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# An Assessment of The Relationship Between Economic Growth and Adjustment Savings: Education Expenditures for Türkiye

# Ekonomik Büyüme ve Düzeltilmiş Tasarruflar: Eğitim Harcamaları Arasındaki İlişkinin Türkiye İçin Değerlendirilmesi

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## *Abstract*

*The education sector is one of the most fundamental factors that should be emphasized for sustainable and lasting growth in the long run. Both in terms of countries and households, the higher the income level, the greater the importance attached to education. The main objective of this study is to examine the relationship between public education expenditures and growth using an up-to-date and different econometric method. In this study on Türkiye, the period between 1970 and 2021 is considered and gross domestic product and adjusted savings: education expenditures are used as data. ADF and FKPSS unit root tests are used as the analysis method and The Fourier-Shin test is used to determine the cointegration relationship. The Fully Modified Ordinary Least Square method is used for long-run coefficient values. The findings confirm the existence of a positive relationship between the variables in the long run.*

***Keywords:*** *Economic Growth, Education Expenditures, Fourier-Shin Test*

***JEL Classification:*** *C10, H52, I25*

## *Öz*

*Uzun vadede sürdürülebilir ve kalıcı bir büyüme için önem verilmesi gereken en temel faktörlerden birisi eğitim sektörüdür. Hem ülkeler açısından hem de hanehalkları açısından değerlendirildiğinde gelir düzeyinin yükselmesi eğitime verilen önemin de derecesini artırmaktadır. Bu çalışmada ana amaç kamunun gerçekleştirmiş olduğu eğitim harcamaları ve büyüme arasındaki ilişkiyi güncel ve farklı bir ekonometrik yöntem kullanarak incelemektir. Türkiye üzerine yapılan bu çalışmada 1970 ve 2021 dönemi ele alınmış olup gayri safi yurtiçi hâsıla ve düzeltilmiş tasarrufla: eğitim harcamaları veri olarak kullanılmıştır. Analiz yöntemi olarak ADF ve FKPSS birim kök testi, eş bütünleşme ilişkisinin tespiti için ise Fourier-Shin testi kullanılmıştır. Uzun dönem katsayı değerleri için Fully Modified Ordinary Least Square yöntemi kullanılmıştır. Elde edilen bulgularda, uzun dönemde değişkenler arasında pozitif bir ilişkinin varlığı onanmaktadır.*

***Anahtar Kelimeler:*** *Ekonomik Büyüme, Eğitim Harcamaları, Fourier-Shin Testi*

***JEL Sınıflandırması:*** *C10, H52, I25*

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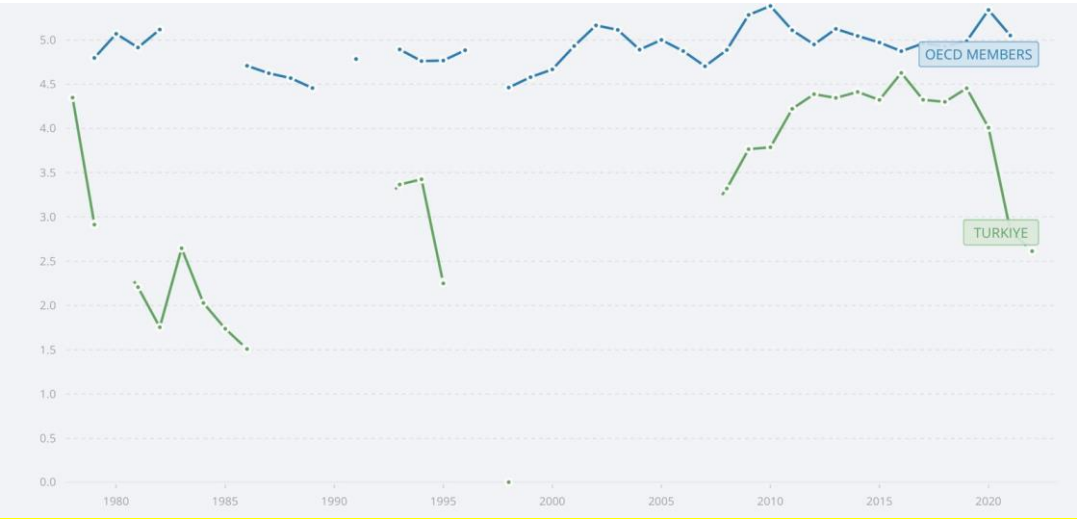
## 1.Introduction

