Topics in Middle Eastern and African Economies
Vol. 10, Sept 2008

DISAGGREGATED EDUCATION DATA AND GROWTH: SOME FACTS FROM TURKEY AND MENA COUNTRIES

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ABSTRACT

This paper investigates the interaction between the economic growth and the education in MENA countries and Turkey. Following a brief outline of the theoretical discussions on the nexus between economic growth and human capital formation through education, first we present some observations for the MENA region. Rest of the paper devoted to the estimation result of the VAR model which is developed in order to study the interaction between education and economic growth in Turkey. The paper concludes that the efforts to improve the quality of education have significant contribution to the economic growth of the countries in the MENA region. We also found that all levels of education except high-technical schools and university level contribute the economic development in Turkey when the indicators of education quality are used.

JEL Classifications: J24, O43
Key Words: Education, Growth, disaggregated data, VAR, MENA region, Turkey.

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1. INTRODUCTION

Last two decades, high economic returns of education have been documented in a growing body of research. The paper intends to contribute to the existing knowledge on the interaction between the economic growth and the education, considering the MENA countries and Turkey. As a common knowledge, micro labor literature mainly concentrates on the rate of return of education for individuals, whereas macro literature underlines the effect of education on macroeconomic growth. Furthermore, micro labor literature covers labor quality issue, which is affected from the education level and quality. The paper basically focuses on the macroeconomic aspect of the issue comparing the education and growth performance indicators. Considering the empirical findings on the interaction between quality of education and economic growth, the paper implicitly refers to microeconomic dimensions of the issue, as well.

Main purpose of the paper is to investigate the effectiveness of the various indicators of education to explain economic growth. We employed different education indicators where available in order to evaluate the MENA countries. For the VAR analysis on Turkey, on the other hand, we disaggregated the data by the education levels, such as primary, secondary, high, high-technical schools and university. The reason behind the use of disaggregated data is to grasp which type of investment in education can be effective in economic growth. The effectiveness will reduce if the education system serves inappropriately for the skill development and other labor quality issues in a particular country through improper investments in education. Our analyses show that improvement in the quality of education in primary and secondary levels have similar contribution to the Turkish economic growth.

Next section summarizes the selected theoretical and empirical contributions on the nexus between education and economic growth. Section 3 presents some observations on the interaction between education and economic growth in the MENA region. Section 4 devoted to the VAR analysis to evaluate the effectiveness of the Turkish education system. Last section concludes the paper.

2. INTERACTION BETWEEN GROWTH AND EDUCATION

Becker (1962), Schultz (1960), Phelps (1967) are the pioneering examples of the theoretical models to analyze the interaction between economic growth and education. Later, following neoclassical growth theory introduced by Solow (1956) and Swan (1956) several growth models were developed to explain the interaction between economic growth and education.[1] The models developed by Romer (1986) and (1990), and Lucas (1988) on the effects of the technology on the economic growth stimulated a new wave of discussions on the role of education on economic growth.

Solow-Swan model anticipate that the aggregate output depends on the quantities of physical capital and the labor. However, empirical research shows that the primary source of the economic growth is the level of technology. The mechanisms that produce new technology and enhance human capital formation are widely discussed by the studies on economic growth. Both theoretical models and empirical research show that, in addition to learning-by-doing, education is one of the main instruments to improve the human capital. Furthermore, for the developing economies, Barro and Lee (2000) stressed that the well-educated human resources can also help facilitate the absorption of advanced technology.

The studies on education can be classified into two groups: They are known as micro labor literature and macro growth literature. Micro labor literature mainly concentrates on the rate of return on education for individuals, whereas macro literature underlines the effect of education on macroeconomic growth. Although the theoretical discussions outlined above focus on the role of education on economic growth, the studies on the return to education have also some important consequences on economic growth through externalities created by the education.

Considering both social and private returns, for instance, with higher education level it is possible to reduce the probability that an individual will engage in activities which generate negative externalities. Increase in education levels may lead to more healthy parents and

[1] Among others, Razin (1972) on optimal investment in education, Manning (1982) on balanced growth and education, and Tu (1970) on optimal education planning are the examples of the studies in this route.

children and healthier individuals may be more productive. Another example may be given in the voting process. More educated voters probably will be more successful in the decision process to select the right politicians. Hence, educated voters decisions' increases the social welfare in that point of view. Higher education levels also increases the interactions between individuals; Dowrick (2003) mentioned that the accumulation of abilities contributes both to physical rewards such as our pleasure in conversation and to market economic activity, such as selling one's services as a computer programmer. Thus, as the private return to education, at least, a well educated individual would enjoy life. Weiss (1995) also underlines the private return of education with the following quotation:

> *"Education does not have to be justified solely on the basis of its effect on labor productivity. … Students are not taught civics, or art, or music solely in order to improve their labor productivity, but rather to enrich their lives and make them better citizens."* (Weiss: 1995, p. 151).

In general, recent empirical studies on education refer to both micro and macro literatures to improve their analyses. However, the studies we outline below are basically focuses on growth literature.

As a pioneering empirical work, Mankiw et. al. (1992) stressed the importance of human capital accumulation in the economic growth literature, too. They constructed an augmented Solow model that includes both human capital accumulation and physical capital accumulation. They have two important reasons of including human capital in the model;

> *"First, for any given rate of human capital accumulation, higher saving or lower population growth leads to a higher level of income and thus a higher level of human capital; hence accumulation of physical capital and population growth have greater impacts on income when accumulation of human capital is taken into account. Second, human-capital accumulation may be correlated with saving rates and population growth rates; this would imply that omitting human-capital accumulation biases the estimated coefficients on saving and population growth."* (Mankiw et. al.: 1992, p.408)

Hence, to test this augmented Solow model, they include a proxy for human-capital accumulation as an explanatory variable. Their results confirmed that accumulation of human capital is correlated with saving and population growth. Thus, as they expected, including a human capital accumulation lowers the estimated effects of saving and population growth. In

this model, the proxy for the human capital is the percentage of the population in secondary school. The model is performed for three different samples and human capital enters significantly in all these three samples.

