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The Nexus for Education on Economic Growth: The Case of Turkey

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ABSTRACT

Purpose – Human capital has consistently been recognized as one of the major factors driving the economic growth of a nation. It is essential to make the education sector, which plays a major role in development of human capital, more responsive towards the changing demands of an economy. Extensive literature on this subject presented a close relationship between role of education and economic growth of the nation. The present study examines the impact of Turkey's education sector on the economic performance of the country for the time period 1999-2016. Additionally this study investigated the inverse relationship between them i.e. whether the rising economic growth of Turkey is also contributing significantly in education.

Design/methodology/approach – Economic growth theories including classical Cobb Douglas model search impact of education level on economic growth. This paper studies whether schooling rate, vocational education and other education improvements had positive impacts on economic growth for Turkish economy. In order to search the relation between human capital and economic growth trend analyses, stationarity analyses, ARIMA modelling, causality search and cointegration tests made for education variables in Turkey.

Findings – Improvements in education level has positive impacts on economic growth for Turkish economy. The econometric analyses supports that hypothesis.

Discussion – Human capital has strong impact on economic development for future success of Turkish economy. Improvements in education level reveals the human capital and economic growth relation in long term.

INTRODUCTION

Investment in human capital was not given a great deal of importance until the mid-nineteenth century (Bhatawdekar, 2017). Expenditure on development of human resources such as schooling, training and skill development was insignificant. This situation radically changed with the development of new business models that increased the need of skilled workforce. The onset of twentieth century brought in 'human capital' as the primary constituent in country's development process (Owings, Kaplan, & Pirim, 2012). Education started playing an increasingly dominant role in development of not only an individual, but for an economy too. Considerable investment in education during this period was considered necessary for achieving a high rate of economic development.

The concept of development in 'human capital' can take various forms. Previous researches conducted by (Ardiente & Guiking, 2015; Decker, Rice, & Moore, 1997; Odit, Dookhan, & Fauzel, 2016) focused upon a variety of forms of human capital growth, represented in terms of basic education, research, learning by doing, training and aptitude building Among these, education was considered one of the most important element for economic growth. However, unequal distribution of education tends to have a disproportionate as well as a negative impact on per capita income for most of the people. In order to achieve higher prospects for education and skills, the economies need to focus upon its distribution (Monteils, 2004).

Till the 1960s, the neoclassical models failed to consider education as one of the major inputs for production. Eventually, the seminal works after 1960s depicted series of growth models encompassing the contribution of human capital in form of education and training as the major determinant in economic growth of a nation (Odit et al., 2016). The logic behind this idea is attributed to the fact that investing in human beings is considered to be similar to investing within tangible assets like industrial equipments and buildings that would generate a flow of returns in future. Robert Solow also developed a theoretical model linking human capital and economic performance (Najeb, 2014). This model examined the working of human capital within

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endogenous growth models wherein the continuous growth is achieved with the addition in human capital overtime. Further, the model developed by (Romer, 1989) focused upon the importance of technological progress and innovation that are required for improvising a country's ability to compete.

The importance of education can attributed to the fact that the school enrolment rates of the country in primary, secondary, and tertiary levels are closely related to various variables of economic growth including GDP (Gross Domestic Product) growth rate, reduction in poverty and greater job generation metrics (Lowe, 1988). The tertiary level of education of a country is directly connected with FDI (Foreign Direct Investment) inflow within the country which in turn impacts the national growth of the economy. An educated workforce is better equipped to operate the upgraded technological infrastructure that boosts its production capacity. Eventually, this results in boosted economic growth of the country (Odit et al., 2016).

Turkey has depicted a remarkable growth after the global financial crisis and is projected to grow at a steady pace for the next few years. The economy grew by 9.1% in 2010 and 8.5% in 2011. This remarkable economic performance placed Turkey in the list of the most rapidly growing economies in the world with 13% increment in the GDP along with 9.5% decrement of employment rates by the end of 2011(Akat and Yazgan, 2012). However, in spite of facing a series of adverse shocks including severe geo-political tensions at the southeastern border and an averted coup attempt in 2016, similar growth scenario has continued in the Turkish economic sphere till 2017 with an average GDP growth of 7.4% in 2017. Further, Turkey has also witnessed higher growth in labor productivity as compared to many other OECD countries (OECD, 2018). However the recent fall in exchange rate of the Turkish Lira against the US Dollar has resulted in shrinking of its economy by 2.5-3% (Butler & Erkoyun, 2019).

