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Analysis of the Relationship Between Adjustment Savings: Education Expenditures and Economic Growth for USA

ABD için Düzeltilmiş Tasarruflar: Eğitim Harcamaları ve Ekonomik Büyüme Arasındaki İlişkinin Analizi

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ÖZ

Bireylerin eğitim düzeyleri toplumsal gelişmişlik göstergeleri içerisinde önemli bir yere sahiptir ve aynı zamanda üretim süreçlerine katılan bireyler açısından beşeri sermaye özelliklerinin de göstergesi kabul edilmektedir. Eğitim düzeyi ve eğitim kalitesinin ilerleyişi de bir bakıma eğitime yapılan harcamalar ve yatırımlarla ölçülmeye çalışılmaktadır. Bu da toplumların sadece gelişmişlik düzeyi ya da sosyolojik yapısını değil, genel ekonomik durumunu ve makroekonomik dengesini de etkilemektedir. Öyle ki eğitim harcamalarının ekonomik büyümenin de göstergesi olup olmadığı hem teorik hem de ekonometrik çalışmaların konusunu oluşturmaktadır. Ancak söz konusu eğitim harcamalarının mı ekonomik büyümeye etki ettiği yoksa ekonomik büyüme bakımından belirli bir düzeye ulaşan ülkelerde mi daha fazla eğitim harcamaları için bütçe ayrıldığı literatürde sıklıkla analiz edilen konular arasında yer almaktadır. Özellikle tasarrufların eğitim alanına yansımaları sonucunda ülkelerin ekonomik büyüme düzeyleri ya da hızları hususundaki değişimler söz konusu ilişkiyi ölçmek için göz önünde bulundurulması gereken verilerdir. Bu bağlamda bu çalışmada düzeltilmiş tasarruflar: eğitim harcamaları ve ekonomik büyüme verileri ABD için analiz edilmiştir. Çalışmanın amacı, ABD için eğitim harcamaları ile ekonomik büyüme arasında bir ilişki olup olmadığını araştırmaktır. 1970-2020 dönemi için ARDL testi uygulanmıştır. Yapılan analizler sonucunda düzeltilmiş tasarruflar: eğitim harcamaları değişkeninin ekonomik büyümeyi etkilediği tespit edilmiştir.

ABSTRACT

The level of education of individuals has an important place among social development indicators and is also considered an indicator of human capital characteristics in terms of individuals participating in production processes. In a way, the level of education and the progress in the quality of education are also tried to be measured by the expenditures and investments made in education. This affects not only the level of development or the sociological structure of societies, but also their general economic situation and macroeconomic balance. In fact, whether education expenditures are also an indicator of economic growth is the subject of both theoretical and econometric studies. However, whether the education expenditures in question affect economic growth or whether countries that reach a certain level of economic growth allocate more budget for education expenditures are among the issues frequently analyzed in the literature. In particular, changes in the economic growth levels or rates of countries as a result of the reflection of savings on education are data that should be taken into account to measure this relationship. In this context, this study analyzes adjusted savings: education expenditures and economic growth data for the United States. The aim of the study is to investigate whether there is a relationship between education expenditures and economic growth for the US. ARDL test was applied for the period 1970-2020. As a result of the analysis, it was found that the adjusted savings: education expenditures variable affects economic growth.

1. Introduction

Education is accepted as an extremely important and

effective tool and process in terms of increasing the quality of human capital for states. Especially with the expenditures made for education, both the increase in the level of social

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welfare and the creation of a qualified workforce structure are among the accepted views. The inadequacy of explaining economic growth with only physical capital and the inability of physical capital to be fully effective without labor force as a production factor made the labor force factor to be the focal point in production, and along with it, the efficiency and qualifications of the labor force began to be questioned. Thus, the concept of human capital emerged. In this context, with education investments and expenditures positively affecting human capital qualifications; There are opinions that many other factors, which are extremely important for the level of development, economic growth, development and the increase of the welfare of societies in macroeconomic and sociological terms, will also be affected. Education is extremely important in terms of improving human capital. With human capital, the characteristics of individuals, namely the workforce, such as knowledge and abilities are expressed and these abilities can be developed through education.

