

SİYASET, EKONOMİ ve YÖNETİM ARAŞTIRMALARI DERGİSİ



RESEARCH JOURNAL OF
POLITICS, ECONOMICS AND MANAGEMENT

January 2017, Vol:5, Issue:1

Ocak 2017, Cilt:5, Sayı:1

P-ISSN: 2147-6071

E-ISSN: 2147-7035

journal homepage: www.siyasetekonomiyonetim.org



Human Capital and Economic Growth: Bounds and Causality Analysis for Turkey

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ARTICLE INFO

Article History:

Received 10 September 2016

Received in revised form 12 January 2017

Accepted 16 January 2017

Keywords:

Bounds Testing Procedure, Economic Growth, Granger Causality, Human Capital, Turkey

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ABSTRACT

This study examines the long-run relationship and causality between human capital and economic growth for Turkey by using the autoregressive distributed lag (ARDL) approach and Toda and Yamamoto (1995) causality test. The dataset covers the 1971-2013 period. In order to measure the human capital different education levels of gross enrolment ratios (primary, secondary, and tertiary) were considered. The main finding of this paper indicates that apart from other education levels, an accumulation of high-educated (tertiary education) human capital fosters economic growth in Turkey. A long-run relationship and bidirectional causality are found between tertiary education and economic growth. In this context, this study supports the human capital-based endogenous growth theory for Turkey. A stable long run economic growth can be achieved through high-skilled human capital.

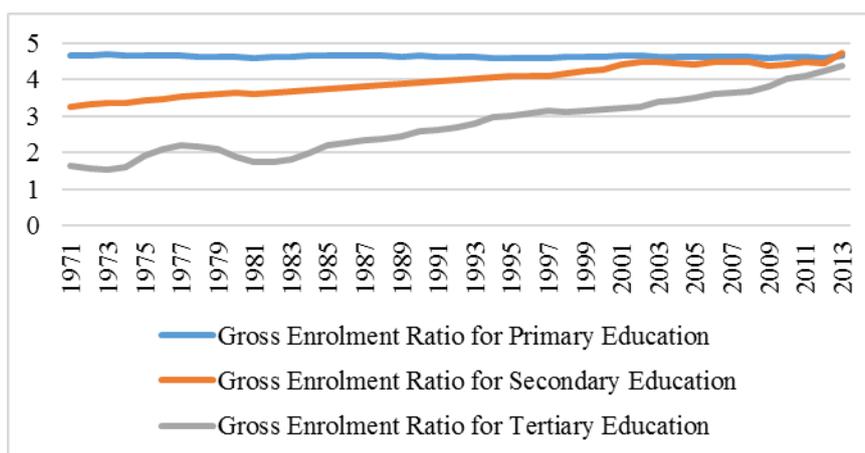
INTRODUCTION

The contribution of labour to economic growth became especially popular after the rise of human capital theories advocated by Schultz (1961) and Becker (1964). In the field of macroeconomics, the empirical studies on human capital and economic growth have been based on two main approaches: neoclassical growth models of Solow (1956) and endogenous growth models of Romer (1990) and Lucas (1988). Endogenous growth theory (Lucas, 1988; Romer, 1990; Stokey, 1991; Grossman and Helpman, 1991; Young, 1991) argues that human capital is the primary driving force of growth. Human capital is the central and essential factor that contributes in achieving economic growth, progress, and a better life. Becker (1964) states that investment policies on human capital considers various socio-economic factors that differ according to the cultures and political regimes such as educational level, on-the-job skills training, healthcare, migration, and consideration of issues regarding regional prices and income. Human capital investment, by mean of education, has been central in promoting economic growth, high employment, and greater social cohesion (Tsen, 2006:291). There are many studies, such as Barro (1991; 1997), Barro and Lee (1993) and Benhabid and Spiegel (1995) and Gemmell (1996), which have found evidence that human capital can foster long-run growth rates of a country.