Significant studies (N. Gungor, 2010; Mercan & Seger, 2014; Yurtkuran & Terzi, 2015) examining the impact of education on economic performance of Turkey were conducted prior to 2012, thus failing to capture current market scenario. While material life of Turkey has improved due to noteworthy economic growth of the country in the last few years, well-being inequalities are persistent in many socio-economic groups, genders and regions of the country due to large gaps in education, skill and eventual earning capacity of the Turkish population (Koç, 2015). One of the major reasons behind this difference on well-being and living standards of the Turkish population is unequal access to education and gap in educational attainment among people. Presently, the country suffers from critical challenges in the education sector such as underperformance of students in primary and secondary education, lack of participation in research and development in academia, degrading quality of teachers and inadequate skill development opportunities (Akyol, 2017; Kizilcelik, 2015). Therefore, this paper is considered important from the stand point that it attempts to understand the role played by education in the economic prosperity of the country during 1999-2016, thus taking into consideration the changes observed by the country's education system and its subsequent effect on economic performance for the recent years too.

AIM OF THE STUDY

The main objective of this study is to examine the impact of education on economic growth in Turkey for the period 1999-2016.

LITERATURE REVIEW

a) Education system of Turkey

The education system of Turkey has taken the center stage in its economic policies for the last century which is evident from the fact that during the average adult literacy rate grew to 89% by 2010 from 10% in 1920 (ETF, 2012). Government spending and share of education expenditures in budget increased for years. The positive impacts of education expenditures on economic development in historic context is quite clear in past years (Tunç, 1998). Among the literate population, about 96% are males and 81% of them are females (Gumus, 2012). The education infrastructure of Turkey comprises of formal and higher education. It is further structured into pre-primary, primary, secondary, and higher education institutions. Turkey's higher education comprises of universities that provide at least four years of education. In addition to this, there are vocational schools in the country that offer a minimum of two years of education. Further, in regards to the public and non-profit universities across the country, conduct several types of entrance examinations(ETF, 2012).

In Turkey, the commencement in any formal education for most of the children accounts to primary education. It is only few children who get the chance to attend pre-primary schools. Although the higher education enrolment rate in primary schools has led to improvement in adult literacy but education continues to be a controversial issue for the Turkish Republic (MOE, 2014). This is because in contrast to the scenario of many developed countries, the regulations and norms of the educational institutions, teaching procedures and entrance exams in high schools and universities are often changed disruptively by the authorities (Süleyman & Harun, 2015). Moreover, while dropout rate is high in Turkey, the students who pursue education in Turkish institutions often fail to meet the industry needs due to limited level of knowledge and skill sets (Gungor, 2010). Apart from this, the major concerns in the education sector includes shortage of appropriate infrastructure, shortage of appropriately skilled teachers, paucity of adequate number of schools in comparison to the population and indifferent attitude of the patents towards schools and need of schooling their children (OECD, 2018) . In endogenous growth theories, human capital considered as an important determinant for the growth. Therefore, the relationship between human capital and economic growth investigated in terms of causality for Turkey (Kar, 2006).

b) Evidences on growth models

In context of the growth in human capital, the most prominent contribution was made by (Romer, 1989). The economic models proposed by him considered human capital as a function of the level of output. According to this model, the expression 'human capital' was majorly relevant to facts relative to the skilfulness obtained via education. Another study by (Jones, 2003) related Uzawa-Lucas model as an extension to improve the quality of education in contributing to higher productivity. This model revealed that even with constant average educational attainment, the stock of human capital would ride up the output levels. Further, the model highlights that some degree courses focus upon greater impact of productivity rather than vocational qualifications.

Though education offers substantial economic benefits ,individuals often tend to under invest in it (Mercan & Sezer, 2014). In this context, the model by Rustichini and Schrnitz as cited in (Odit et al., 2016) discusses on how individual under-invest in education. In this model, the individuals divided their own time within three sections: original research, production and their acquirement of education. Every individual is acknowledged as to how the attainment of information with education is imperative but there is no means to measure research and development activities. This model highlighted that policy intervention places a much smaller impact in time allocation on education but a substantial effect on the growth rate.

c) Evidences on education and economic growth

Extensive literature presented below depicts the nexus of education and the economic development of a country.

Table 1: Studies depicting the relationship between education and economic growth Turkey

Aim	Time Period	Methodology	Variables	Findings
Human capital in development: Internal rate of return approach (Tunç. 1998)	1973-1996	Internal rate of return	Education expenditures and economic growth	Education level positively effects personal income and GDP
Human Capital and Economic Growth in Turkey (Kar,2006)	1936 to 1994	Cointegration analyses and causality test	Share of education expenses in GDP	Long term strong relation between human capital and economic growth
Impact of educational growth and economic status of Turkey. (Gungor,2010)	1975 to 2000	Hausman Test and Regression	Mean of schooling years for the laborforce and education ginni coefficient	Educational inequality negatively affects uniform economic growth of the entire country.