Undoubtedly, education is one of the sectors that constitute the most important expenditure item of the total income of the countries. Especially it is seen that education expenditures (ED) lag compared to developed countries when looking at developing countries.[2] From past to present, the connection between economic growth (EG) and the education expenditures has been the focus of many theories and discussions. It can be said that education and EG were first examined comprehensively by Becker (1964). Becker (1964) investigated the extent of education expenditures on economic growth in the USA. Becker mentioned that as the human capital stock increases, the rate of return on human capital will increase, thus investments will increase and savings will also increase with physical capital accumulation. Therefore, the human capital a country has is a major factor in economic development. Schultz (1961) mentioned the impossibility of economic growth without supporting human capital and the necessity of increasing the share of ED in public investments in order to achieve effective and efficient growth. Education expenditures accounted for between 36% and 70% of the total income increase in the USA between 1929 and 1956. Romer (1986), one of the advocates of the endogenous growth model, argued that in the long run increases in marginal information efficiency will contribute to economic growth. Lucas (1988) mentions three models in his analysis of the USA. The first of these is physical capital accumulation and technology, the second is the model in which human capital accumulation is through schooling, and the third is the accumulation of human capital specialized through experience. As a result, human capital accumulation serves as the primary catalyst for EG. Denison (1962) stated in his study that a 1% increase in labor quality, thanks to education, would increase economic growth by 0.73%. Harbison (1971) saw human capital as the prime source of the wealth of nations. Solow (1956) included in his article that investment and labor are important factors for economic growth, but technological advances are an important factor for permanent growth acceleration in the long term. Additionally, underlined that income growth is linked to physical capital, savings and population growth. Mankiw, Romer and Weil (1992) expanded the Solow model and included human capital accumulation finding reveals that savings and population growth are important factors in further increasing income. He also explained that, unlike the Solow model, physical capital has a greater impact on per capita income, higher savings rates will lead to higher income, and this will increase its positive impact on human capital.

Education services are provided by both the public and private sectors in Türkiye. On the other hand, households themselves spend on education. When Türkiye is compared to OECD countries, it is observed that the share of ED in GDP remains low. It is noteworthy that Türkiye has moved away from OECD countries especially in recent years. The relationship between ED and EG in Türkiye has been the subject of many academic studies. Studies examining the relationship between ED and EG have generally accepted the existence of a positive correlation. The economic evaluation of the education sector plays an important role for both the present and the future. In this respect, it is thought that analyzing it with more recent data and different methods will enrich the originality value of the study. In previous studies, there are a few studies using the Fourier KPSS unit root test and the Fourier-Shin cointegration test. According to Enders and Lee (2012), the most important advantage of using the Fourier test is that it does not directly estimate the break dates and the number of breaks in the data, and thus, it covers unknown and possible structural breaks. In this way, both sudden changes and slow changes can be detected. Therefore, it can provide accurate findings for determining and implementing appropriate policies. In this regard, the study is expected to make a significant contribution to the current literature.

[2] For data: https://www.cia.gov/the-world-factbook/field/education-expenditures/country-comparison/

**Fig. 1: Government Expenditure on Education, Total (% of GDP)**




**Note:** OECD Members and Türkiye

The primary aim of this study was to evaluate the connection between economic growth-education expenditures between 1970 and 2021 in Türkiye. Data used for the review; real gross domestic product (dollars) calculated according to purchasing power parity and current education expenditures (dollars) in GDP were taken annually. For the stationarity test, ADF developed by Dickey et al. (1979) was used and Fourier KPSS unit root test developed by Becker et al. (2006) was used. Fourier-Shin test developed by Tsong et al. (2016) was preferred for the cointegration relationship between ED and EG. FMOLS method was preferred to determine long-term coefficient values.