Benhabib Spiegel (1994) suggested that the change in schooling has an insignificant effect if it is included in a GDP growth model. They used cross-country estimates of physical and human capital by estimating a growth accounting model. Their results indicate that human capital enters insignificantly in the model. However, Benhabib and Spiegel specified an alternative model in which the growth rate of total factor productivity depends on a nation's human capital stock level. In this specification, human capital affects aggregate productivity through two different channels. First, they thought that it directly influences productivity by determining the capacity of nations to innovate new technologies that are suitable to domestic production. Second, they assumed that human capital level affects the speed of technological catch up and diffusion. Hence, they further assumed that the ability of a nation to adopt and implement new technology from abroad is a function of its domestic human capital stock. In this second specification, human capital has a positive role in determining the growth of per capita income and it attracts physical capital.

Lucas (1993) analyzed the East Asian miracle economies, with the emphasis on the on-the-job accumulation of human capital, namely, learning-by-doing. The study compares Philippines and South Korea using some indicators that in 1960s, both countries had about the same living standards. For instance, they both had 640 $ per capita GDP in 1975. From 1960 to 1988, GDP per capita in Philippines grew at about 1.8 percent per year which is about the average for per capita incomes in the world as a whole. On the other hand, In Korea, over the same period per capita income grew at 6.2 percent per year which is a rate that doubles the living standards. According to the study of Lucas, the main engine of growth is the accumulation of human capital which is measured by knowledge. Hence, Lucas underlines the role of education in this paper, too. According to his paper, the main source of differences in living standards among nations is difference in human capital. He also emphasized that human capital takes place in schools, in research organizations and in the course of producing goods and engaging in trade.

A more recent paper by Ehrlich (2007) investigated why the US overtook the UK and other European Countries in both aggregate and per-capita GDP especially during the 20th

century. His paper was a case study of recent models of endogenous growth in which human capital is the engine of growth. One of the significant results which is closely related to our subject is the role of schooling attainments of US's labor force. In this paper, it is underlined that the US developed a considerable gap over Europe especially at the higher education level and this gap was largely as a result of the massive high school movement of 1915 – 1940. O'Rourke and Williamson (1995) also provides an historical perspective to analyze the European countries, and presents interaction between the quality of schooling and the growth performance.

Hanushek and Woessmann (2007a) focuses on the role of educational quality in promoting economic well-being: It is concluded that both the quality of the institutional environment and the quality of education are important for economic development Furthermore, they emphasized that good institutional quality and good educational quality can reinforce each other in advancing economic development. The quality of education is also stressed by Hanushek and Woessmann (2007a):

> *"The East Asian countries consistently score very highly on the international tests and they also had extraordinarily high growth over the 1960–1990 period. It may be that other aspects of these East Asian economies have driven their growth and that the statistical analysis of labor force quality simply is picking out these countries. But in fact, even if the East Asian countries are excluded from the analysis, a strong relationship is still observed with test performance. This test of sensitivity of the results seems to reflect a basic importance of school quality, a factor that contributes also to the observed growth of East Asian countries."* (Hanushek and Woessmann: 2007a, p.29)

For the case of Turkey, Gungor (1997) estimates an aggregate production function by panel data techniques to measure the effect of the educational attainment of industry workers on economic growth. Kasnakoglu and Erdil (1994) analyze the trends in real public expenditures on education in Turkey. Cecen et al. (2003) investigates the relationship between the growth dynamics of the Turkish economy, human capital formation patterns and openness using VAR technique.

3. SOME OBSERVATIONS ON ECONOMIC GROWTH AND EDUCATION IN THE MENA REGION

Table 1: Economics Growth and Selected Education Indicators for MENA Region (1999-2004 average)

Country Name	GDP per capita growth (annual %)	Expenditure per student, primary (% of GDP per capita)	Expenditure per student, secondary (% of GDP per capita)	Public spending on education, total (% of GDP)	Pupil-teacher ratio, primary	School enrollment, primary (% net)	School enrollment, secondary (% net)
Algeria	2.53	10.91	17.29		27.68	94.11	64.96
Bahrain	3.40	15.82	17.70		17.48	96.43	88.57
Egypt, Arab Rep.	2.28				22.66	93.41	78.92
Iran, Islamic Rep.	3.57	10.87	11.62	4.79	24.33	83.74	78.65
Israel	0.26	21.72	22.70	7.28	13.17	99.66	87.73
Jordan	2.16	14.68	17.20	4.95	19.99	92.62	81.21
Kuwait	-0.34	21.31	24.40	8.17	13.41	84.56	82.56
Lebanon	2.00	5.06	6.17	2.48	15.46	94.18	
Libya	1.49	2.97		2.67			
Morocco	1.79	19.42	49.38	6.32	28.18	81.45	33.27
Oman	1.91	12.04	20.91	4.33	23.00	80.28	70.53
Qatar					11.96	93.32	79.36
Saudi Arabia	0.15	31.94	31.37		11.98	57.14	54.70
Sudan	4.05				28.80	43.15	
Syrian Arab Republic	-0.67	13.00	24.43		23.06	95.54	43.41
Tunisia	3.71	15.62	25.43	6.90	22.64	95.43	66.88
Turkey	1.34	12.37	11.90	3.67		90.96	
United Arab Emirates	-0.46	8.08	11.35	1.59	15.60	75.26	68.40
Yemen, Rep.	0.41			9.75	29.84	66.61	32.74

Source: WB World Development Indicators 2006.