If educational improvement in terms of school enrollment rates has any connection with economic growth in Turkey(Gumus, 2012)	1980 to 2008	Toda-Yamamoto's causality test and modified Wald test.	GDP per capita and gross school enrollment ratios at the primary, secondary, and tertiary levels	Direct connection between educational attainment through enrolment in primary school level and economic growth in Turkey
Link between educational attainment of the average population and economic growth of a country.(Henderson, Parmeter, & Delgado, 2012)	1994-2016	Nonparametric version of the canonical growth regression modeling:	School life expectancy rate and investment in vocational education	The years of schooling of an individual is connected with his academic and skill attainments which in turn determine the quality of the workforce.
Relationship between the level of educational attainment and economic growth of Turkey(Mercan & Sezer, 2014)	1970 - 2012	Unit root test co-ntegration analysis	real gross domestic products and total expenses to the education	Role of education is undeniable in fostering economic growth in Turkey because it enriches the knowledge of the human resource and makes their skills in perfect balance with the needs of the job market.
How quality of human capital in Turkey determines its economic growth.(Erdem & Tugcu, 2010)	1950-2012	Standard Granger causality, Hsiao version of Granger causality and Dolado-Lütkepohl VAR causality	GDP and enrolments in university and vocational high school	There is a positive connection between the completion of university degree, vocational high school degree and academic high school degree of students and the economic growth of the country due to enrichment in the human resource.
Establish a connection between development education and economic development of European country(Miller, 2007)	1977-2014	Granger causality test	Literacy rate and GDP growth rate	The number of adult literates in a country, greater will be the skill level of the workforce
The strategic importance of human capital on economic growth (Aksu,2016)	1960-2009	MWALD causality test Zivot-Andrews Structural breaks test	Government budget on education, HDI, schooling rate and economic development ratio	State budget spending on education has positive impacts on economic growth. There is no structural breaks on those variables.

d) Econometric modeling: A Cobb-Douglas specification

In pursuit of identifying the influence of education within the economic prosperity of a nation, a production function, commonly known as the the Cobb-Douglas production function, along with constant returns to scale, has been utilised hugely. In this function, the human capital is represented as the sole predictor and a factor of production with respect to human capital augmented growth model (Canarella & Pollard, 2016) and the dependent variable is economic growth of the nation. The mathematical formulation of this model is presented as follows (adapted from Leoning model as cited in (Odit et al., 2016).

$Y = CK^{\propto}H^{\beta}$L(1-$\alpha$-$\beta$)

Wherein α= the elasticity of production with respect to capital

β= the elasticity of production with respect to human capital

1-α-β= the elasticity of production with respect to labour

Y= Output

C= Total factor productivity (in terms of level of technology)

K, H, L represents physical capital, human capital and labor. For avoiding multicollinearity amidst capital and labor, output and capital is standardized by labor units in addition to the assumption of scale elasticity of production factors equal to 1.

$y=Ck^{\propto}h^{\beta}$

Where,

y = Y/L,

k= K/L and

h= H/L

Taking log on both sides,

⇨ $lny= lnC+ aln k_t + \beta lnh_t + u_t$----------(1)

This equation is much suitable for statistical estimation. However, most macroeconomic time series have unit roots and the regression of such series end in spurious results(Giles, 2007). In such cases, the first differencing of the time series results in developing stationarity that in turn could remove the bias occurring as a result of estimation. Although, there are new sets of problems especially in the long run relationships of the variables since there is a risk involved in loss of information during this long period of time. In such a situation, an error correction model is implemented that unites information for long run to a short run adjustment mechanism. The first step includes transformation of an autoregressive distributed lag model (ARDL) which then also undertakes even the non-stationary series. Following this, stationary series is developed using ARIMA (autoregressive, integrated, moving average modelling) through which the researcher identifies the significant variables. Co-integration with the identified significant variable confirms on the long run adjustment of the independent variable with that of the dependent variable. Finally, the granger causality test validates on the inverse relationship between the variable in consideration to the long term association between the variables.

Thus to determine such human augmented production function, following is the error-correction model.

$\Delta lny_t= C +y_1\Delta lnk_t+y_2\Delta lnh_t-y_3 lny_{t-1}+y_4 k_{t-1}+y_5 h_{t-1}+u_t$

METHODOLOGY

The present study focuses on assessing the impact of education on Turkey with respect to its economic growth. To this, the researcher examines different secondary data sources accounting to the already complied data available in books, reports, published journals, magazines, and newspaper and such. For the present study, the data had adopted an approach to gather data via such secondary sources for the time period 1999-2016.