It would not be wrong to say that the development of human capital, which we can define as the basic building block of socio-economic development and economic growth, is also related to the size and quality of investments made in the field of education. When the countries that have achieved a certain growth momentum, in other words: developed countries are examined, the size of the investments in the field of education draws attention. Education expenditures and economic growth and improvement of developed countries are always correlated. With the investments made in the education process, it is expected that the human capital will reach a better position in terms of quality as a result of the educational activities reaching a better structure in terms of quality and quantity. Expenditures made specially to increase the quality of education and to make education more accessible to all segments of the society also have an important place in human capital investments. Educational investments and expenditures at both pre-school, undergraduate and graduate levels also have a great place in the social investments of states.

Many countries around the world have given importance to education as one of the leading sectors for economic growth. Countries invest in education to increase human capital, which we can describe as human resources, and thus they want to achieve their goals of realizing economic growth and increasing the growth rate. In order to realize the desired levels in the concept of growth, which we can briefly describe as the increase in GDP of countries, scientists working in the field of growth in the historical process have also put forward opinions and theories about education. Human capital and its effects on economic growth Neo-Classical growth models and endogenous growth models are also discussed. Especially since capital movements, which are the determinants of economic growth, affect all of the elements of production, labor and technological development, the education literature is often examined with econometric models whose relationship with growth is questioned. Although capital and natural resource issues are

seen as elements that cannot be changed with education, as a result of the development of human capital with education, an increase in efficiency in the use of material capital and natural resources will also develop. On a fundamental basis, it will be possible to increase productivity for all growth factors. From this point of view, the views of economics schools on the relationship between economic growth and education will be examined in the theoretical part of the study.

In this context, it is expected that the productivity of educated individuals participating in the working life will also increase. Based on these views expressed, the USA, which is one of the countries that draw attention in terms of educational performance, has been examined in the context of education and economic growth in this study. In particular, the effect of adjustment savings: education expenditures on GDP, which is the main indicator of economic growth, has been examined econometrically. While conducting this analysis, firstly, the issue is analyzed from a theoretical perspective. The relationship between economic growth and human capital expenditures has been analyzed theoretically in the context of education expenditures. Then, the relevant literature in this field is reviewed and the results obtained through econometric analyses are presented. After the literature review, the data compiled for the study are tested with econometric methods and the results obtained are explained.

2. Theoretical Background

Economic growth is an indicator that is among the main goals of states. Sustainability of economic growth and increase in growth rate are among the factors of economic power. States that want to reach the said economic power develop economic policies in order to use the sources and supporters of growth in the best way. Especially in the globalizing world, growth and sustainability in economic growth are the issues that states emphasize in order to become a global economic leader. In this context, all kinds of technological developments, effective resource use and education in many other areas attract attention. Today, the relationship between education and economic growth is examined with econometric models. However, in the past, the relationship between growth and education is one of the important issues that have been studied by the schools of economics.

It would not be wrong to say that the first school of economics that emphasized the relationship between economic events and education was the mercantilist school. In particular, mercantilists emphasize the importance of qualified manpower for the increase of national welfare, while the importance of education is expressed (Serin, 1979). In order to explain the physiocracy's view of education, it will be sufficient to mention the importance of education for Godwin and Morquis de Condorcet. They stated that thanks to science and technology, the borders for development will disappear and this will be possible with

education. In addition, on this occasion, they emphasized that more people would be accommodated in the existing lands and more production would be achieved with less work (Güneş, 2009:13).

As can be seen, the schools that first emphasize the importance of education are Mercantilist and Physiocratic thought.

One of the pioneers of Neo-classical thought focusing on education for human capital is Gary Becker, and he especially focused on the benefits and returns of education investments (Krasniqi, 2016). Also, Becker formulated the theory of capital (Bilen and Yumuşak 2008).

Schultz, on the other hand, formed the basis of the modern human capital theory and stated that the growth of America was not only achieved by labor-land-capital but also by a different element. This element is human capital (Schultz, 1963).

On the other hand, Gregory Mankiw, David Romer and David N. Weil in 1992. In their study, they expanded the concept of capital for the Solow Growth model. In the aforementioned study, they created the Extended Solow Growth Model by adding human capital to the model, and this model is also known as The Mankiw-Romer-Weil Model (Mankiw, Romer and Weil, 1992).

However, the views on the importance of education were not limited to these. Adam Smith, who is mentioned as one of the main founders of economic thought, also emphasized the issue of human capital. He stated that individuals have a very important contribution to the production process with their acquired skills (Erick & Yılancı, 2013: 91). Marshall also emphasized the importance of education and expressed the effect of change on human capacity (Marshall, 1890: 3).