The remaining parts of the study are organized as follows: The first part of the study consists of the introduction. The second section includes literature related to the main subject of the study. In the third section, the method and data information used are included. The fourth section contains the analysis findings. The last part of the study includes method evaluations and the conclusion of the research.

## 2. Literature

The nexus between ED and EG has been a current issue that has taken its place in different studies over the years. The general conclusion in studies on Türkiye has been that there is a linear connection between EG and ED. Köksel and Tecirli (2023) examined that a causality connecton from ED to EG and they found that there was a relationship. Yürük and Acaroğlu (2021) found that ED support EG in both the long and short term. Ülger (2020) for Türkiye found that the effect of education on growth is statistically insignificant. Akıncı (2017) found that a 1% rise in ED causes a 0.86% rise in EG in the long term and a 0.23% increase in the short term. Alper (2017) found that a 1% increase in education expenditures increased EG by 1.33%. Acar, Günalp and Cılasun (2016) found that the budget allocated to education expenditures by households in all income groups in Türkiye increased over time. Uçan and Yeşilyurt (2016) for Türkiye determined a bidirectional causality relationship between growth and education expenditures. In their study for Türkiye, Mercan and Sezer (2014) concluded that the effect of ED on EG is positive. In their review, Eriçok and Yılancı (2013) detected a short term relationship between ED-EG but did not detect a long-term relationship. Arabacı (2011) made a comparison between Türkiye and OECD countries and stated with relevant data that Türkiye is the country that allocates the least resources to education expenditures among OECD countries and at the same time that when the ratio of education expenditures to GDP is evaluated it is half of the average of OECD countries. Yıldırım, Deniz

Karakoyun and Hepsağ (2011) detected a causality from economic growth to education expenditures.

While some studies conducted outside Türkiye accepted the existence of a correlation between EG and ED, some studies did not find any relationship. Çetin (2023) for the USA, increasing education expenditures increases economic growth. Coman, Lupu and Nuţă (2022), for 11 former communist Eastern European states, current EU members, found that in the connection between ED-EG, there was no correlation in the long term for five countries, but a long-term relationship for six countries, and in the short term relationship for four countries. It has been determined that there is a correlation between the two countries, but no relationship has been detected for the two countries. Zeynalli and Hasanoğlu (2022) for Azerbaijan concluded that education expenditures positively affect economic growth. Suwandaru, Alghamdi and Nurwanto (2021) for Indonesia found that there is a negative relationship between education expenditures and economic growth in the short term and a positive relationship in the long term. Tabar, Najafi and Badooei (2017) found in their study for Iran that a long-term correlation between ED-EG. In his review of 50 selected countries, Trabelsi (2017) concluded that growth was positively affected in countries that exceed a certain public education expenditure. Hussin, Muhammad, Hussin and Razak (2012) found in their study for Malaysia that EG in the short term is the reason for education expenditures. Karagianni, Pempetzoglou and Saraidaris (2019) found that increases in education expenditures support economic growth in England. In their study for Uganda, Musila and Belassi (2004) concluded that increasing ED increases EG in both the short and long term. In his review of 100 countries, Barro (2001) found that increasing the education level of men contributes more positively to growth than women, that advances in science have a positive impact on growth and that increasing the quality of education will have a positive impact on EG. Hsieh and Lai (1994) in their analysis, for G-7, did not detect any correlation between education and EG.

The nexus between EG and ED has been a subject of interest in the literature for every period. This has led to different results, especially due to the different development levels of the countries. But undoubtedly, the general opinion is that as the development level of countries increases, the share allocated to education also increases. Or, on the contrary, it is observed that as the importance given to education increases, the development levels of countries increase in the long run. When we look at the studies on Türkiye, it can be said that the same opinion and observation are obtained.