Following secondary sources were used for gathering the data for required variables to be used in analysis. A logarithmic transformation of following variables was done in consideration to the economic framework undertaken for the study. Also this procedure normalized the figures with respect to determination of their impact on other variables.

Table 2: A review of studies applying logarithmic transformation

No	Variables	Source	Meaning	Notation
.	Dependent variable: GDP at market prices	World Bank Education Statistics	Gross domestic product is the standard measures which captures the value of all the final goods and services produced by a country during a particular period. It is the indicator of the economic prosperity and is used to measure the level of economic growth of the country(Pathak, 2018).	loggdp
.	Independent variables Enrolment in primary, secondary and tertiary sector	UNESCO Database	The enrolment rate in primary education is the ratio of children enrolled in the primary, secondary and tertiary with the total population of official school age children(Michaelowa, 2007).	logprimary, logsecondary, logtertiary
.	Government expenditure in education sector as a % of GDP	UNESCO	It is the total expenditure incurred by the government on education expressed as a percentage of GDP. It also includes the expenditure funded through transfers from international sources to the government (Michaelowa, 2007).	loggovtexp
.	Literacy rate	World Bank Education Statistics	Literacy rate is referred to as the population of literates to the total population who area aged seven years or above. Literacy rate is one of the vital indicators signifying the development of society. It indicates the quality of life, level of awareness and the skill level of the people in the society (Shah, 2013).	logliteracyrate
.	School life expectancy for pre-primary education(in years)	CEIC (https://www.ceicdata.com/en/turkey/education-statistics)	It is the total number of years of schooling which a child of a certain age is expected to receive in future (Sylva, 2014).	logschoollife
.	Enrolment in secondary vocational education sector	World Bank Education Statistics	The enrolment rate in vocational education is the ratio of children enrolled in vocational education with the total population of official school age children (Michaelowa, 2007).	logvocational

The final equation of the study is based on equation(1) presented in the previous section:

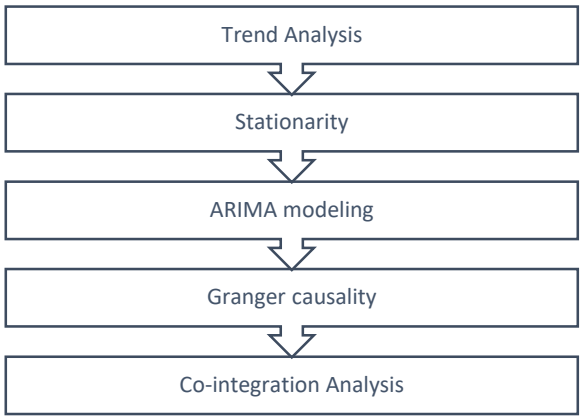
⇨ lny= lnC+ alnk_t + $\beta ln h_t$ + u_t

wherein the values for k and hare substituted. 'h' represents the human capital stock and is measured in form of all the independent variables mentioned above. Hence the final equation is----

⇨ lggdp=c+ loggovetexp+ logprimary+ logsecondary+ logtertiary+ logvocational+ logschoollife+ logliteracyrate+u_t

A series of tests were conducted to analyse the collected data. Primarily the researcher analysed the stationarity of the time series. Thereafter the researcher de-trended to overcome the inconsistencies and variations in the dataset. Following this ARIMA regression modelling were conducted to analyse the impact of above mentioned independent variables on the dependent variable (Economic growth). Also the cause and effect relationship among the variables were undertaken using the Granger causality test. Lastly Co-integration analysis was implemented in order to detect the existence of relationship among the significant variables overtime.

Figure 1: Sequence of Multivariate Tests



The excel sheet stored the time series data for this study while the software STATA was used in this study for analysing the secondary data collected. Given the research methodology, the succeeding chapter will present the analysis for the gathered data thus depicting the insight on the issue at hand.