A stable long-run economic growth can be achieved by human capital or in other words by high-skilled employment. The imitation and adaptation of technology are directly related to a high level of human capital. Along the increase of education and highly advanced technology, the production and exports of intensive products become essential for a country. The developing countries, which are lagging behind the advanced countries, can fill this gap though the educated human capital. In this context, the developing countries are still striving to transform its huge unproductive human resource into a skilled and professional labour force (Khan, et al., 1991:245).

Turkey is a large country with a significant stock of human resources. However, the rapidly increasing population is causing the human capital accumulation of Turkey to lag behind the requirements of the economy. The structure of Turkish economy has changed in recent years, the share of agriculture, with low-productivity and being labour-intensive, has gone down, while that of industry and services has raised up.

Graph 1: Logarithm of Human Capital in Turkey, 1971–2013



Source: World Bank, WDI (2016)

While the educational attainment in Turkey has increased over the period and the educational opportunities have expanded significantly, the educational level of population and employment are still at their lower levels. The shares of illiterates and those without basic education is declining, but of those with primary education has remained roughly constant and the enrollment in secondary education could increase only 3.38% from 1971 to 2013. However, a significant and rapid increase has been observed in the share of gross enrolment ratio to higher education through out the period. The

enrollment in higher education is still at low levels, but the gross enrolment to tertiary education degree has increased steadily from 5.09 % in 1971 to 78.98% in 2013, with a growth rate of 14.49%. However, Turkish real GDP rose 5.30% over the period (World Bank, 2016) but lagged behind the absorption of the increasing workforce through the creation of compatible new jobs with the growing economy.

The mismatch between the skills provided by the schooling and that required in labor market is one of the bottlenecks in integrating educated workers into the work force. The average educational level for employment is relatively low in Turkey, as the highest share in the total employment is below the level of high school education. In line with the mentioned fact about the employment, skilled agricultural, forestry and fishery workers and the elementary occupations belong to the largest share among the occupational groups classed as in ISCO-88 (International Standard Classification of Occupations) (TURKSTAT, 2016). Therefore, in order to strengthen human capital accumulation and to boost economic growth, the efficiency and quality of education have been one of the critical issues in Turkey. Strengthening the capabilities of education system is crucial for a sustainable economic growth.

In this context, the main objective of this study was to measure the relationship between economic growth and human capital by using the autoregressive distributed lag (ARDL) approach to cointegration analysis and Toda-Yamamoto's (1995) causality tests for the period of 1971-2013. This study differs from the earlier ones in two ways. First, an alternative approach is used to test the relationship between variables and then the relationship between the quality of human capital and economic growth is examined by using the enrolment rates in different education levels. This paper is organized in the following order. Section 1 presents an overview of the empirical literature in the areas of human capital and economic growth for Turkey. Section 2 defines data and the empirical model of the study. Section 3 explains the econometric methodology applied. The obtained results are analyzed in section 4 and conclusions and policy implications are discussed in last section.

1.Literature Review

In the literature, several studies have analyzed the relationship between economic growth and human capital in Turkey. Among these studies, Taban and Kar (2006) found a positive and reciprocal relationship between human capital and economic growth for the period of 1969-2001 by employing causality tests. By employing the cointegration and causality tests for the period of 1926-1994, Kar and Ağır (2006) delineated a relationship between human capital and economic growth, where the share of health and education expenses in income was used to measure human capital. Varsak and Bakırtaş (2009) found a bidirectional causality from education indicators (human capital) to GDP per capita over the period of 1970-2008. By using Toda Yamamoto's Granger causality tests, Genç et al., (2010) examined the relationship between economic growth, human capital and exports. While they found bidirectional causality between primary school enrolment and economic growth, a unidirectional relationship was found secondary school enrolment and economic growth over the period 1980-2007. Altıntaş and Çetintaş (2010) found a positive long-term relationship among human capital, fixed capital, and exports and economic growth by using cointegration and error correction methods for the period of 1970-2007. According to the results of Şimşek and Kadılar (2010) increase in exports and human capital (enrolment to higher education) supported a long-term growth and GDP affected the increase of human capital for the period of 1960-2004. Bal et al., (2014) found a long-run relationship between human capital and economic growth for the BRICS countries and Turkey between the years 1995-2011. Demir and Demir Yılmaz (2009) investigated the relationship between human capital and economic growth in the BRICS countries and Turkey between 1995 and 2012 by employing a bootstrap panel Granger causality analysis and found positive causality only for Brazil and Russia. Boztosun et al., (2016), by using a Hatemi-J cointegration and causality tests, found a dual causality relationship between human capital and economic growth variables for Turkey over the period of 1961-2011.