On the other hand, what is expressed as Intrinsic Growth Models for the subject of education is also extremely important. One of the most striking of these is the Rebelo Model: Basic AK Model. It removed the assumption of diminishing marginal return on capital and defined an external factor for technological development (Ay and Yardımcı, 2008). Another remarkable model in this field is the Lucas Growth Model. Accordingly, the level of output is a function of human capital. Sustainable growth is possible if human capital can be increased perpetually for the long term (Temple, 2001:59).

As can be seen, the subject of human capital has also been identified with education by the schools of economics and has taken its place in growth models. Today, while examining the subject of growth, the relationship between education and growth is tested with econometric models as well as the studies that test the aforementioned theories. This study examines education and growth from an econometric perspective. For this reason, in the literature research below, the studies carried out with econometric models are included.

3. Literatur Review

There are studies examining education and economic growth relationship. While some of these studies examine the relationship between education and growth by including different variables in econometric analysis, some of them compare education rates with growth. In a part of the literature, the relationship between education investments and education expenditures and economic growth is examined. Some of the examples from the reviewed literature are included in this part of the study because they show similarities or contrasts with the econometric results in this study.

In his study, Schultz (1963) investigated the relationship of education to economic growth and explained the increase in the rate for the USA with education investments. Levine and Renelt (1992) conducted panel data analysis covering 119 countries for the period 1960-1989 and found that there was no strong relationship between the rate of enrollment in primary and secondary education and the ratio of public education expenditures to GDP and the rate of economic growth.

Benhabib and Spiegel (1994) examined the relationship between human capital and economic growth in terms of 78 developing and developing countries for the 1965-1985 period, with the model they developed. As a result of their investigations, they concluded that human capital affects economic growth.

Çoban (2004) analyzed the relationship between primary school enrollment rate, secondary school enrollment rate, college enrollment rate, education expenditures and economic growth for 1980-1997 for Turkey. One of the results obtained is that the increase in the primary school enrollment rate is the reason for the economic growth, and the increase in the economic growth is the reason for the increase in the high school enrollment rate.

Musila and Belassi (2004) examined the relationship between public education expenditures and real GNP for Uganda in the 1965-1999 period. As a result, they determined that the increase in public education expenditures per worker positively affects economic growth.

Çakmak and Gümüş (2005) analyzed the GNP by forming a human capital index with the number of primary, secondary and higher education graduates in Turkey for the period 1960-2002. Accordingly, they measured the relationship of human capital, physical capital and labor force with economic growth by applying cointegration analysis. As a result of the analysis, they determined a long-term positive relationship between human capital and economic growth.

Ağır and Kar (2006) examined the relationship between human capital and economic growth for the period of 1926-1994, and as a result of the analysis, they found a long-term relationship between the variables regarding the share of health expenditures and education expenditures in income.

Blankenau et al. (2007) examined the relationship between education expenditures and economic growth for 23 developed countries for the period 1960-2000 and found a positive effect in the long run. Haitao and Jinchang (2009) examined the interaction of economic growth and three different types of education for China with a panel analysis between the period of 1988-2006. It has been concluded that the increase in public expenditures and the spread of enrollment in secondary education affect growth in the short and long term, while increasing expenditures per student in primary education also affect growth. However, they discovered those investments in higher education had little effect on growth.

Kumba (2009) examined the relationship between high education participation rate and economic growth for the 1996-2005 period in terms of Indonesia and found that the increase in the rate had a significant effect on economic growth.

Karataş and Çankaya (2011) examined the human capital growth relationship for Turkey for the 1981-2006 period by using the real GDP rate per capita, the GDP ratio of total education expenditures, the higher education enrollment rate and the GDP share of total health expenditures. As a result of the study, it has been determined that physical capital investments are more effective than human capital on economic growth.

Rao and Jinn (2013) examined the relationship between education expenditures and economic growth in terms of China. As a result of the said examination, China's education expenditure to economic growth is positive, and there is a lagged effect. Thus, education expenditures brought about economic growth.

Pamuk and Bektaş (2014), examined the relationship between education expenditures and economic growth for Turkey with data for the period 1998:01-2013:02, and no cointegration relationship was found between the variables, but according to the Granger causality test result, there is a one-way causality relationship from GDP to growth in education expenditures detected.