ANALYSIS and INTERPRETATION

The main aim of the current study assesses the impact of education with respect to economic growth in Turkey for the time period 1999-2016. The proposed hypothesis in this context is presented as follows:

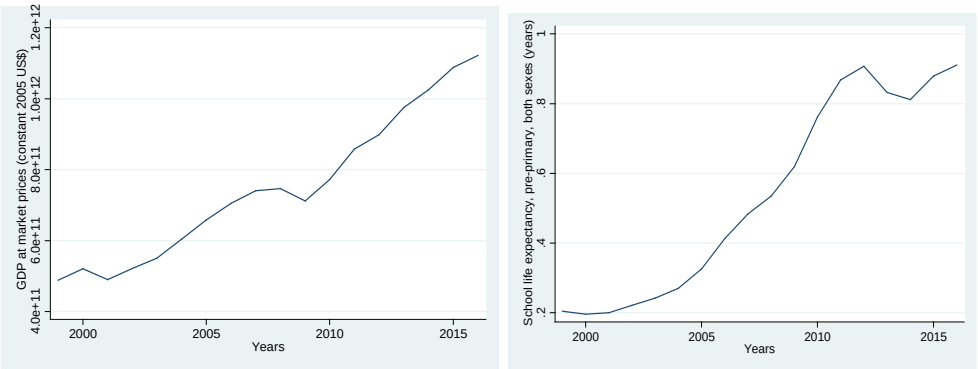
HA: There is no impact of education on economic growth of Turkey during 1999-2016.

This hypothesis depicts economic growth as the dependent variable. Gross domestic product at market prices is used as a proxy to this dependent variable. While for education statistics, the researcher used enrolment in primary, secondary, tertiary sector; enrolments in secondary vocational education, school life expectancy and the literacy rate as the final independent variables.

a) Trend Analysis Of The Variables

GDP at market prices at constant prices and School life expectancy for pre-primary, both sexes

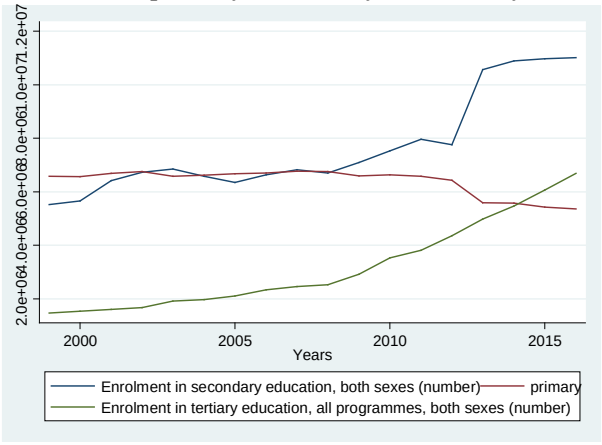
Figure 2: GDP and school life expectancy



The graph above clearly depicts that both the GDP of the country and the school life expectancy for pre-primary schooling have been positive and rising from the year 1999 to 2016. Although the GDP of Turkey reflected a drop during 2009 but the overall trend recovered sooner and rose thereafter. In respect to school life expectancy for pre-primary education, there was a slight drop during 2011. However this trend too recovered soon thereafter.

Enrollment rate in primary, secondary and tertiary education

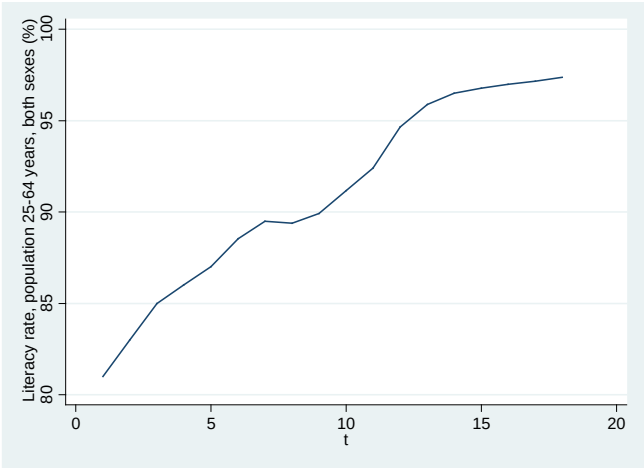
Figure 3 : Enrolments in primary, secondary and tertiary education



In terms of enrolments in primary, secondary and tertiary education in Turkey, there was a quite mixed response depicted. Both the enrolments in secondary and tertiary education was positive and rising however there was a static response viewed in enrolments within primary education initially and a light fall after 2012.

Literacy rate

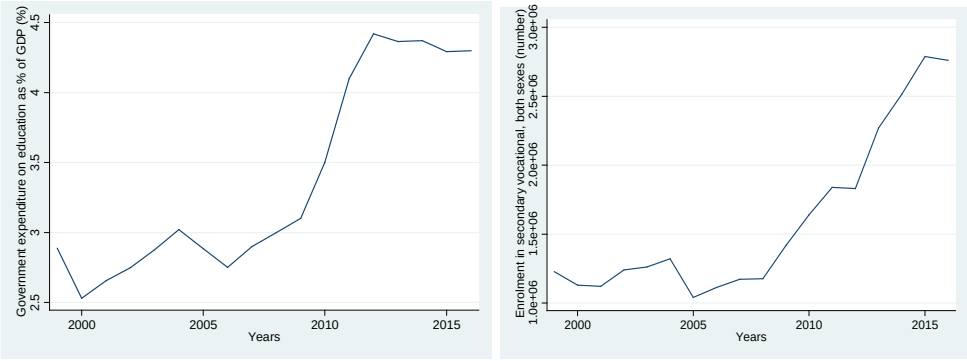
Figure 4: Literacy rate of Turkey



In the figure above, in terms of literacy, the statistics showed a continuous improvement in its rate over the period.