This section gives a succinct description of the growth and education nexus in the MENA region. Selected indicators of education and per capita annual GDP growth rates are displayed in the Table-1 for the countries in the MENA region, excluding Iraq because of lack of data, and including Sudan due to its cultural and political ties with the MENA region. Unfortunately, the period of the education indicators in the data set used in this section is very short.[2] Due to limited number of observation, it is not possible to employ the basic econometric techniques like cross-section or panel data. Therefore, we preferred to present education and growth indicators on a scatter diagram using the data given in Table-1 as the

[2] The source of the data is 2006 version of World Bank - World Development Indicators.

average of 1999-2004 period. Figures 1 to 6 display the pairs of growth and education indicators for the countries where data is available.

It is clear that the countries in the MENA region differ in terms of historical background of their economic development and formation of the economic institutions. In other words, the sample is not homogenous in terms of the factors which may affect the growth performance. Consequently, variations in economic growth can not be attributed solely to the differences between level and quality of education in these countries. Given this caveat, the figures support the views which propose causality between education and growth.

Figure-1 displays the pairs of expenditure per student at primary level as the percentage of GDP per capita and annual growth of GDP per capita. Excluding Israel, Kuwait and Saudi Arabia, as the outliers, the remaining MENA countries are located around an increasing line.[3] Similar result is obtained when we compare expenditure per student at secondary level with annual growth of GDP per capita (Figure-2).

Expenditure per student can be taken as the indicator of the quality of the education. Figure 1 and 2 show a visible interaction between education and growth in MENA countries excluding the outliers where expenditures per student are relatively higher than the rest of the countries considered. These countries can be taken as the exceptional cases: As the oil rich countries economic growth in Kuwait and Saudi Arabia primarily determined by the price of the oil in the international markets. On the other hand, it seems that the priorities given to education by the governments do not coincide with the growth performances of Morocco and Syrian Arab Republic.

Another indicator of the quality of education is total public spending on education as the percentage of GDP. Excluding Kuwait and Yemen, growth performance of the MENA countries can be explained by public spending on education (Figure-3). These three quality indicators show similar effects on economic growth. Student-teacher ratio also can be used as a quality indicator for the education. It is expected that the decrease in number of student per teacher should stimulate the economic growth. However, the data for the MENA region do

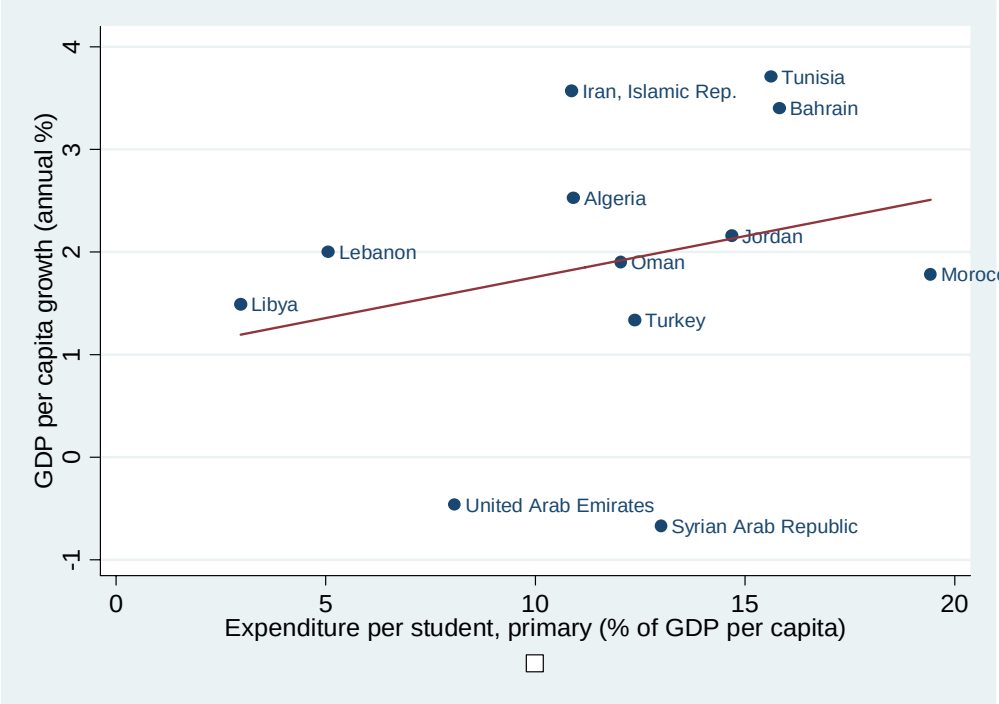
[3] The lines shown on the figures are the fitted values of the variables given on the horizontal axis, based on the linear regression estimation. However, due to the limited number of observations, the line should be considered only as a reference rather than a statistical inference.

not support this view when we evaluate student-teacher ratio for primary education and economic growth. The result displayed in Figure-4 does not change even if we exclude reasonable number of outlier.

Figure-5 and 6 display relationship between enrollment and economic growth at primary and secondary education in the MENA region. As it is discussed in the Section-2, enrollment is considered as a weak indicator for education in economic growth literature. However, excluding Sudan, link between school enrollment and economic growth is not at least weaker than the result obtained employing quality indicators for the education.