Manga et al. examined the relationship between human capital and economic growth for Turkey and the BRICS countries with the 1995-2011 Panel Data Analysis. As a result of the analysis, the long-term relationship between human capital and economic growth in Turkey and BRICS countries It has been determined that human capital affects economic growth.

Uçan and Yeşilyurt (2016) examined the relationship between economic growth and education expenditures for Turkey with data for the period 2006Q1-2015Q4 and a long-term and bidirectional relationship was determined between education expenditures and economic growth.

Akıncı (2017) examined the economic growth and education expenditures in terms of Turkey with ARDL analysis for the period 2006:Q1-2017:Q2. Accordingly, a statistically

significant relationship was found between education expenditures and economic growth in the long run.

Kramata (2017) examined how growth volatility in public expenditure on education affects economic growth for selected EU countries in terms of the 1995-2014 period. As a result, he found that the variance of public expenditure on education hinders GDP growth.

Özataç et al. (2018) applied the Johansen cointegration test for France for the period 1970-2012 and found a long-term equilibrium relationship between the variables. According to the results of Granger Causality Analysis, one-way long-term causality from labor and education expenditures to GDP was determined.

Şen, Kaya and Alpaslan (2018) examined the relationship between education, health expenditures and economic growth in terms of Argentina, Brazil, Chile, India, Indonesia, Mexico, South Africa and Turkey for the period 1995-2012. While a positive causality was found from education and health expenditures to economic growth for Brazil and Mexico, a significant but negative causality was found between education, health expenditures and economic growth for Indonesia, and a causal relationship was found for Argentina, Chile, India, South Africa and Turkey.

Le and Train (2021) examined the relationship between government spending on education and economic growth, with data for Vietnam for the period 2006-2019. According to the results of the VAR model and the Granger causal model, a two-way link was found between economic growth and government spending on education, with a lag of about two years.

Yürük and Acaroğlu (2021), examined the relationship between education expenditures and economic growth in Turkey for the period of 1980-2015 with the NARDL model. In the long term of positive shocks in education expenditures, growth is observed, and in the short term, shocks are observed due to the negative economic situation.

When the literature review is examined, it is seen that in the studies examining the relationship between economic growth and education expenditures with both education expenditures and some human capital indicators, studies that find a positive relationship between economic growth, education, economic growth and human capital indicators are in the majority. However, there are studies concluding that there is no relationship, and it is noteworthy that these studies are studies conducted with human capital indicators.

4. Method

The Autoregressive Distributed Latency Dependent Test-ARDL was developed by Pesaran et al (2001). It is used to detect the existence of long-term relationships between economic variables and is carried out with distributed lagged autoregressive models. ARDL model. In the ARDL model, cointegration relations are explained by the autoregressive distributed lag model instead of an equation (Sevüktekin and

Çınar, 2017: 576). The fact that the stationarity levels are different does not prevent the implementation of ARDL, and first, the unconstrained error correction model (UECM) is established and the existence of long-term relationships between the variables is tested. If the calculated F statistical value is less than the lower bound test, the null hypothesis is accepted and it means that there is no cointegration relationship. Although the calculated F statistical value is between the lower and upper limit values, it is not possible to reach a definite decision about whether there is a cointegration relationship between the variables. However, if the calculated F statistical value is greater than the upper limit value, the hypothesis that there is no cointegrated relationship between the variables is rejected. Then, the alternative hypothesis, which states that there is a cointegrated relationship between the variables, is accepted. In the case of co-integrated connections, short and long term ARDL tests are applied. The linearity of the series was determined and Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-PhilipsSchmidt-Shin (KPSS) unit root tests were performed for the series with linear structure.

Augmented Dickey-Fuller unit root test was created to solve the autocorrelation process in the series and the test statistical result should be negative.

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t \tag{1}$$

$$\Delta y_t = \mu + \delta y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t \tag{2}$$

$$\Delta y_t = \mu + \beta_t + \delta y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t \tag{3}$$

$H_0: \delta = 0 \qquad H_1: \delta < 0$

The Phillips-Perron unit root test is based on non-parametric functions and the result must be negative.

$$\Delta y_t = \delta y_{t-1} + \varepsilon_t \tag{4}$$

$$\Delta y_t = \mu + \delta y_{t-1} + \varepsilon_t \tag{5}$$

$$\Delta y_t = \mu + \beta_t + \delta y_{t-1} + \varepsilon_t \tag{6}$$

$H_0: \delta = 0 \qquad H_1: \delta < 0$

In the ADF test and the PP test, the null hypothesis states that the series has a unit root, but the alternative hypothesis states that the series is stationary.

