Araştırma Makalesi ● Research Article

The impact of education expenditures on economic growth in Turkey: Evidence from the ARDL bounds testing approach [*]

Türkiye'de eğitim harcamalarının ekonomik büyümeye etkisi: ARDL sınır testi yaklaşımından elde edilen kanıtlar

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ANAHTAR KELİMELER

Eğitim giderleri

Ekonomik büyüme

ARDL

Türkiye

ÖZ

Bu makale, Türkiye'de 1997-2020 dönemi için yıllık verileri kullanılarak kamu eğitim harcamalarının kişi başına düşen reel GSYİH üzerindeki etkisini ampirik olarak incelemektedir. Bu makale, değişkenler arasındaki uzun vadeli ve kısa vadeli ilişkiyi tahmin etmek için otoregresif gecikmeli dağıtma (ARDL) sınır testini benimser. ARDL sınır testi yaklaşımına ilişkin ampirik sonuçlar, eğitim harcamaları ile kişi başına düşen reel GSYİH arasında uzun dönemli bir ilişki olduğunu ve eğitime yapılan kamu harcamalarının Türkiye'nin kişi başına düşen reel GSYİH üzerindeki olumlu etkilerin uzun dönemde ortaya çıktığını göstermektedir. Bulgular, uzun vadede, eğitime yapılan kamu harcamalarının üretkenliği artırmaya ve ekonomik kalkınmayı hızlandırmaya yardımcı olduğunu göstermektedir.

KEYWORDS

Education expenditures

Economic growth

ARDL

Turkey

ABSTRACT

This paper empirically investigates the impact of public education expenditures on real GDP per capita using annual data for the period 1997-2020 in Turkey. This paper adopts the autoregressive distribute lagged (ARDL) bound test to estimate the long-run and short-run relationship between variables. Empirical results of the ARDL bound test approach reveal that there is a long-run relationship between education expenditures and real GDP per capita and that the positive effects of public expenditures on education on Turkey's real GDP per capita emerge in the long run. The findings point out that in the long run, public spending on education serves to promote productivity and accelerate economic development.

1. Introduction

The determinants of economic growth are among the most discussed and researched issues in every period of the historical development of economics. Although the economic literature focused mainly on the quantitative aspect of growth until the 1980s, attention was drawn to the effects of education on increasing the workforce's productivity and economic growth, together with the endogenous growth theories. From this point of view, human capital is needed to ensure economic growth. As important as the labor force is for economic growth, its effective and efficient use is just as important. Increasing efficiency in the economy is possible with a qualified workforce. This situation requires investing in humans,

which is the basis of human capital to a large extent (Esen and Seren, 2022). Investments in the human element such as education, health, and nutrition make it possible to benefit from the human capital factor properly (Afşar, 2009). Changing the effectiveness of human capital, which is one of the main determinants of economic growth, through education is a necessity that needs to be examined in terms of economic growth.

It is accepted that the level of development of countries depends on their ability to produce information, technology, goods, and services and to transform them into economic and social benefits. Nowadays, it is known that education is a critical component that accelerates economic, social, and cultural development. In addition to contributing to the acquisition of the labor force in the quality and quantity needed in the development process, education also enables countries to follow, develop and apply contemporary production technologies to produce and disseminate information. As the education level rises, the increase in the productivity of the workforce also supports the competitiveness of countries and eases their outward expansion (Çalışkan et al., 2013). Moreover, increasing and developing human capital stock plays a key role in attracting foreign capital. As a result, education makes significant contributions to economic development and social welfare by increasing the knowledge and abilities of the labor factor and thus its productivity (Uçan and Yeşilyurt, 2016).

The effects of human capital on economic growth have been widely researched in the literature recently. In particular, researchers and policymakers closely follow the short- and long-term effects of investments in education on economic growth. Among these studies, Erdoğan and Yıldırım (2009) tested the link between education and economic growth for Turkey covering the 1983 - 2005 period using the ARDL method. They found a positive relationship between education expenditures and economic growth, and a negative relationship between investment in education expenditures and economic growth. Çalışkan et al. (2013) used data from Turkey covering the period 1923-2011 to examine the impact of education on economic growth. Based on the cointegration test results, they found evidence that improvements in education support economic growth. Similarly, Selim et al. (2014) examined the short- and long-run relationship between education expenditures and economic growth for G20 countries covering the 2000-2011 period using a panel cointegration and error correction model. They found a positive and statistically significant relationship between education expenditures and economic growth in both the long and short run. Uçan and Yeşilyurt (2016) examined the relationship between economic growth and education expenditures for the period 2006:Q1 and 2015:Q4 in Turkey using cointegration and causality analyses. They conclude that there is both a cointegration relationship and a bidirectional causality relationship between the variables. Addressing the subject in the context of the number of students, Gövdeli (2016) used unit root and cointegration tests with structural breaks and causality tests