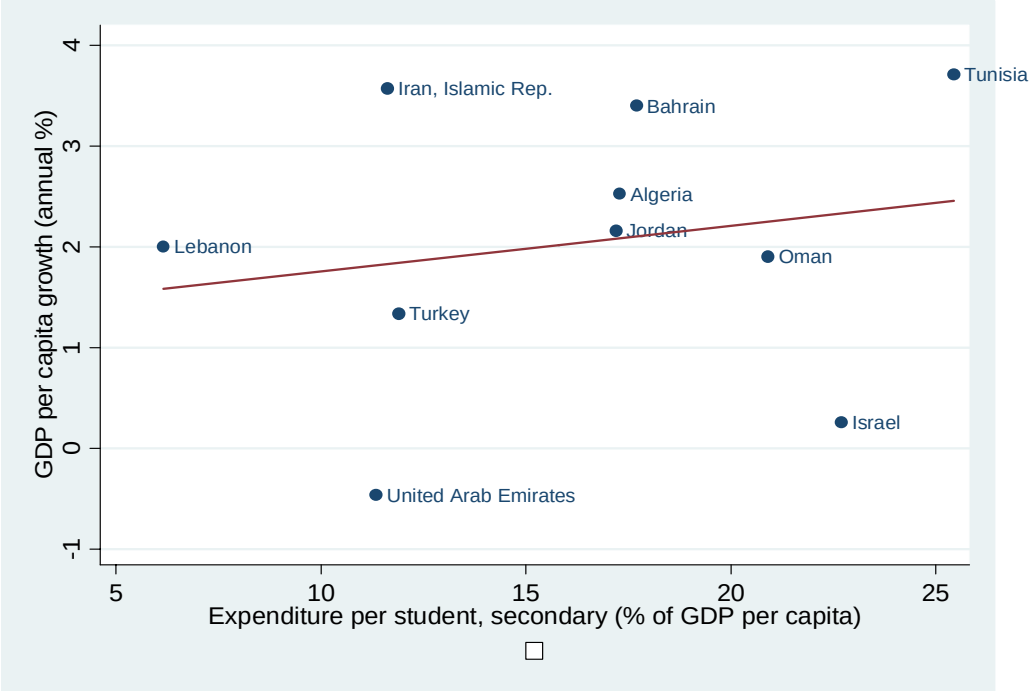
The observations based on limited data, provide fairly apparent relation between education and economic growth. Static nature of the cross-section data hinders the conclusion on the dynamic interaction between education and economic growth. Consequently, the results we present in this section are also subject to the economic conditions prevailing during the period considered. For example, Turkey has experienced two severe economic crises, which significantly reduced average growth rate for the period of 1999-2004. Nevertheless, the observations presented in this section are sufficient to emphasize the role of education on economic growth in the MENA region.

Figure 1: Expenditure per student, primary (% of GDP per capita) - GDP per capita growth (annual %)



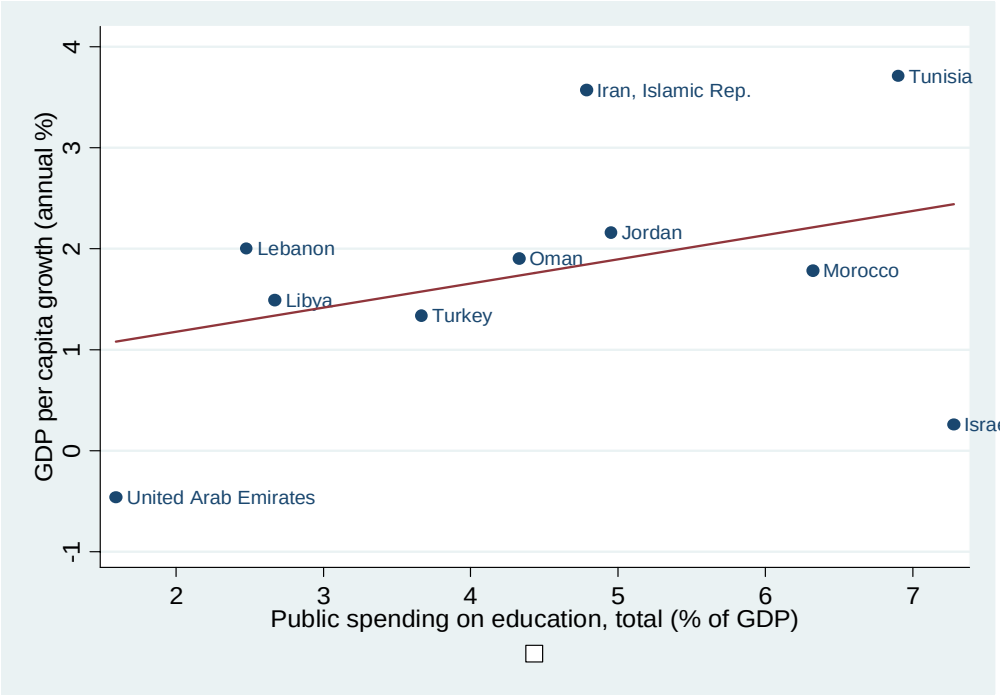
Source: Table-1. Israel, Kuwait and Saudi Arabia are excluded.