2. Empirical Model and Data

In order to examine the long-run relationship between economic growth and human capital for Turkey, a linear logarithmic equation was developed:

$$\ln GDP_t = \gamma_0 + \gamma_1 \ln HU_t + \varepsilon_t \quad (1)$$

where GDP_t is real GDP per capita, HU_t is the human capital and ε_t is the regression error term. Equation (1) can be written as in equations (2), (3) and (4).

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln PRIM_t + \mu_t \quad (2)$$

$$\ln GDP_t = \beta_0 + \beta_1 \ln SECON_t + \nu_t \quad (3)$$

$$\ln GDP_t = \theta_0 + \theta_1 \ln TERTI_t + \eta_t \quad (4)$$

where $PRIM_t$, $SECON_t$ and $TERTI_t$ are the gross enrolment ratio for primary, secondary and tertiary education, respectively and μ_t , ν_t and η_t are the regressions error terms. There are a large number of empirical studies that have analyzed the effect of human capital on economic growth and have used various proxies to measure human capital, such as the number of new school graduates (Wang and Yao, 2003), gross/net educational enrolment ratios (Barro and Lee, 1993; Asteriou and Agiomirgianakis, 2001), the average years of schooling (which is measured by the average years of schooling for the population aged 15 and over) (Barro and Lee, 2013; Lee, 2005), the share of people having higher education to the population of people with ages over 15 (Chuang, 2000), literacy (Khan et al., 1991), public educational expenditures (Jung and Thorbecke, 2003). However, in this study gross enrolment ratio for primary (PRIM), secondary (SECON) and tertiary (TERTI) education is used separately as a proxy of human capital formation. In this context, by using the enrolment rates in all education levels, an attempt was made to trace out the relationship between the quality of human capital and economic growth. Moreover, considering the data availability and the sample size, this study employed the longest available series of the data. Real GDP per capita in Turkish Lira (TL) is deflated by the consumer price index (CPI) (2000= 100) of Turkey. All data are collected from World Bank WDI (World Development Indicators) (World Bank, 2016). The annual sample period of this study is from 1971 to 2013.

3. Methodology

In order to test the stationarity of variables and the integration and the possible cointegration among the variables, Augmented Dickey–Fuller (ADF) (Dickey and Fuller, 1979) and an alternative Phillips–Perron (PP) (1989) unit-root tests were employed.

Following the stationarity tests, the bounds test for co-integration within ARDL modelling approach of Pesaran et al. (2001) was adopted to test whether a long-run relationship exists between economic growth and human capital in Turkey. The bounds testing approach can be applied irrespective of the order of integration of the variables, in this context, the regressors can be I(1), I(0) or mutually cointegrated. At first, to implementing the bounds test procedure, the following ECM (error correction models) were estimated:

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_1 \Delta \ln GDP_{t-i} + \sum_{i=1}^{p-1} \alpha_2 \Delta \ln HU_{t-i} + \alpha_3 \ln GDP_{t-1} + \alpha_4 \ln HU_{t-1} + \mu_t \quad (5)$$

Equation (5) can be further transformed to accommodate the one period lagged error correction term (EC_{t-1}) as in equation (6).