Kwiatkowski-Philips-Schmidt-Shin (KPSS) Unit Root Test is performed according to LM test statistics and eliminates the deterministic tendency in time series. Thus, it makes the series stationary. The null hypothesis states that the series is trend stationary. But the alternative hypothesis shows the unit root process.

The Autoregressive Distributed Latency Dependent Test-ARDL is a "Boundary Test" developed by Pesaran et al.

(2001) and to identify possible long-term relationships between economic variables. In the ARDL model, cointegration relations are explained with the autoregressive distributed lag model (Sevüktekin and Çınar, 2017: 576).

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta Y_{t-i} + \sum_{i=0}^m \alpha_{2i} \Delta X_{t-i} + \alpha_3 Y_{t-1} + \alpha_4 X_{t-1} + \varepsilon_t \tag{7}$$

$$\Delta X_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta X_{t-i} + \sum_{i=0}^m \alpha_{2i} \Delta Y_{t-i} + \alpha_3 Y_{t-1} + \alpha_4 X_{t-1} + \alpha_5 trend + \varepsilon_t \tag{8}$$

In the ARDL Boundary test, although the stability levels of the variables are different, the test is applied and for this, the existence of long-term relationships between the variables is determined by establishing the UECM first.

$$H_0 : \alpha_3 = \alpha_4 = 0$$

If the calculated F statistical value is less than the lower bound test, the null hypothesis is accepted. Accordingly, it is said that there is no cointegration relationship between the variables. Although the F statistical value remains between the lower and upper limit values, it cannot be decided whether there is a cointegration relationship between the variables. However, if the F statistical value is greater than the upper limit value, then the hypothesis stating that there is no cointegrated relationship between the variables is rejected and the alternative hypothesis is accepted. If a cointegrated relationship between the variables is detected, estimation of short and long term ARDL models can be started.

The long-run ARDL model

$$Y_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} Y_{t-i} + \sum_{i=0}^n \alpha_{2i} X_{t-i} + \varepsilon_t \tag{9}$$

$$X_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} Y_{t-i} + \sum_{i=0}^n \alpha_{2i} X_{t-i} + \alpha_3 trend + \varepsilon_t \tag{10}$$

The short-term ARDL model

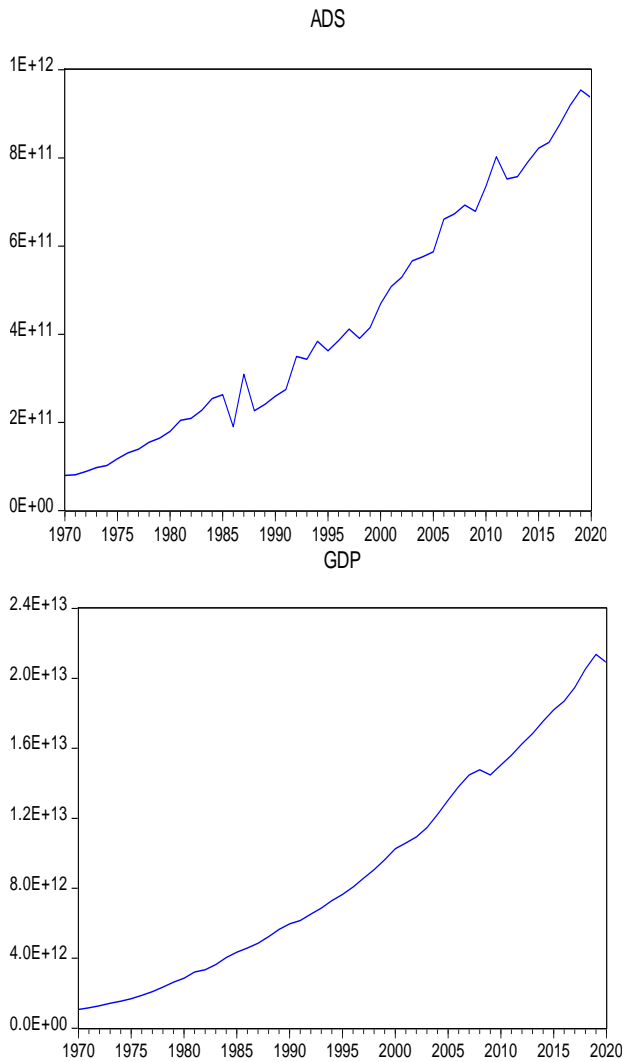
$$\Delta Y_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta Y_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta X_{t-i} + \delta EC_{t-1} + \varepsilon_t \tag{11}$$

$$\Delta X_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta X_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta Y_{t-i} + \delta EC_{t-1} + \alpha_5 trend + \varepsilon_t \tag{12}$$