## 3. Data and Method

This study employed the annual data, real gross domestic product and the value of ED in GDP between 1970 and 2021 to examine the association between ED and EG for Türkiye. Logarithmic transformations of the variables were used in the analysis phase. For the stationarity test, ADF developed by Dickey et al. (1979) was used and Fourier KPSS unit root test developed by Becker et al. (2006) was used. Fourier-Shin test by developed by Tsong et al. (2016) was preferred for the nexus relationship between ED and EG. FMOLS method developed by Phillips and Hansen (1990) was preferred to determine long-term coefficient values. Cointegration tests generally examine the long-run relationship. The probability of structural breaks in long-run data is high. In this respect, the biggest advantage of the cointegration test developed by Tsong et al. (2016) is that structural breaks are independent of the number of structural breaks and break dates (Songur & Sertkaya, 2023, 13). After the detection of long-run cointegration, the FMOLS method, which is preferred in determining the long-run coefficients, solves the endogeneity problem in the estimation of the coefficients, on the other hand, it adjusts the deviations in the standard fixed effect estimators. In this respect, FMOLS method provides a great advantage.

The relevant model is shown in Equation 1.

$$lngdp_t = ß_0 + ß_1 lned_t + \varepsilon_t \quad (1)$$

$$lned_t = \alpha_0 + \alpha_1 lngdp_t + u_t \quad (2)$$

Table 1 shows that information about the variables. The variables are obtained from the World Bank website.

**Table 1: Variable Definitions**

| Variables | Symbol | Explanation | Source |
|---|---|---|---|
| Real Economic Growth | GDP | Constant (LCU)-Dollar | The World Bank |
| Education Expenditures | ED | Adjusted Savings: Education Expenditure, Current- Dollar | The World Bank |

Figure 1 shows the time path graph of the variables for the period 1970 and 2021. When the time paths of both variables are analyzed, it is observed that contain structural breaks and have a non-linear structure. The red curve shows estimated values and the blue curve shows actual values.

**Fig. 2: Time Path Graph of the Variables**

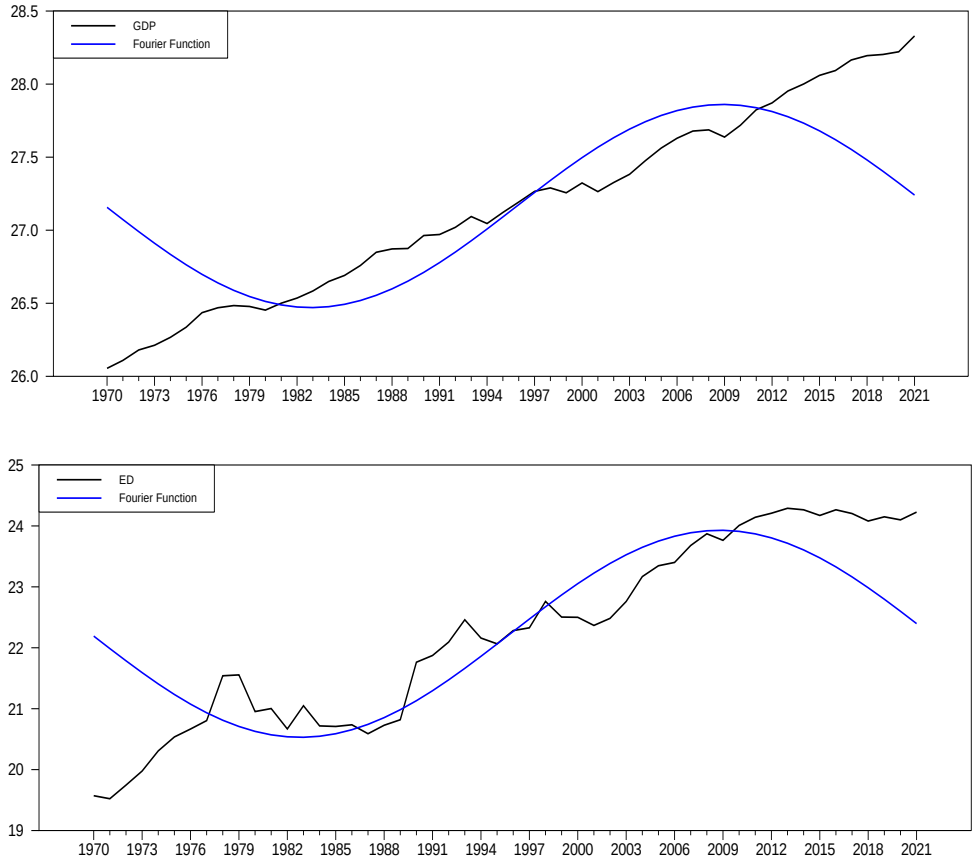


Table 2 includes the basic statistical values of the variables. The coefficients Skewness and Kurtosis indicate whether a distribution is normal or not. Also, they are important in terms of giving an idea about the shape of the probability distribution. The fact that the Skewness value is close to 0 and the Kurtosis value is close to 2 indicates that the series are normally distributed. On the other hand, Jarque-Bera test results show that the series is normally distributed.