Government expenditure on education (%) and enrolments in secondary vocational education

Figure 5: Government expenditure on education as % of GDP and enrolments in secondary vocational education



In terms of the expenditure incurred by government in education segment, the statistics were much positive. Online a minute steep fall was detected during 2005 but the trend was positive throughout the given time

period. Also the trend on enrolments in secondary vocational education was rising during the given time set except a fall during 2005.

A logarithmic transformation was taken for all the variables in order to normalize the values of the variables overtime. Also this process enabled the researcher to attain a much consistency in the dataset. Thus the researcher hereafter analysed stationarity or the consistency within the dataset overtime.

b) Augmented Dickey Fuller stationarity test

The stationarity test is undertaken using augmented dickey fuller test. The hypothesis for application and estimation to this test is as follows:

H0: There is no stationarity in the given time series.

H1: There is stationarity in the given time series.

In order to detect the results of accepting or rejecting the hypothesis stating stationarity, the resulted P-value in the result table is examined. If the p value is less than 0.5, the null hypothesis stating the presence of stationarity is rejected. In appendix 1, the results views that there was the presence of unit root in the given time series for all variables except for log of literacy rates. From the table below it can be viewed that the p-value was less than 0.05 as well as trace statistic was also less than the critical values, the null hypothesis is rejected for all such variables.

Table 3: Stationarity Testing

Variables	Test statistic	1% Critical value	P value	Results for Null hypothesis
Loggdp	0.110	-2.602	0.5430	Accepted
Loggovtexp	-0.159	-2.602	0.4381	Accepted
Logliteracyrate	-3.421	-2.602	0.0019	Rejected
Logprimary	0.441	-2.602	0.6673	Accepted
logsecondary	-0.309	-2.602	0.3808	Accepted
Logtertiary	1.813	-2.602	0.9551	Accepted
logvocational	0.563	-2.602	0.7093	Accepted
logschoollife	-0.750	-2.602	0.2324	Accepted

Following this, the de-trending was done by the researcher to derive a smoother trend of the variables. The de-trending was done using the differencing of the variables from their past values. A short summary results of de-trending for the logarithmic transformed variables is given below.

Table 4: Detrending

Variables	Test statistic	1% Critical value	P value	Results for Null hypothesis
Loggdp	-3.536	-2.624	0.0016	Rejected
Loggovtexp	-3.563	-2.624	0.0016	Rejected
Logprimary	-3.475	-2.624	0.0019	Rejected
logsecondary	-4.218	-2.624	0.0004	Rejected
Logtertiary	-3.331	-2.624	0.0025	Rejected
logvocational	-3.747	-2.624	0.0011	Rejected
logschoollife	-2.043	-2.624	0.0302	Rejected

It is much evident from the table that the p values for almost all the variables are less than 0.05 and thus the null hypothesis is rejected. This indicates that there is stationarity or no unit root in the data.

c) ARIMA modeling

Next the researcher investigated on to the determination of most significant variables and the most accurate model along with de-trended variables.

In regards to the impact of education on GDP of Turkey, the table below was accounted as the most accurate model that depicted highest value for log likelihood (49.22). Also the value of AIC(76.44) and BIC(67.28) were minimum to the developed model ARIMA(1,1,3). This indicates that the model is well stationary at lag of its previous year's value, difference with its previous years' value and related to error terms of previous year.