$$\Delta \ln GDP_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_1 \Delta \ln GDP_{t-i} + \sum_{i=1}^{p-1} \alpha_2 \Delta \ln HU_{t-i} + \lambda EC_{t-1} + \mu_t \quad (6)$$

where Δ is the first difference operator, \ln is the log of the dependent and independent Variables, μ_t is serially independent random error with zero mean and finite covariance matrix and the deterministic term (a constant) is denoted by α_0 . In equation (6), the parameter λ represents the long-run relationship and α_1 and α_2 represent short-run dynamics of the model. To examine the long-run relationship between the dependent variable GDP_t and its determinant, an F-test procedure is followed for the joined significance of the coefficients of the lagged levels of the variables. While the null hypothesis is $H_0:\alpha_3=\alpha_4=0$ (no cointegration) and the alternative hypothesis is $H_1:\alpha_3 \neq \alpha_4 \neq 0$ (cointegration). If the Null hypothesis is rejected, it indicates the existence of a long-run relationship or cointegration. Pesaran et al. (2001) provided the set of asymptotic critical values where these critical bounds can be applied irrespective of the order of integration of the regressors. These critical values are composed of two sets: lower bounds $I(0)$ and upper bounds $I(1)$. The first set gives the lower bound, which is applicable when all regressors are $I(0)$. The second bound gives the upper bound, which is applicable, when all regressors are $I(1)$ (Akkoyunlu and Siliverstovs, 2014:3240). If the calculated F-statistic exceeds the upper bound, the null hypothesis of no relationship between dependent variable (GDP) and independent variables (HU: PRIM, SECON, TERTI) can be rejected. Conversely, if the F-statistic falls below the lower bound, the null hypothesis of no long-run relationship cannot be rejected. However, if the F-statistic falls within the critical bounds, the outcome of cointegration will be inconclusive. However, according to Narayan (2005), the existing critical values reported in Pesaran et al. (2001) cannot be used for small sample sizes because they are based on large sample sizes for 500 and 1000 observations. Therefore, Narayan (2005) provides a set of critical values for sample sizes ranging from 30 to 80 observations. Given the relatively small sample size in the present study (43 observations), the hypothesis testing rely on the critical values simulated in Narayan (2005).

As a last step, the Granger causality tests was applied to examine the causal linkages between economic growth and human capital and labor productivity. The notion of Granger causality (Granger, 1969; Engle and Granger, 1987) is one of the most commonly and extensively used methods for evaluating the existence and direction of linkages among time series variables within vector autoregressive (VAR) models in economics literature (Pitarakis and Tridimas, 2003:362). According to Sims et al. (1990) the asymptotic distribution theory cannot be applied for the testing of causality of integrated variables in a level form using the VAR model even if the variables are cointegrated (see Clark and Mirza, 2006; Wolfe-Rufael, 2007:201). In this context, Toda and Yamamoto (1995) proposed an alternative approach that is applied in the level VARs, irrespective of whether the variables are integrated, cointegrated, or not integrated. Toda and Yamamoto (1995) introduced, on the basis of augmented VAR(k) modelling, a modified Wald test statistic that asymptotically shows a chi square (χ^2) distribution, irrespective of the order of integration or cointegration properties of the variables in the model (Wolde-Rufael, 2007:201). The test has two steps. First, in order to apply Toda and Yamamoto (1995) approach, it is essential to determine the true lag length (k) and the maximum order of integration (dmax) of the series under consideration. The modified Wald test statistic is valid regardless of whether a series is $I(0)$, $I(1)$ or $I(2)$ non-cointegrated or cointegrated of an arbitrary order. The lag length, k, is obtained in the process of VAR in the levels among the variables in the system by using different lag length criteria such as AIC (Akaike Information Criterion), SC (Schwarz Information Criterion), HQ (Hannan-Quinn Information Criterion), FPE (Final Prediction Error) and LR (Sequential Modified LR Test Statistic). Then the unit root testing procedure can be used to identify the order of integration (dmax). As a second step, a modified Wald test procedure is used to test the VAR(k) model for causality. The VAR(k) models are estimated by Ordinary Least Squares (OLS) estimation technique.