5. Empirical Results

In this study, the relations between adjustment savings: education expenditures and GDP were investigated by using annual time series in 1970-2020 periods in Turkey. Data for all variables were obtained from the World Bank data website. The logarithm of all data was used in the analysis.

Figure 1: Graphs of Variables



The cointegration relationship between Adjustment savings: education expenditures and GDP variables will be made using ARDL analysis. For this purpose, first of all, descriptive statistics for the variables were determined.

Table 1: Descriptive Statistics of Variables

	LnAdj	LnGDP
Mean	26.56	29.51
Median	26.67	29.66
Max	27.58	30.69
Min	25.10	27.70
Standard Deviation	0.73	0.88
Skewness	-0.38	-0.50
Kurtosis	2.03	2.10
Normality	3.25 (0.19)	3.91 (0.14)

*Adj means adjustmen savings: education expenditures

Note: The value in parentheses is the probability value.

Table 1 shows the descriptive statistics of the variables. Table 1 presents the descriptive statistics of the variables. The explanations of the variables are made by using the logarithm of ADJ and GDP.

Table 2 presents the results of conventional unit root tests. Accordingly, as a result of the analysis, the LnGDP variable is found to be stationary at the level. The LnAdj variable, on the other hand, is determined with a unit root at the level. Since the variables are found to be unit rooted at the level, the first difference of the ADJ variable is taken. The first differences of the variable with unit root at the level are taken and shown in Table 3.

Table 2: Traditional Unit Root Tests

LnGDP	ADF			PP			KPSS	
	None	Constant	Constant&Trend	None	Constant	Constant&Trend	Constant	Constant &Trend
Test statistic	1.64	-8.84	-1.32	6.66	-9.04	-1.33	0.93	0.23
1%	-2.61	-3.56	-4.15	-2.61	-3.56	-4.15	0.73	0.21
5%	-1.94	-2.92	-3.50	-1.94	-2.92	-3.50	0.46	0.14
10%	-1.61	-2.59	-3.18	-1.61	-2.59	-3.18	0.34	0.11
LnAdj	ADF			PP			KPSS	
	None	Constant	Constant&Trend	None	Constant	Constant&Trend	Constant	Constant&Trend
Test statistic	4.60	-2.81	-2.18	4.57	-2.08	-3.08	0.94	0.18
1%	-2.61	-3.57	-4.16	-2.61	-3.56	-4.15	0.73	0.21
5%	-1.94	-2.92	-3.50	-1.94	-2.92	-3.50	0.46	0.14
10%	-1.61	-2.60	-3.18	-1.61	-2.59	-3.18	0.34	0.11

H₀: The serial unit is rooted.

H₁: The series is stationary.

Table 3: Traditional Unit Root Tests – First Differences

LnAdj	ADF	PP	KPSS
Test statistic	-2.302817	-9.030131	0.263914
1%	-2.615093	-2.613010	0.739000
5%	-1.947975	-1.947665	0.463000
10%	-1.612408	-1.612573	0.347000

Note:H0 acceptance is expressed with * and H1 acceptance is expressed with **.

H₀: The serial unit is rooted.

H₁: The series is stationary.

Following the unit root tests, the ARDL Model is constructed. In Table 3, traditional unit root tests were performed by taking first differences. As seen in the table, the adj series became stationary at the 1st order.

Table 4: ARDL Model

Test statistic	Value	Probability	n=49	
		10%	3.177	3.653
F stat.	15.02591	5%	3.86	4.44
		1%	5.503	6.24
k	2			

H₀: There is no cointegration relationship between the variables.

H₁: There is a cointegration relationship between the variables.

Table 4 presents the results of the ARDL Analysis. According to the results in Table 4, since the F statistic is 15.02591>6.24 with a probability of 1%, the null hypothesis was rejected and it was concluded that there is a cointegrated relationship between the variables. Due to the co-integrated relationship between the variables, long-term relationship analysis and error correction model can be performed.