for Turkey covering the period of 1923-2014. Findings pointed out that there is a long-term positive relationship between the number of students in primary education, high school, and university and economic growth, and a unidirectional causality relationship from the number of students in primary education to economic growth and from growth to the number of students in high school. Yalçınkaya and Kaya (2016) examined the long-term effects of education on economic growth in low-, middle- and high-income countries for the period 1991-2011. They found that education contributed positively to economic growth in all country groups. In addition, the findings indicate that the positive effect of education on economic growth also increases, as the income levels of the countries increase. Karış (2019) examined the cointegration and causality relationship between education expenditures and economic growth for Turkey covering the period 2003:Q1-2018:Q2. The findings revealed that there is a cointegration relationship between the variables and that education expenditures are the cause of economic growth only in the long run. Yürük and Acaroğlu (2021) analyzed the relationship between education expenditures and economic growth for Turkey covering the 1980-2015 period using the Nonlinear Autoregressive Distributed Lags (NARDL) model. They found that positive shocks in education expenditures developed in favor of economic growth in both the short and long run, while negative shocks resulted only against economic growth in the short run. The findings support the positive externality of education.

In contrast, Pamuk and Bektaş (2014) examined the effects of education expenditures on economic growth in Turkey covering the period 1998:01-2013:02, employing the ARDL bounds test approach. The findings showed that there was no cointegration relationship between the variable. Similarly, Altun et al. (2018) examined the effect of education expenditures on economic growth using the Least Squares method for Turkey covering the period 1999-2017 and concluded that education expenditures do not have a significant effect on economic growth. Fendoğlu and Canpolat Gökçe (2021) used the Fourier ARDL approach to examine the relationship between economic growth and health and education expenditures in Turkey for the period 2006Q1-2021Q1. Findings revealed evidence that there is no long-term relationship between economic growth and education expenditures for Turkey.

To this end, this paper empirically studies the impact of public education expenditures on real GDP per capita for Turkey covering the period 1997-2020 using an autoregressive distribute lagged (ARDL) bound test. The rest of the paper is organized as follows. Section 2 briefly describes the data sets used in the analysis. Section 3 presents and discusses the empirical results. Subsequently, Section 5 provides some concluding remarks.

2. Model and Data

This paper examines the short- and long-term effects of

education expenditures on economic growth in the Turkish economy using the ARDL Boundary test approach. This study uses annual time series data covering the period 1997-2020 for Turkey. The availability of data is decisive in the selection of the sample period. The model used in this study to examine the relationship between education expenditures and economic growth is established in Equation (1). The data used in the analysis consists of time series data belonging to variables of education expenditures (EDU) and economic growth (GDP per). Data on education expenditures were compiled from the National Education Statistics database of the Ministry of National Education (MEB, 2007; 2021). The economic growth series was obtained from the World Bank's World Development Indicators (WDI) database (World Bank, 2022).

$$lnGDPper_t = \beta_0 + \beta_1 lnEDU_t + \varepsilon_t \qquad (1)$$

The variables and the explanations for these variables in Eq. (1) are as follows; GDPper (GDP per capita) represents the real gross domestic product per capita and EDU (education expenditures) symbolizes the ratio of Turkey's Ministry of National Education (MEB) budget to GDP. Also, ε is the error term. In the calculations, the natural logarithm of each series is taken to reduce the skewness observed in the data distribution of the variables. Depending on taking the natural logarithms of all variables, the expression "ln" has been added to the model representations of the variables. The descriptive statistics of the variables are shown in Table 1.

Table 1. Descriptive statistics of the variables

Variables	Obs.	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis
lnGDPper	24	9.628	9.618	9.970	9.286	0.239	0.068	1.598
lnEDU	24	0.542	0.862	1.938	-2.606	1.168	-1.149	3.672

3. Empirical results

In this study, the ARDL bounds test approach developed by Pesaran and Shin (1995), Pesaran et al. (1996), Pesaran (1997), and Pesaran et al. (2001) is used to examine the long-run cointegration relationship between education expenditures and economic growth. ARDL cointegration approach has several advantages compared to other cointegration methods. Unlike other cointegration approaches, ARDL does not impose a restrictive assumption that all examined variables must be integrated at the same level. In other words, the ARDL approach can be used regardless of whether the variables are stationary at the same level (Odhiambo, 2010). Second, while other cointegration techniques are sensitive to sample size, the ARDL test can

be applied to models with small sample sizes. Third, the ARDL technique can generally give unbiased estimates of the long-term model and can provide valid t-statistics even if some variables are endogenous (Harris and Sollis, 2003).

In the estimation of this study, which examines the effect of education expenditures on economic growth, the stationarity of the series must first be determined to examine the time series properties of each variable. Although the ARDL bounds test approach does not require unit root tests, these tests are required to ensure that variables are not integrated at the 2nd degree [I(2)] or higher. Therefore, the stationarity of the series is tested using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, and the results are reported in Table 3.

Table 2. Unit root tests results

Variables	ADF Tests			
	Level		1st Difference	
	Constant	Constant & trend	Constant	Constant & trend
lnEDU	-7.6967*	-7.6183*	-5.7990*	-4.0184**
lnGDPper	-0.0150	-3.2998	-4.2462*	-4.1547**
	PP Tests			
	Level		1st Difference	
	Constant	Constant & trend	Constant	Constant & trend
lnEDU	-7.3157*	-13.8372*	-4.6237*	-4.0949**
lnGDPper	-0.0373	-2.8340	-4.2379*	-4.1475**

* and ** indicate statistically significant at the 1% and 5% levels respectively.