Table 5: ARIMA modeling

ARIMA regression						
Sample: 2 - 18			Number of obs =	17		
			Wald chi2(9) =	5927		
Log likelihood = 49.22317			Prob> chi2 =	0		
D.loggdp	Coef.	OPG Std. Err.	z	P>z	[95% Conf.	Interval]
loggdp						
loggovtexp D1.	0.29949	0.330337	-0.91	0.365	0.94693	0.347964
logliteracy D1.	2.479607	5.695151	0.44	0.663	-8.68268	13.6419
logprimary D1.	-1.25351	1.663252	-0.75	0.451	-4.51343	2.006405
logsecondary D1.	-0.65473	0.466865	-1.4	0.161	-1.56976	0.260311
logtertiary D1.	-0.16571	0.518853	-0.32	0.749	-1.18265	0.85122
logvocatio~l D1.	0.250514	0.075406	3.32	0.001	0.102722	0.398306
logschooll~e D1.	0.077041	0.498127	0.15	0.877	-0.89927	1.053351
_cons	0.016661	0.050051	0.33	0.039	-0.08144	0.114759
ARMA						
ar L1.	-0.30293	1.469584	-0.21	0.837	-3.18326	2.577403
ma						
L1.	0.96727	1.338188	0.72	0.47	-1.65553	3.590069
L2.	-0.96726	.	.	.	.	.
/sigma	0.01072	0.007513	1.43	0.154	-.0040062	0.025446
Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	17	.	49.22317	11	-76.4463	-67.281

It can be further deduced from the table above that the most significant variable contributing towards the variation in 'loggdp' of the nation is 'logvocational' since the p value <0.05. Also the associated beta coefficient signifies that the value of GDP changes .2505137 times as the value of variable 'enrolments in secondary vocational education' changes a unit.

Hence the final equation for the study -----

⇨ lggdp= 0.01666 + .25051logvocational+ u_t

d) Co-integration testing

The co-integration test is used to detect the relationship of variables over a long period of time. This testing is measured using the values of max and trace statistic representing the maximum eigenvalues for the model developed. ARIMA model in the current study highlighted that enrolment in secondary vocational

education impact have a positive impact on the economic growth. Therefore following are the hypothesis framed for detecting co- integration.

H0: There is no co-integration or the long term relationship between economic growth and enrolments in secondary vocational education.

H1: There is co-integration or the long term relationship between economic growth and enrolments in secondary vocational education.

Five lags were chosen in order to forecast the existence of long term relationship between the variables. The table below depicts both the trace and the max statistic.

Table 1: Co-integration testing

Johansen tests for cointegration					
Trend: constant	Number =	13			
Sample: 6 - 18	Lags =	5			
maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	18	73.440035	.	29.7043	15.41
1	21	88.227512	0.89720	0.1294*	3.76
2	22	88.292193	0.00990		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	18	73.440035	.	29.5750	14.07
1	21	88.227512	0.89720	0.1294	3.76
2	22	88.292193	0.00990		

In the table above, the trace statistic as well as the max statistic are greater than that of the 5% critical values. This indicates that the null hypothesis is rejected and there exists a co-integration among the variables. Also this means that economic growth of the nation is co-integrated with enrolments in secondary vocational education. There is a long term association between these two variables. Further it can be deduced that there are symmetrical movements between these variables over a longer period of time.

e) Granger- causality test

The Vector auto regression model includes the past values of the time series to the series of its own history. In order to determine the direction of causality among the variables, Granger causality test is applied among with VAR. This helps the researcher in identifying the variable that act as a determinant factor for the other variable. In the present study, the results of the ARIMA model highlighted that enrollment in secondary vocational education impact have a positive impact on the economic growth. Hence, the researcher conducts VAR and granger causality to test whether the lagged values of each of these variables can be predicted by the other variable.

H01: Lagged values of economic growth and the enrolment at the secondary vocational education are not related at an instantaneous moment in time.

Ha1: Lagged values of economic growth and the enrolment at the secondary vocational education are related at an instantaneous moment in time.

Table 2: VAR testing

	Coef.	Std. Err.	z	P>z .	[95% Conf	Interval]
loggdp						
loggdp						
L1.						
L2.	0.708709	0.058448	12.13	0	0.594153	0.823264
L3.	-0.38956	0.082988	-4.69	0	-0.55221	-0.2269
L4.	0.061232	0.075146	0.81	0.415	-0.08605	0.208516
L5.	0.185534	0.065456	2.83	0.005	0.057242	0.313825
	0.286907	0.080054	3.58	0	0.130004	0.44381
logvocatio~l						
L1	-.0438872	0.03307	-1.33	0.184	-0.1087	0.020929
L2.	-0.03001	0.028398	-1.06	0.291	-0.08566	0.025654
L3.	0.121987	0.028831	4.23	0	0.065479	0.178495
L4.	0.37419	0.039577	9.45	0	0.296619	0.45176
L5.	-0.26318	0.02355	-11.18	0	-0.30934	-0.21703
_cons	0.831873	0.377447	2.2	0.028	0.092091	1.571655
logvocatio~l						
loggdp						
L1.	-0.79732	0.599626	-1.33	0.184	-1.972561	0.37793
L2.	1.192202	0.851389	1.4	0.161	-.4764895	2.860893
L3.	-0.36695	0.770938	-0.48	0.634	-1.877958	1.144062
L4.	1.442347	0.671523	2.15	0.032	.1261859	2.758508
L5.	-0.90155	0.821287	-1.1	0.272	-2.511242	0.708143
logvocatio~l						
L1.	0.544791	0.339272	1.61	0.108	-0.12017	1.209751
L2.	0.297458	0.291338	1.02	0.307	-0.27355	0.868469
L3.	0.211885	0.295784	0.72	0.474	-0.36784	0.791611
L4.	-0.05146	0.40603	-0.13	0.899	-0.84726	0.744346
L5.	-0.44667	0.241604	-1.85	0.064	-0.92021	0.026865
_cons	-3.98128	3.872283	-1.03	0.304	-11.5708	3.60826