Unlike the Granger causality test, Toda and Yamamoto (1995) approach fits to standard vector autoregression at the levels of the variables and not at the first difference of the variables (Wolde-Rufael, 2007:202). Therefore, to undertake Toda and Yamamoto's (1995) version of the Granger non-causality test, the following VAR system is presented:

$$\ln GDP_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} \ln GDP_{t-i} + \sum_{j=1}^{d \max} \nu_{1j} \ln GDP_{t-j} + \sum_{i=1}^k \phi_{1i} \ln HU_{t-i} + \sum_{j=1}^{d \max} \psi_{1j} \ln HU_{t-j} + \lambda_{1t} \quad (7)$$

$$\ln HU_t = \beta_0 + \sum_{i=1}^k \delta_{1i} \ln GDP_{t-i} + \sum_{j=1}^{d \max} \theta_{1j} \ln GDP_{t-j} + \sum_{i=1}^k \vartheta_{1i} \ln HU_{t-i} + \sum_{j=1}^{d \max} \pi_{1j} \ln HU_{t-j} + \lambda_{2t} \quad (8)$$

The null hypothesis that the independent variable HU_t : $PRIM_t$, $SECON_t$ and $TERTI_t$) does not cause dependent variable GDP_t can be formulated as follows: $H_0: \phi_1 = \phi_2 = \dots = \phi_i = 0$. Similarly, in equation (8), the null hypothesis that GDP_t does not cause HU_t ($PRIM_t$, $SECON_t$ and $TERTI_t$) can be depicted as follows: $H_0: \delta_1 = \delta_2 = \dots = 0$.

4. Empirical Results

Table 1 summarizes the ADF and PP unit root-testing results for GDP, PRIM, SECON and TERTI. All series are non-stationary (contain a unit root) in their levels but are stationary in their first differences. Thus, they are integrated by order one, $I(1)$. Therefore, the long-run relationship between variables can be investigated by using the bounds test for cointegration within the ARDL modeling approach.

Table 1: ADF and PP Tests for Unit Root

ADF				
	Level		First Difference	
	τ_μ	τ_η	τ_μ	τ_η
GDP	-1.546[1]	-4.124[0]**	-7.746[0]***	-7.759[0]***
PRIM	-2.530[0]	-2.354[0]	-5.573[0]***	-5.527[0]***
SECON	-0.336[0]	-3.789[0]	-4.957[0]***	-4.680[0]***
TERTI	0.186[2]	-3.100[1]	-3.981[1]***	-3.999[1]**
PP				
	Level		First Difference	
	τ_μ	τ_η	τ_μ	τ_η
GDP	-1.571[3]	-3.975[4]**	-7.804[3]***	-8.059[4]***
PRIM	-2.592[2]	-2.461[2]	-5.628[2]***	-5.562[2]***
SECON	-0.314[1]	-2.895[2]	-4.957[1]***	-4.679[1]***
TERTI	1.051[0]	-1.942[1]	-3.527[0]**	-3.660[1]**

Note: All series are at their natural logarithms. τ_μ represents the model with a drift and without trend; τ_η is the most general model with a drift and trend. The optimal lag lengths used in ADF test are indicated within brackets and determined by the AIC. When using PP test, values in brackets represent Newey-West Bandwidth (as determined by Bartlett Kernel). (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively.

The lag length that supplies the smallest critical value is determined as the lag length of the model by using several lag selection criteria such as AIC, SC, HQ, FPE and LR. According to the results from the selection criteria and the evidence of no residual autocorrelation the value of 1 is preferred for the relationship between GDP and PRIM and GDP and SECON. The value of 2 is preferred for the relationship between GDP and TERTI.

The calculated F-statistics for the equation (2) and (3) is found 1.162 and 4.055, respectively and are below the lower critical value. This implies that the null of no cointegration cannot be rejected. However, in the case of equation (4), the null of no cointegration can be rejected at 5% level, implying that there exists a long-run relationship or cointegration between economic growth (GDP) and gross enrolment ratio for tertiary education (TERTI).