Figure 2: Expenditure per student, secondary (% of GDP per capita) - GDP per capita growth (annual %)



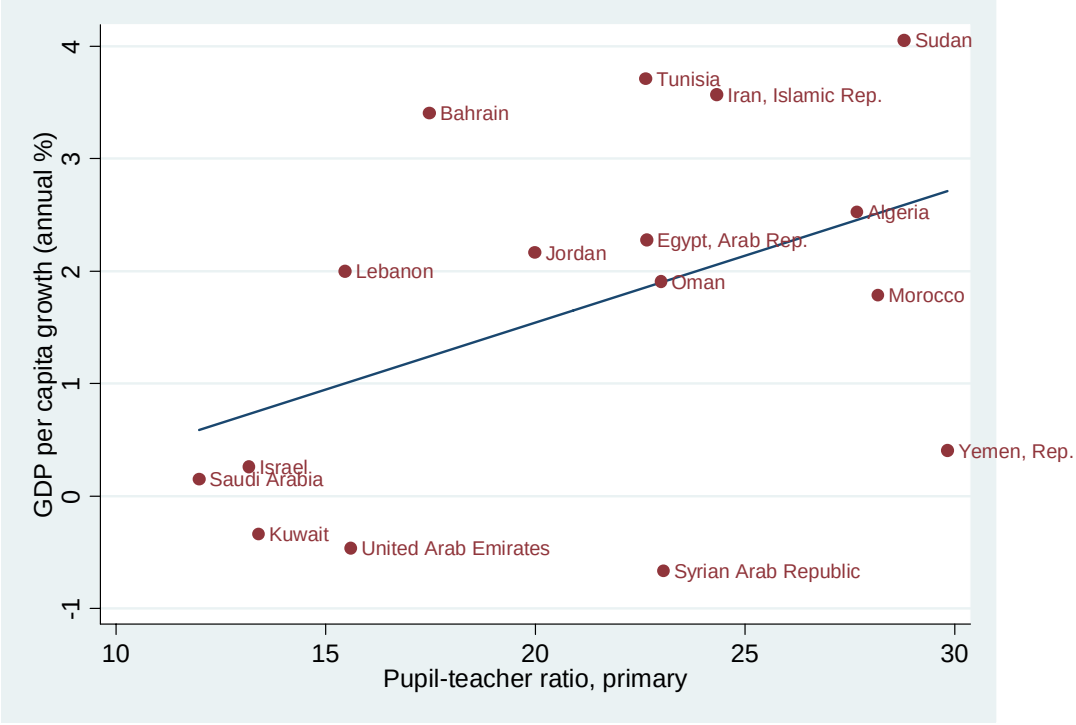
Source: Table-1. Morocco, Kuwait, Syrian Arab Republic and Saudi Arabia are excluded.

Figure 3: Public spending on education, total (% of GDP) - GDP per capita growth (annual %)



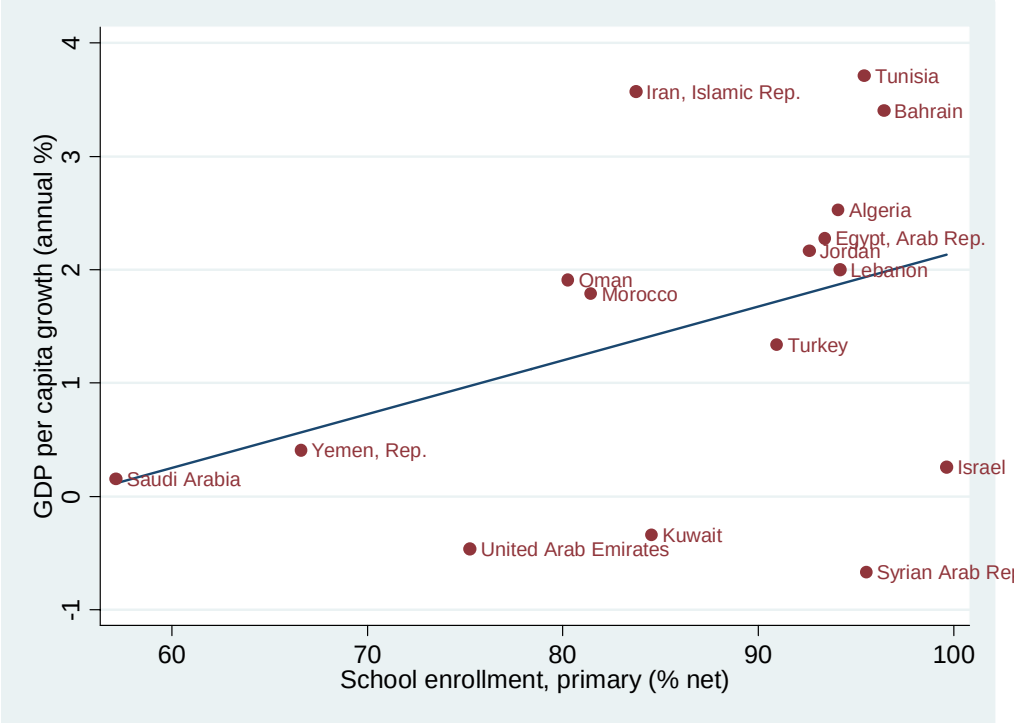
Source: Table-1. Kuwait and Yemen, Rep. are excluded.

Figure 4: Pupil-teacher ratio, primary - GDP per capita growth (annual %)