**Table 2: The Variables Statistics**

| | GDP | ED |
|---|---|---|
| **Mean** | 27.16571 | 22.22948 |
| **Median** | 27.15720 | 22.30495 |
| **Maximum** | 28.32955 | 24.28931 |
| **Minimum** | 26.05474 | 19.52247 |
| **Std.Dev.** | 0.650769 | 1.506575 |
| **Skewness** | 0.099385 | -0.063242 |
| **Kurtosis** | 1.887094 | 1.707273 |
| **Jarque-Bera** | 2.769151 | 3.655474 |
| **Probability** | 0.250430 | 0.160777 |

For the unit root test, which is the first step of the analysis method, the ADF test, which is one of the traditional unit root tests, is performed first. The ADF unit root test does not take structural breaks into account, especially in long-run analysis. Therefore, the FKPSS test developed by Enders and Lee (2012), which takes into account both sharp and smooth transition structural breaks, is used. The FKPSS test includes structural breaks using trigonometric terms such as sine and cosine.

The Fourier equation is as follows;

$$y_t = a_0 + \gamma_1 sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 cos\left(\frac{2\pi kt}{T}\right) + \epsilon_t \quad (3)$$

In Equation 3, "π" stands for pi (3.14), "k" stands for frequency, "T" stands for number of observations and "t" stands for trend.

The FSHIN test developed by Tsonag et al. (2016) is used to determine the long-run cointegration relationship between the variables. The equation established in the context of this test is as follows;

$$y_t = d_t + x_t'\beta + \eta_t \quad (4)$$

Equation 4 denotes, $\eta_t = \gamma_t + v_{1t}$, $\gamma_0 = 0$ and $\gamma_t = \gamma_{t-1} + u_t$ ve $x_t = x_{t-1} + v_{2t}$. Here $u_t$ denotes an independent, similarly distributed error term with zero mean and constant variance $\sigma_u^2$ and $\gamma_t$ denotes a random walk process with zero mean. "$d_t$" in Equation 4 denotes the deterministic trend.

$d_t = \sum_{i=0}^{m} \delta_i t^i + f_t$

If m=0 or m= 1;

$$f_t = \alpha_1 sin\left(\frac{2\pi kt}{T}\right) + \alpha_2 cos\left(\frac{2\pi kt}{T}\right) \quad (5)$$

If all variables are stationary at I (1) level in the stationary test results, a cointegration test is performed. The equation for cointegration is as follows;

$$y_t = \alpha_0 + \alpha_1 sin\left(\frac{2\pi kt}{T}\right) + \alpha_2 cos\left(\frac{2\pi kt}{T}\right) + x_t'\beta + v_{1t} \quad (6)$$

FSHİN cointegration test statistic;

$$CI_f^m = T^{-2}\hat{\omega}_1^{-2} \sum_{t=1}^{T} S_t^2 \quad (7)$$

"$S_t$" in Equation 7 stands for the coefficient of the ECM error terms and is calculated as $S_t = \sum_{t=!}^{T} \hat{v}_{1t}$.

After the unit root and cointegration tests, the FMOLS method is used to calculate the long-run coefficients.

## 4. Analysis Findings

In the first stage of the analysis, the stationarity of the variables was determined. Both traditional ADF and non-traditional (FKPSS) unit root tests were conducted. As a result of both tests, it was determined that all variables were not stationary at level I (0) values, but became stationary at I (1) values. Test results are in Table 3.