For ARDL tests, the series should not be second-order stationary. Based on the results of both ADF and PP unit root tests in Table 2, it is seen that all series are stationary in difference. According to these findings, it is seen that lnEDU is stationary at I(0) and lnGDPper is stationary at the I(1) level. Within the scope of the study, it is evaluated that they

can be modeled according to the ARDL bounds test approach, depending on the variables being stationary at different levels.

Firstly, the most appropriate lag length for the variables must be determined in the ARDL model. In this study, Akaike Information Criterion (AIC) was used to determine

the optimal lag length of the Model. ARDL (2,1) model corresponding to the smallest AIC value was chosen as the most suitable model. Accordingly, ARDL (2, 1) bounds test results are given in Table 3.

As reviewing Table 3 including the results of the ARDL bounds test, it is seen that the calculated F statistical value (5.032) is greater than the critical I(0) and I(1) bound values at the 5% significance level. Based on these findings, the H_0

hypothesis is rejected, and it is concluded that there is a long-term cointegration relationship between education expenditures and economic growth. After determining the existence of a long-term relationship between the variables, cointegration parameters reflecting the long-term relationship are estimated for the ARDL (2,1) model. Accordingly, the long-term estimation results of the ARDL approach are given in Table 4.

Table 3. ARDL results of cointegration

Test statistic		H_0: No cointegration relationship		
		Significance level	Lower I(0)	Upper I(1)
F-Statistic	5.032**	1%	6.027	6.760
k	1	5%	4.090	4.663
		10%	3.303	3.797

*, ** and *** indicate statistically significant at the 1%, 5% and 10% levels respectively.

Table 4. Long-run estimates based on the selected ARDL (2,1) model

Variables	Coefficients	t-Statistics	Prob.
lnEDU	0.240*	3.286	0.004
C	9.661*	49.423	0.000

*, ** and *** indicate statistically significant at the 1%, 5% and 10% levels respectively.

Table 4 shows the parameter estimation results of the long-run relationship between education expenditures and economic growth in Turkey. The findings show that education expenditures have a positive and significant effect on economic growth in the long run, that is, increases in education expenditures further increase real income per capita, which represents the level of welfare. From this point of view, an increase of 1 unit in education expenditures causes an increase in real income per capita by 0.24 units in Turkey in the long run. The short-run results with error correction representation are shown in Table 5.

Table 5. Short-run results with error correction representation for the selected ARDL (2,1) model

Variables	Coefficients	t-Statistics	Prob.
D(lnEDU (-1))	-0.061	-0.339	0.738
D(lnEDU)	-0.049	-1.230	0.235
ECM (-1)	-0.204*	-4.107	0.000

*, ** and *** indicate statistically significant at the 1%, 5% and 10% levels respectively.

Reviewing the short-term results in Table 5, it is seen that the ECT coefficient (-0.204) is negative and statistically significant. According to these results, it is understood that 6.2% of disequilibrium in the level of economic growth caused by education expenditures disappears or improves in the next period (one year). In other words, the deviations from the equilibrium in the short run converge to the equilibrium point in the long run. The short-term results show that, unlike the long-term, education expenditures have a statistically insignificant but negative effect on economic growth. The diagnostic tests related to the reliability of the model discussed in the study at a

significance level of 0.05 are given in Table 6.

Table 6. Diagnostic test statistics

Diagnostic tests	F-stat. value (Prob.)
Breusch-Godfrey Serial Correlation LM Test	0.018 (0.974)
Heteroskedasticity Test: ARCH LM Test	0.045 (0.824)
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.271 (0.858)
Ramsey RESET Test	0.462 (0.506)

When the diagnostic test results of the model in Table 6 are evaluated, it is seen that there is no evidence of serial correlation and heteroskedasticity in the model, and finally there is evidence of a well-specified model. Therefore, these findings confirm the reliability and validity of the estimation results obtained in the study.

4. Conclusions

In this study, the effect of public education expenditures on real GDP per capita is examined with the help of the ARDL model, using annual data for the period 1997-2020 in Turkey. The study is based on the suggestions of the human capital and endogenous growth doctrines to provide investment in the education sector as a tool for economic development. The study provides evidence for the existence of a positive and statistically significant long-term effect of government education expenditures on economic growth for the examined period. The results of the long-term analysis reveal that a 1% increase in education expenditures causes an increase of 0.24 units in real income per capita in Turkey in the long run. In addition, it is concluded that the education

expenditures of the state have a non-significant negative effect on economic growth in the short run. As a result, it is understood that the positive effects of public expenditures on education on GDP per capita emerge in the long run. From this point of view, education offers people the opportunity to expand their knowledge and develop their skills. It can provide a fundamental incentive for research, development, and innovation, as well as the accumulation of human capital and skilled labor, which are decisive factors for growth. In other words, the findings indicate that in the long run, public spending on education serves to promote productivity and accelerate economic development. Therefore, it is concluded that policies aiming to invest more in education are important for more production and greater economic growth.

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