Table 5: ARDL Long-Run Model

Variable	Coefficient	Std. Error	t-stat.	Possibility
LNGDP	0.785202	0.045995	17.07128	0.0000
C	3.495357	1.409525	2.479813	0.0170
EC = LNADS - (0.7852*LNGDP + 3.4954)				

The long-term coefficients calculated are shown in Table 5. As seen in the table, the GDP variable was also found to be statistically significant. The coefficients indicate how much the 1% unit changes will affect the GDP ratios. Accordingly, the 1% unit increase seen in adjustment savings: education expenditures increases the GDP variable by 0.785202%.

The error correction term must be statistically significant and negative. According to the results in Table 6, the error correction term is statistically significant and has a negative value. Therefore, it can be said that short-term imbalances tend to return to normal in the long-term.

Table 6: ARDL Short-Run Relationship and Error Correction Model

Variable	Coefficient	Std. Error	t-stat.	Possibility
D(LNADS(-1)	-0.36947	0.09923	-3.72327	0.0005
CoIntEq (-1)*	-0.43785	0.06381	-6.86157	0.0000

6. Conclusion

Education is undoubtedly one of the factors that have the greatest impact on the social development of societies. In particular, investments in education, education expenditures, and educational regulations of the states can be considered as the locomotive that can move societies from the current civilization level to more advanced levels. In addition to the mentioned social effects, the importance of education expenditures in terms of economic development and growth for states and societies belonging to states is frequently examined in the literature. In particular, the economic growth levels of the countries classified as developed and whether education expenditures have a share in the economic growth rates realized over time is also the subject of econometric analyzes.

In this study, adjustment savings: education expenditures and GDP data and the relationship between education expenditures and economic growth were analyzed econometrically. When the literature investigating the relationship between economic growth and education, such as this study, is examined, it is seen that the majority of studies show that education expenditures have an effect on economic growth and that the said effect is positive. However, in some studies investigating the relationship between education expenditures and growth, it was emphasized that a strong relationship could not be determined. While Schultz (1963), Benhabib and Spiegel (1994), Benhabib and Spiegel (1994) found a positive relationship between the variables they examined about education and economic growth, Levine and Renelt (1992) found a strong correlation between the variables related to education expenditures and economic growth. they could not detect a relationship. In the studies, it is seen that the relationship between education expenditure and economic growth is mostly examined with econometric models.

This idea or whether such an effect exists has been examined theoretically by the schools of economics. In particular, the relationship between human capital and growth has been explained with models by the pioneers of Mercantilist thought, Physiocracy and Classical school thought. In particular, Lucas' model is based on human capital accumulation, which is one of the most important endogenous growth models in this field. In summary, when the theories explaining the relationship between education and economic growth are examined, it is mentioned that the factors affect the productivity and technological development positively, based on the fact that education is effective on human capital accumulation. In this case, the importance of the relationship between human capital and economic growth, which is associated with the level of

education or the quality of education, has also been demonstrated by the theories developed by the schools of economics. However, whether the existence of the said relationship is the same or similar in strength and direction for developed or developing countries, or whether such a relationship exists for all countries is also investigated by econometric analyzes carried out other than theoretical studies. When the literature containing the relevant econometric studies is examined, it is seen that different results have been reached.

In order to set an example in the study, USA was determined as the country to be analyzed. The reason for choosing the USA is that this state is among the top spenders in the world in terms of education expenditures. Adjustment savings: education expenditures and GDP data for the USA for the period 1970-2020 were obtained from the World bank data website and the ARDL test was applied.

As a result of the tests carried out, a cointegrated relationship was found between the variables adjustment savings: education expenditures and GDP. Based on this result, the long-term relationship and error correction model were realized. Since the error correction term is statistically significant and negative, it has been determined that the short-term imbalances tend to return to normal in the long-term. Adjustment savings: 1% unit increase in education expenditures increases the GDP variable by 0.785202%. Adjustment savings: education expenditures affects the GDP variable. Based on these results, it is possible to interpret the adjustment savings: education expenditures are effective on economic growth for the period of 1970-2020 in the USA. When the relationship found between the variables in the study is compared with the studies in the literature, it is seen that other studies have reached similar results between education expenditures and economic growth. Especially among the studies conducted for the USA, the result obtained by Schultz (1963) in his study reveals the importance of human capital. In addition, it is also seen that studies conducted with different countries or groups of countries have obtained results to explain the relationship between economic growth and education expenditures.

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