For the ADF unit root test;

$H_0$ = There is a unit root

$H_1$ : There is no a unit root

For FKPSS unit root test;

$H_0$ = There is no a unit root

$H_1$ : There is a unit root

If the calculated test statistic < Critical value, the $H_0$ hypothesis is accepted and the series is determined to be stationary. It is mean that trigonometric terms are statistically significant. So, in the long term variables are in equilibrium.

**Table 3: ADF and FKPSS Test Results**

| **ADF** | | | | |
|---|---|---|---|---|
| | **Constant** | | **Trend & Constant** | |
| **Variable** | **t-stat.** | **p-value** | **t-stat.** | **p-value** |
| **lngdp** | 0.1150 | 0.96 | -26.452 | 0.26 |
| **lned** | -11.897 | 0.67 | -22.708 | 0.44 |
| **Δlngdp** | -67.859 | 0.00* | -67.217 | 0.00* |
| **Δlned** | -69.977 | 0.00* | -70.135 | 0.00* |

| **FKPSS** | | | | | | |
|---|---|---|---|---|---|---|
| | **Constant** | | | **Trend & Cons.** | | |
| | **Tau-m(k)** | **k** | **Crit.V** | **tau-t(k)** | **k** | **Crit.V** |
| **lngdp** | 0.31539 | 1 | 0.1720 | 0.06812 | 1 | 0.0546 |
| **lned** | 0.32036 | 1 | 0.1720 | 0.07353 | 3 | 0.0423 |
| **Δlngdp** | 0.20894* | 5 | 0.4626 | 0.10702* | 5 | 0.1484 |
| **Δlned** | 0.09701* | 3 | 0.4480 | 0.09155* | 3 | 0.1423 |

**Note:** * It is stationary at the 5% significance level, n (number of observations) =52

The next step after testing the stationarity of the variables is to test the existence of cointegration. For this, the Fourier-Shin cointegration test results in Table 4 were taken into consideration. Established hypothesis;

$H_0$ = There is a cointegration.

$H_1$ : There is no cointegration.

**Table 4: Fourier-Shin Cointegration Test Results**

| Model | CI0f | Critical Value | Fm(k) | F critical value |
|---|---|---|---|---|
| **Lngdp=f(lned)** | 0.07410 | 0.146 | 7.00889 | 4.066 |

**Note:** $\alpha$= %5 p (number of independents) =1, lopt= 3, k (frequency)3, CI0f= Calculated test statistic value

According to the test results, the critical value (0.146) was greater than the calculated test statistic (0.05058) (CI0f < critical value). Therefore, the $H_0$ hypothesis is accepted and the existence of a cointegrated nexus between the variables is determined.

The second stage of the cointegration test is whether the trigonometric terms are meaningful or not. Established hypothesis;

$H_0$ = Trigonometric terms are significant.

$H_1$ : Trigonometric terms are meaningless.

If the calculated value of F is greater than the F critical value (Fm(k)> F critical value), the $H_0$ hypothesis is accepted and the significance of the trigonometric terms is decided.

After determining the existence of a long-run relationship between the variables, the last step is to test whether the trigonometric terms are significant. When the results in Table 5 are evaluated, the calculated F test statistic is greater than the F critical value. As a result, trigonometric terms are statistically significant.

**Table 5: Fourier "F" Test Results**

| | Constant | | Trend & Constant | |
|---|---|---|---|---|
| **Variables** | **Fm (k)** | **minSSR** | **Ft (k)** | **minSSR** |
| **Gdp** | 34.0742* | 9.0340 | 9.92587* | 0.10176 |
| **ED** | 45.1631* | 40.7112 | 30.08460* | 3.42459 |
| **ΔGdp** | 9.92587* | 0.10176 | 3.67606* | 0.06961 |
| **ΔED** | 4.95921* | 2.71333 | 4.62937* | 2.71288 |

**Note:** k=1, At 5% significance level, F table critical value for constant =4.929, constant and trend= 4.972

Table 6 shows the FMOLS test results. FMOLS test results show that a 1% increase in education expenditures causes a 0.4% increase in economic growth, while a 1% increase in economic growth provides a 2.2% increase in education expenditures. According to the findings, in the long term, economic growth and education expenditures impact each other positively. Moreover, it can be said that increases in economic growth have a greater impact on education expenditures.