Table 2: Results of Bounds Test for Cointegration

Model				F-statistic	
<i>GDP=f(HUMAN CAPITAL)</i>					
F _{GDP/PRIM}				1.162	
F _{GDP/SECON}				4.055	
F _{GDP/TERTI}				6.191**	
Narayan (2005)				k=1, T=43	
90%level		95%level		99%level	
I(0)	I(1)	I(0)	I(0)	I(1)	I(0)
3.210	3.730	3.937	3.210	3.730	3.937

Notes: (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively. Critical values are cited from Narayan (2005:1988) (Table Case III: Unrestricted intercept no trend)

After established the cointegration relationship for the equation (4), the next step is to estimate the long-run coefficients of the equation by using the ARDL specification. Due to the ARDL specification assumes that the errors are serially uncorrelated, maximum lag is selected as 2 according to the lag length criterias where no autocorrelation is found in equation (4). The estimated long-run coefficients of ARDL(2,2) model is given in Table 2.

Table 3: Estimated Long-Run Coefficients Using ARDL Approach

Regressors	ARDL(2,2)
<i>Constant</i>	3.679 [77.212]***
<i>TERTI</i>	0.356 [21.479]**

Note: t-values are given in parenthesis. (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively.

The long-run coefficients show that all regressors in equation (4) exhibit the theoretically expected sign and are highly statistically significant at 1% level. The results indicate the importance of enrolment ratio for tertiary education in economic growth in the long-run. A 1% increase in tertiary education increases economic growth by 0.35%.

The error correction model was also estimated within the ARDL framework. The results of the short-run dynamic coefficients related to the long-run relationships estimated by equation (6) are reported in Table 4.

Table 4: Error Correction Model

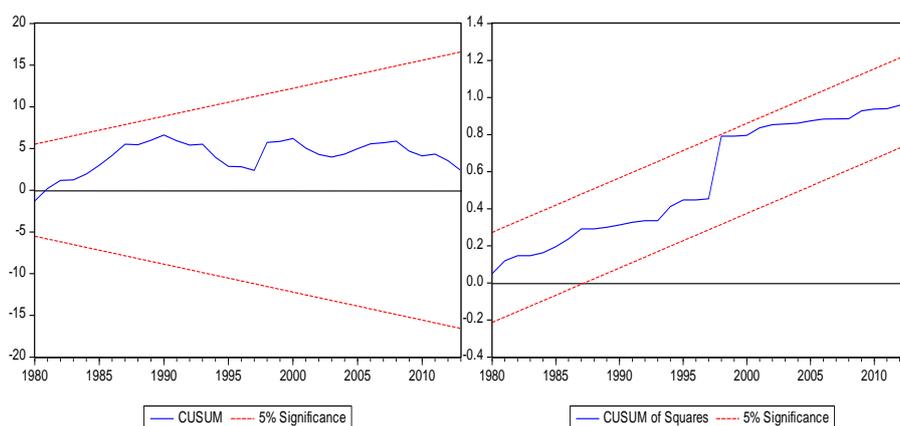
Regressors	ARDL(2,2)
Dependent variable: ΔGDP_t	
<i>Constant</i>	0.034[2.549]**
ΔGDP_{t-1}	0.028[0.176]
ΔGDP_{t-2}	0.064 [0.427]
$\Delta TERTI_{t-1}$	0.075[0.593]
$\Delta TERTI_{t-2}$	-0.153 [-1.228]
EC_{t-1}	-0.554[-3.432]***
Adjusted R ² : 0.22 DW:2.01 F=3.260(0.016)	
$\chi^2_{LM}(2) = 0.128$	$\chi^2_{HETERO}(5) = 0.904$
$\chi^2_{ARCH}(1) = 0.604$	$F_{(1,33)}^{RESET} = 0.452(0.505)$

Note: t-values are given in parenthesis. (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively. Statistics are distributed as chi-squared variates with degrees of freedom in parentheses.