The above figure reflects the results of vector auto regression among the two variables economic growth and enrolment in secondary vocational education. The results clearly indicate that except the third lag, the economic growth is impacted by other lagged values as the p value <0.05. Additionally, the economic growth is also affected by the third, fourth and fifth lagged values of enrolment in secondary vocational education. Hence, the null hypothesis that the lags of enrolment in secondary vocational education do not impact the economic growth is rejected.

Next the granger causality test was undertaken to confirm the cause and effect relationship between variables. The proposed hypothesis is as follows:

H0: Log of gross domestic product does not granger cause log of enrolments in secondary vocational education i.e. loggdp does not granger cause logvocational

H1: Log of gross domestic product granger cause log of enrolments in secondary vocational education i.e. loggdp granger cause logvocational

Table 3: Granger causality testing

Equation	Excluded	chi2	df	Prob> chi2
loggdp	logvocational	326.86	5	0
loggdp	ALL	326.86	5	0
logvocational	loggdp	24.687	5	0
logvocational	ALL	24.687	5	0

The above results highlight that the lagged values of the variable 'logvocational' cause 'loggdp' as the p value is less than 0.05 which means that enrolment in the secondary vocational studies have an impact on the amount of economic growth of the country. In addition to this, the figure indicates that the lagged values of 'loggdp' cause 'logvocational' which indicates that higher level of economic growth would increase the enrolment in vocational education at the secondary level. Therefore, the null hypothesis that the lagged values of enrolment in the secondary level of vocational education does not impact the economic growth and the lagged values economic growth does not impact enrolment in vocational education at the secondary level is rejected . The direction of causality is from enrolment in secondary level of vocational education to economic growth as well from economic growth to enrolment in secondary level of vocational education. Hence there exists bi-directionality among the two.

CONCLUSION

Since 2000, there has been impressive performance of Turkey with respect to its economic and social development. Turkey is now among the upper middle income countries that has both increased employment and incomes. The nation has maintained a long term focus on implementing broad policy changes especially to its education segment for driving an incomparable growth to the country. Following this the present study investigated on to the existence of the impact of education on economic growth of the nation during 1999-2016.

HA: There is no impact of education on economic growth of Turkey during 1999-2016.

The results clearly rejected this null hypothesis and resulted 'enrolments in secondary vocational education' as the most significant and positive variable that contributes to the rising growth of the nation in terms of gross domestic product of the country. Additionally the current study also discovered a reverse relation i.e. there is much impact of increase in economic growth of the nation on to the increase in enrolments on secondary vocational education of the nation. The need of workforce in Turkish Industry is an important subject for Turkish economy which tries to gain an international competitive capacity. Imparting vocational education would educate employees for different professional fields and prepare students for higher education institutions.

In the similar context, the study conducted by Mupimpila & Narayana (2009) examined the role of vocational and technical education in the economic growth of the Botswana. Botswana is also another upper middle country like Turkey within the region of Africa. The findings of the study indicated a positive relationship between the vocational education and technical training with the economic growth of the country. Similarly in formal sector of Turkey, there is a limited job formation, thus the expansion of vocational training would expand the economic growth in the country.

Perennial to the results attained it is recommended that the concerned authorities and the government must monitor to the enrolment rates and delivery of quality training and education among individuals for further improvement of personal as well as overall growth of the economy. The raining in updated technology as well as new management tools would ensure the skill improvements of individual and thus the economic growth of the nation.

The study has though accounted an evident relationship among the variables over the selected time period but there are few limitations entailed to the same. There has been much changes in both economic and educational sectors of the nation that might have additionally enhanced the situation of education in the country. Along with this, the international economic trends have also additionally impact the enrolments in vocational education among the nations. However the present data has not integrated to any such changes

within the testing process. Moreover the study has included a limited set of education indicators. Inclusion to more education statistics in future studies would enrich the findings and present insight to the issue attempted.

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