Model 1 : $lngdp_t = ß_0 + ß_1 lned_t + \varepsilon_t$ (8)

Model 2 : $lned_t = \alpha_0 + \alpha_1 lngdp_t + u_t$ (9)

**Table 6: FMOLS Long Run Test Results**

| **Model 1** | | | | |
|---|---|---|---|---|
| **Variables** | **coefficient** | **Std. Error** | **t-statistic** | **Prob.** |
| **lned** | 0.428058 | 0.020621 | 20.75802 | 0.0000 |
| **Cons. term** | 17.65618 | 0.460271 | 38.36040 | 0.0000 |
| **Cos.** | 0.143266 | 0.042497 | 3.371168 | 0.0015 |
| **Sin.** | -0.087874 | 0.041549 | -2.114960 | 0.0398 |
| **Model 2** | | | | |
| **lngdp** | 2.282150 | 0.111521 | 20.46390 | 0.0000 |
| **Cons. term** | -39.76447 | 3.032709 | -13.11186 | 0.0000 |
| **Cos.** | -0.305244 | 0.097479 | -3.131369 | 0.0030 |
| **Sin.** | 0.193430 | 0.098628 | 1.961201 | 0.0558 |

## 5. Conclusions and Discussion

At the study, the connection between Türkiye's economic growth and education expenditures was examined from 1970 to 2021. ADF and FKPSS unit root tests were used as analysis methods, and the Fourier-Shin test was preferred as the cointegration test. FMOLS method was used to determine long-term coefficient values. In the unit root test results, it was found that both variables became stationary at their first difference. This result shows that shocks in both education expenditures and economic growth are not permanent, tend to return to their average value, and are important as economic variables. On the other hand, the cointegration test results for both variables accept the existence of a cointegrated relationship in the long run. In other words, Türkiye's education expenditures and real gross domestic product move together in the long run. According to the test results obtained with the FMOLS method, a 1% increase in ED increases EG by 0.4% in the long run, while a 1% increase in economic growth increases education expenditures by 2.2%. The results obtained are particularly consistent with Becker (1964), Schultz (1961), Romer (1986) Denison (1962) Mankiw et al. (1992) supports their hypothesis. In studies on Türkiye, Yürük (2021), Ülger (2020), Akıncı (2017), Alper (2017), Uçan et al. (2016), Mercan et al. Similar findings were obtained with (2014).

The impact of human capital on EG has been a much debated topic by economic schools. Human capital, which is generally referred to as human capital in the literature, is perhaps the most important factor that should be given importance in the economy in the development process. The relationship between human capital and EG has been analyzed especially by the classics within the framework of endogenous growth. They agreed that human capital has a positive impact on EG both in terms of education level and technological advances. Increasing the share of investments and expenditures in education plays a major role both in raising the level of development of societies to a higher level and for a long-term social welfare level. After the Industrial Revolution, societies started to allocate a larger share of income to this sector in order to improve the level of education. Developing countries like Türkiye need to take the right and realistic steps in education not only for economic growth but also to ensure their development and increase their welfare in the long run. Therefore, economic plans and programs should be prepared for the development of human capital in the sharing of real income in terms of expenditures in the economic policies to be followed. In the long run, making progress in human capital provides the right moves in terms of both EG and the level of development of the society.

An increase in the level of education is directly proportional to social welfare. In Türkiye, the ratio of ED both in GDP and in the budget remains at low levels.[3] Türkiye needs to act more proportionately in terms of which sectors should be preferred in resource allocation, not on sectors that provide short-term gains, but on sectors that will ensure both national development and social welfare. The industrial sector and the education sector should be considered integrated, and the integration of vocational high schools and related university departments should be ensured in education programs. In this direction, this balance should be observed in resource transfer. In this way, positive results will be achieved on EG in the long term, both in terms of quality and quality-oriented rather than quantity-oriented. Thanks to an advanced education system, advanced technology, labor productivity and high knowledge accumulation required for economic growth will be provided. On the social side, it will provide social welfare-enhancing effects in both social and economic terms.