The results for the 1971–2014 period show that the error correction term – ECMt-1 – is negative and statistically significant at 1% level. This findings indicates the feedback mechanism is effective in Turkey. In this context, convergence to long-run equilibrium after a shock to human capital (enrolment to tertiary education) is moderate for economic growth in Turkey. In other words, a deviation from the long-run equilibrium level of human capital in one year is corrected by about 55% in the next year. It can also be seen that the variables are insignificant contrast to long-run model. This may be due to the fact that the human capital accumulation is a form of long-term costly investment, especially for a tertiary education. Therefore its enhansive affect on economic growth is expected to achieve in the long-run. A higher level of human capital accumulation enables increased productivity, greater production of high value-added goods and an overall increase in economic growth in the long-run.

The model passes the specification tests such as the tests of no residual autocorrelation, no residual ARCH effects, residual normality and no residual heteroscedasticity and the RESET test for functional form misspecification. The cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMQ) tests were employed to determine whether the parameters in the models are stable. The results of CUSUM and CUSUM-Q tests are shown in Figure 2. The lines show the boundaries of 5% significance levels. It can seen in the figures that the parameters are stable and sum of the squared residuals lies inside the critical bounds of 5% significance.

Graph 2: CUSUM and CUSUM Q Test Results for Coefficient Stability



Notes: (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively.

Toda and Yamamoto (1995) procedure, which employs a modified Wald test, does not require pre-testing for the cointegrating properties of the system and is valid regardless of whether a series is $I(0)$, $I(1)$ or $I(2)$, non-cointegrated or cointegrated of an arbitrary order ‘as long as the order of integration of the process does not exceed the true lag length of the model’ (Toda and Yamamoto, 1995:225; Wolde-Rufael, 2007:202). Therefore, the results of the Toda- Yamamoto (1995) version of the Granger causality test are presented in Table 5.

Table 5: The Results of the Toda-Yamamoto Causality Test

Null Hypothesis	p	χ_p^2 statistic	Probability value	Decision
PRIM does not granger cause GDP	2	0.063	0.801	No causality
GDP does not granger cause PRIM	2	0.048	0.825	No causality
SECON does not granger cause GDP	2	0.102	0.748	No causality
GDP does not granger cause SECON	2	1.074	0.299	No causality
TERTI does not granger cause GDP	3	6.936	0.031**	TERTI →GDP
GDP does not granger cause TERTI	3	2.962	0.227	No causality

Notes: (*), (**) and (***) indicate that the corresponding coefficient is significant at 10%, 5%, and 1% levels, respectively. VAR is estimated by $[k + dmax] = 3$ for model 1, optimal lag length $k=2$ is selected by lag length criteria, $dmax=1$; For model 2 and 3, VAR is estimated by $[k + dmax] = 2$, optimal lag length $k=1$ is selected by lag length criteria and $dmax$ is 1.

According to the Toda-Yamamoto causality test results, a strong evidence of causality from gross enrolment ratio for tertiary education to economic growth was found at the 5% level of significance. In other words, a bi-directional causality is found from higher education to economic growth. This implies the importance and necessity of the high qualified human capital in Turkish economy.

CONCLUSION

This paper attempts to examine the relationship between economic growth and human capital for Turkey by using an ARDL bounds test for cointegration and modified version of the Granger causality test, Toda-Yamamoto (1995), over the period 1971-2013. Test results suggest a positive long-run equilibrium relationship between tertiary educated human capital and economic growth. In the meanwhile, a significant bidirectional relationship is found from higher education accumulation to economic growth for Turkey during the period. In this context, human capital accumulation (gross enrolment rate for tertiary education) Granger causes economic growth not vice versa. Results indicate that rather than primary and secondary enrolment, tertiary education enrolment is more effective in economic growth. Therefore, the findings support the human-capital-based endogenous growth theory. Evidence show that high educated human capital become essential in Turkish economy where the structural transformation (also the sectoral transformation of employment) continues. In addition to improve the investment climate to encourage firms and to generate employment for a sustained economic growth, Turkish economy needs to apply reforms in the labor market, to improve labor skills and of better education and training for better matching between employees and jobs. The imitation and adaptation of technology is directly related to the higher level of human capital. Through the increase of education the technology intensive products become essential in the production and exports pattern of countries. Efforts to increase human capital accumulation and to enhance the quality of education are crucial for Turkey's long run economic growth.

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