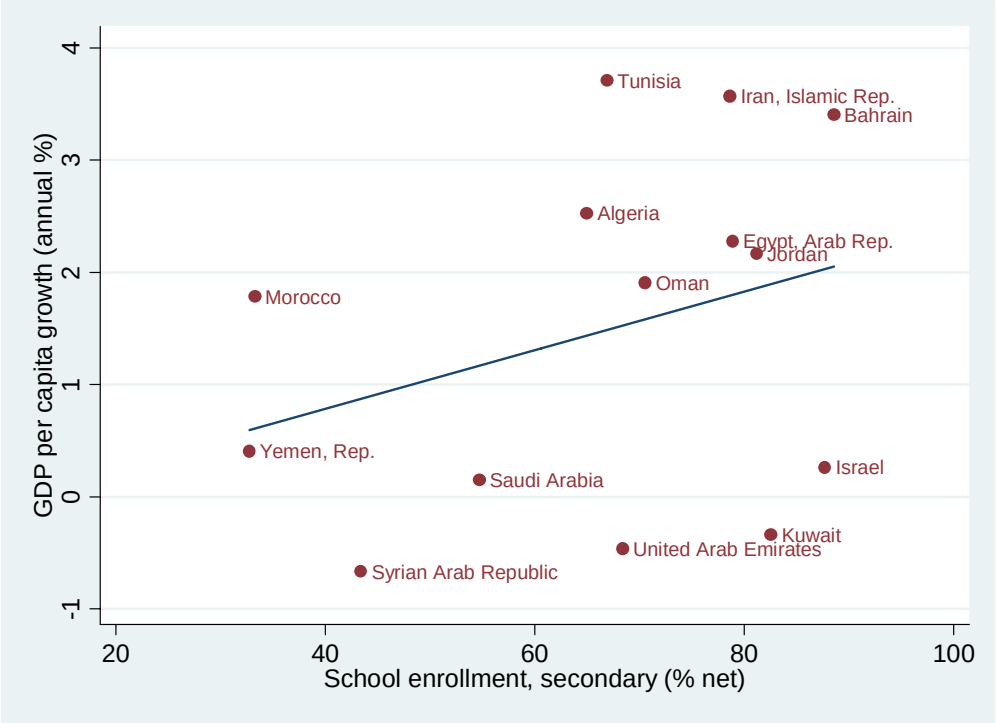
Source: Table-1.

Figure 5: School enrollment, primary (% net) - GDP per capita growth (annual %)



Source: Table-1. Sudan is excluded.

Figure 6: School enrollment, secondary (% net) - GDP per capita growth (annual %)



Source: Table-1.

4. VAR ANALYSES FOR THE CASE OF TURKEY

According to the results of the previous section, we can deduct that education, in general, has a positive effect on economic growth when this relationship is examined with different variables for the MENA countries. In the light of these results, although, the primary goal of this paper is to analyze the effects of different education levels on the Turkish economic growth, the inverse relationship is also worth to investigate. Therefore, we employed Vector Autoregression (VAR) analysis to investigate the mutual relationship.

4.1. Data

We are using time series annual data that cover the period of 1930 – 2004 and it is provided by the Turkish Statistical Institute[4]. However, before proceeding, we investigated whether there is a structural change in the sub-periods of this interval. As the economic growth indicator, the growth rate of gross national product (GNP) per capita series is used. In order to see which type of investment in education can be effective in economic growth, we decomposed the data under five major education categories, which are primary school, secondary school, high school, high-technical school and university.[5] For the education series, we employed "graduates and enrollment over population" as the level indicator and "graduates and enrollment over teacher" as the quality indicator. Hence, share of the population that are graduated from the relevant educational institution just gives an approximation for the number of working force, where as the graduate students per teacher gives an approximation for the qualified working force. For the latter indicator, the positive effect is ensured with an inverse relationship. Additional to these variables, we repeated the analysis for the series of "number of students enrolled over population" and "number of students enrolled over teacher". For the MENA countries enrollment rates are available as the data for education. Hence, this further investigation is placed as an alterative way to have the consistency with the data of the MENA countries. Furthermore, according to the literature, enrollment rate is widely used as the indicator of education. At the same time, we observed high correlations among the number of students enrolled to and graduated from all levels of institutions. However, there are significant differences between enrolment and graduation

[4] Statistical indicators of Turkey 1923 – 2005, Prime Ministry Republic of Turkey, Turkish Statistical Institute
[5] This classification is slightly different than the one used in previous section. In the previous section, secondary education includes secondary and high schools. For the Turkish case, as it is noted below, definition of primary education has been changed.

numbers for the university level. For instance, the total enrolment number for the universities in 1990 is 705.405. Assuming a typical university education takes place 4 years on average, the number of graduates from universities is taken for year 1994 which is equal to 135.346. These numbers show that, for the university level, enrolment number is a weak indicator to explain the economic growth for the Turkish case. On the other hand, the shares of graduates from the universities in total number of graduate are very small, especially in the early years. For that reason, we disregarded the significance of universities in the analyses.

Starting from 1996, data for the number of graduates from secondary schools are not available because of the major change in the primary education system. Primary and secondary schools integrated in this year, and the new system requires 8 years of compulsory primary education while the old system requires only 5 years. In order to keep the homogeneity of the data, we combined the enrollment per teacher data for the primary school and the secondary school, either in terms of sum or weighed average, as the indicator for the 8-year education. For the data of graduates, on the other hand, we consider only the graduates of 8-year education as the indicator of the primary education. Henceforth, due to this change in Turkish education system, 8-year education will be labeled as "primary" and the education at the 9^{th}, 10^{th} and 11^{th} years will be labeled as "secondary" excluding technical schools.

4.2 Preliminary Analysis:

The period of the available data permits us to explore the interaction between education and economic growth over the period 1930 – 2004. However, during this relatively long period Turkey has experienced important changes in terms of its economic structure and the economic policies implemented. Consequently, these changes may affect the nature of the interaction between education and economic growth. In order to check this possibility, we calculated the coefficients of correlations for the pairs of the data we use for the moving 20-year sub-period. Calculations depicted that the correlation between all variables do not show any sort of systematic change over these sub-periods. This result implies that, over the entire period, the interaction between education and economic growth does not have any significant structural change. As a result, we keep the period of the analyses as long as possible in order to capture the long-run nature of the issue.

We would like to identify which education level has the higher effect on the economic growth of Turkey. So, we estimated the VAR equations separately for all education levels. The regressors are exactly collinear if one regressor can be written as a linear combination of the other regressors. In our case, this is an expected problem, especially for the consequent education levels. Accordingly, in order to avoid the multicollinearity problem, we constructed the VAR model for each education level separately.

Table 2: Augmented Dickey –Fuller Test Results

	Primary	Secondary	High-technical schools
Graduates over population	I(1)	I(1)	I(1)
Enrollment over population	I(1)	I(2)	I(1)
Graduates over teacher	I(1)	I(0)	I(0)
Enrollment over teacher	I(1)	I(1)	I(0)

We performed the Augmented Dickey –Fuller test in 5% significance level in order to examine for the presence of unit root. The results are indicated in Table-2. Augmented Dickey –Fuller test is also applied to the GNP per capita series. Results confirm that GNP per capita series is I(0). We also checked the data for the presence of cointegration. Test results do not support that series are cointegrated, i.e. GNP per capita series is I(0) and enrollment over teacher for secondary school series is I(I). Hence, instead of performing vector error correction (VEC) process, we estimate VAR models using first lags of the education indicators.

As the last step of the preliminary analysis, we decided on the appropriate lag value by evaluating both Akaike and Schwarz information criteria. For all series choosing 4 lags minimizes these criteria. For instance, Table-3 presents the lag evaluation process for the enrollment over teacher series of the secondary education.

Table 3: Enrollment over teacher series (Secondary), appropriate lag value

Lag	4	6	8	12
Akaike information criterion	12.753	12.891	12.815	12.698
Schwarz	13.331	13.739	13.943	14.413

4.3 Vector Autoregression (VAR) Analysis:

In order to analyze the interaction between economic growth and education, we estimate following two-variable VAR model.

$$x_t = A_0 + A_1 x_{t-1} + A_2 x_{t-2} + \ldots + A_T x_{t-T} + e_i$$

and $x_t = \begin{vmatrix} X_{1t} \\ X_{2t} \end{vmatrix}$

where X_1 is the annual growth rate of real GNP per capita, and X_2 is the related education variable (i.e. number of students enrolled to the primary schools per teacher), A_i are the coefficients matrices, and, considering the preliminary analyses, T is equal to 4. We estimated the model using different education indicators for each type of schools. VAR estimation results are employed to generate the impulse response functions which permit us to trace the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables. The role of education on economic growth can be deemed as a long-run phenomenon, so we chose 15 periods to trace the response function.

First, we estimated the model using the level indicators, which are "graduates over population" and "enrollment over population". However, results of impulse response functions derived from these estimation are not significant. Therefore, we repeated the estimation using the quality indicators "number of graduates per teacher" and "enrollment to schools per teacher".

We expect to see an inverse relation between GNP per capita and the quality variables, because whenever the graduates or enrolled students per teacher decreases, the knowledge of the students are expected to be greater as a result of the increase in investment on education. Figure-7 displays the results of impulse response functions for the secondary education when we estimate the VAR model using quality indicators. The results show that both enrollment per teacher and graduates per teacher have significant effect on the economic growth. Starting from sixth period for graduates and starting from seventh period for enrollment, initial one standard deviation shock produces a statistically significant effect on the growth rate of GDP per capita. And, it seems that the effects of the shock continue 3 to 4 periods.

Figure 7: Impulse response functions for Secondary School

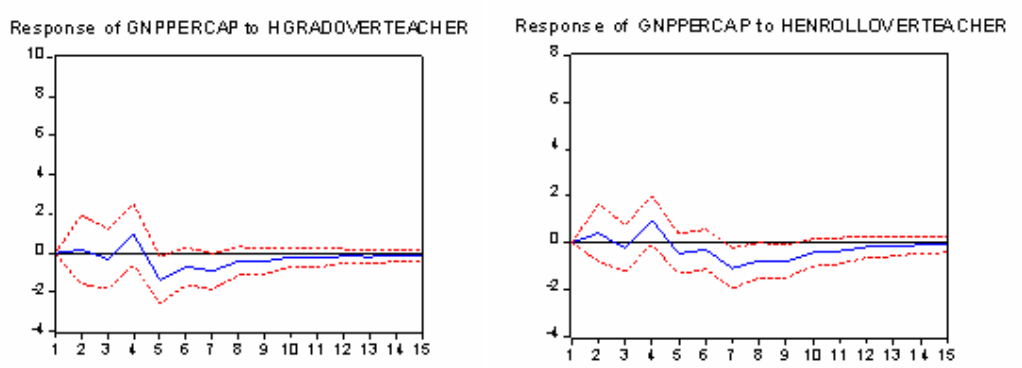
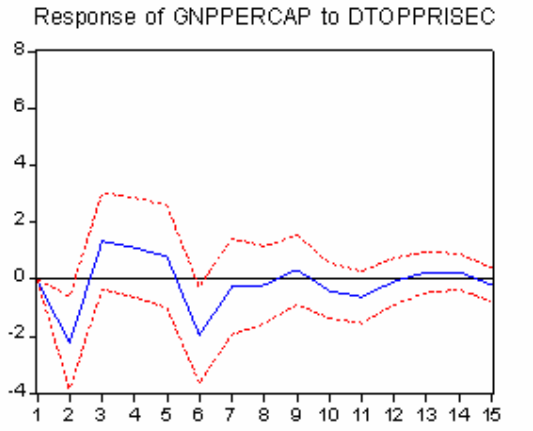


Figure 8: Impulse response functions primary school enrollment per teacher



Similar result is also obtained from the estimation for the primary education (Figure-8). That is, any improvement in the quality of primary education in terms of number of students per teacher has a significant effect on the growth rate. However, the nature of the effect of the education and economic growth differs between primary and secondary educations: The effects of the improvement in primary education is discontinuous and exist at the second and sixth period.

Estimation in which number of graduates per teacher for the primary education is employed did not yield any significant result. Probably, this is an outcome of the change in the nature of the primary education in Turkey which creates a discontinuity in the number of graduates, rather than the ineffectiveness of the quality of the primary education. We do not also obtain any significant result for the estimates of the high-technical schools. Positive role

of the technical education on the improvement of human capital formation is widely discussed in the literature of the development economics. Therefore, the result we obtained is somewhat surprising. We think that this is an outcome of the structure of the Turkish technical education system. First, the figures of the religious schools are accounted under technical schools, and their weight in this group has increased over time. One can expect that the religious schools have little contribution to the improvement of the human capital. Second, we can mention the changing nature of the technical education in Turkey: Initially technical education was concentrated at the 6^{th} to 8^{th} years of the education. Gradually, 9^{th} to 11^{th} years have dominated the technical education over the period that we cover.

5. CONCLUSION

In this paper, we evaluated the economic growth – education relationship with a macro approach both for Turkey and MENA region. We first summarize the significant findings in the literature that exhibits this interaction. Then, we evaluated the role of education in the MENA countries with selected indicators of education. Although the data for education on MENA countries was limited, we could capture an apparent relation between growth and education especially for the primary and secondary school level.

The analyses show that most of the indicators related to the quality of education in all levels have stimulating effects on the economic growth. Therefore, we can conclude that the investments in all levels of education contribute the economic development in the MENA region.

With the motivation of the findings on the MENA region, we investigated the same relationship for Turkey employing the VAR analysis. We performed VAR estimation by using the level indicator variables such as “graduates over population” and “enrollment over population”. Since the results were insignificant, we employed another indicator that shows the quality of the education. The estimation results show that the quality of education in the primary schools and the quality of education in the secondary schools have long-run effects on the Turkish economic growth.

REFERENCES

Barro, R. J. and J. W. Lee, 2000, "International Data on Educational Attainment: Updates and Implications," NBER Working Paper No. w7911

Barro, R. J. and Sala-i Martin, X, 2004, *Economic Growth*, 2nd Edition, MIT Press, Cambridge, Massachusetts,

Becker, G. 1962, "Investment in Human Capital: A Theoretical Analysis," *Journal of Political Economy*, V.70, pp. 9-49.

Benhabib, J. and Spiegel M., 1994, "The role of human capital in economic development: evidence from aggregate cross-country data" *Journal of Monetary Economics*, Vol.34, pp.143-173

Cecen, A., Dogruel A. S. and Dogruel F., 2003, "Erratic Growth cum Weak Human Capital in an Open Economy: An Empirical Study of Education and Development in Turkey," paper presented at ERC/METU International Conference in Economics VII, September 6-9, 2003, Ankara.

Dowrick, S., 2003, "Ideas and Education: Level or Growth Effects?" NBER Working Paper No. 9709.

Ehrlich, I., 2007, "The Mystery of Human Capital as Engine of Growth, or Why the US became the Economic Superpower in the 20th Century," NBER Working Paper, No. 12868.

Gungor, N. D., 1997, "Education and Economic Growth in Turkey 1980-1990: A Panel Study," *METU Studies in Development*, V.24, N.2, pp. 185-214.

Hanushek, E. and Woessmann, L., 2007a, "The Role of Education Quality in Economic Growth," World Bank Policy Research Working Paper No. 4122

Hanushek, E. and Woessmann, L., 2007b, "The Role of School Improvement in Economic Development," NBER Working Paper, No. 12832

Kasnakoglu Z. and Erdil, E., 1994, "Trends in Education Expenditures in Turkey: 1975-91," *METU Studies in Development*, V.21, 4, N.pp. 521-542.

Lucas, Jr. R. E., 1988, "On the Mechanics of Economic Development," *Journal of Monetary Economics*, V.22, pp. 3-42.

Lucas, R. E., 1993, "Making a miracle," *Econometrica*, Vol. 61, No. 2, pp. 251 - 272

Mankiw, N. G., Romer D. and Weil D. N., 1992, "A contribution to the empirics of economic growth," *Quarterly Journal of Economics* Vol.107, No:2, pp. 407-437.

Manning, R.,1982, "Trade, Education and Growth: The Small Country Case," *International Economic Review*, V.23, N.1, pp. 83-106.

O'Rourke K., Williamson J. G., 1995, "Around the European Periphery 1879-1913: Globalization, schooling and Growth," NBER Working Paper, No. 5392.

Razin, A., 1972, "Optimum Investment in Human Capital," *Review of economic Studies*, V.34, pp. 455-460.

Romer, P. M., 1986, "Increasing Returns and the Long-Run Growth," *Journal of Political Economy*, V.94, pp.1002-1097.

Romer, P. M., 1990, "Endogenous Technological Change," *Journal of Political Economy*, V.98, pp.S71-S102.

Phelps, E. S., 1967, *Golden Rules of Economic Growth*, Norton, New York.

Schultz, T.W., 1960, "Capital Formation by Education," *Journal of Political Economy*, V.68, pp. 671-683.

Solow, R. M., 1956, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, V.70. pp.65-94.

Swan, T. W., 1956, "Economic Growth and Capital Accumulation," *Economic Record*, V.32, pp.334-61.

Tu, P. N.V., 1970, "A Multisectoral Model of Educational and Economic Planning," *Metroeconomica*, V.22, pp. 207-226.

Weiss, A. (1995), "Human capital vs. signaling explanations of wages", *Journal of Economic Perspectives*, V.9, N.4, pp. 133 - 154