For policy makers, the necessary economic and programmatic recommendations can be briefly summarized;

- Increasing the share allocated to education in the public budget, similarly increasing the share of education expenditures in GDP,

- Ensuring that the budget used for education is determined correctly in order to maximize the effective use of resources in order to avoid wasting resources,

- Ensuring the integration of vocational high schools with universities for a qualified workforce,

- Improving the curricula in schools by utilizing the education system of developed countries,

- From primary education to higher education, the state should act together with the families of specially qualified students and provide the necessary financial and moral support,

Especially in studies on Türkiye, the role of human capital in economic development has been emphasized. On the other hand, it has been observed that parallel results have been obtained in studies conducted in different countries. In this study, economic growth data was used to evaluate the importance of the education sector. It is thought that studies comparing different country groups can be carried out in order to evaluate the education sector, and it is also thought to be a guide in terms of conducting different studies by using data that include not only education expenditure but also different levels of education.

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## APPENDIX

**Table 7: Brief Summary of Literature Review for Türkiye**

| Author(s)-Year | Period | Method | Results |
|---|---|---|---|
| Köksel & Tecirli (2023) | 1980-2020 | VAR | Causality from education expenditures to economic growth |
| Yürük (2021) | 1980-2015 | NARDL | Education expenditures positively affect economic growth in both the long-short term. |
| Ülger (2020) | 2000-2018 | Charts And Tables | The effect of education on growth is statistically insignificant. |
| Akıncı (2017) | 2006-2017 | ARDL | The increase in education expenditures increases economic growth. |
| Alper (2017) | 1981-2016 | ARDL | Positive relationship between education expenditures-economic growth. |
| Acar, Günalp & Cılasun (2016) | 2003-2007-2012 | Tobit Regressions | The share of the household budget allocated to education expenditures increases over time. |
| Uçan & Yeşilyurt (2016) | 2006-2015 | VAR | A bidirectional relationship between growth and education expenditures. |
| Mercan & Sezer (2014) | 1970-2012 | ARDL | The impact of education expenditures on economic growth is positive. |
| Eriçok & Yılancı (2013) | 1968-2005 | ARDL | While there is a short-term relationship between education expenditures and economic growth, there is no long-term relationship. |
| Arabacı (2011) | 1997-2010 | Charts and Tables | The share of Türkiye's education expenditures in GDP is at the lowest level compared to OECD countries. |
| Yıldırım, Deniz Karakoyun & Hepsağ (2011) | 1973-2009 | Toda-Yamamoto Causality Test | There is a causality from economic growth to education expenditures. |

**Table 8: Brief Summary of Literature Review for other Countries**

| Author(s)-Year | Period-Country | Method | Results |
|---|---|---|---|
| Çetin (2023) | 1970-2020 USA | ARDL | The increase in education expenditures increases economic growth. |
| Coman, Lupu & Nuţă (2022) | 1990-2020 Central and Eastern Europe | ARDL | Education expenditures affect economic growth positively in some countries, but it effects negatively in some countries. |
| Zeynalli & Hasanoğlu (2022) | 2000-2021 Azerbaijan | OLS Method | Education expenditures positively affect economic growth. |
| Suwandaru, Alghamdi & Nurwanto (2021) | 1988-2018 Indonesia | ARDL | A positive relationship in long-term and a negative relationship in short-term between education expenditures and economic growth. |
| Tabar, Najafi & Badooei (2017) | 1981-2012 Iran | ARDL | Long term relationship between education expenditures-economic growth. |
| Trabelsi (2017) | 1980-2010 50 Selected Countries | Panel Threshold Regression Method | Increasing education expenditures positively affects economic growth. |
| Hussin, Muhammad, Hussin & Razak(2012) | 1970-2010 Malaysia | Granger Causality Test | Economic growth is a Granger cause for education expenditures ın he short term. |
| Karagianni, Pempetzoglou & Saraidaris (2019) | 1955-2009 UK | Granger Causality | Education expenditures support economic growth. |
| Musila, J.W. & Belassi, W. (2004) | 1965-1999 Uganda | Johansen Cointegratio n-Granger Causality Test | Increasing education expenditures increases economic growth in both the short-long term. |
| Barro(2001) | 1965-1995 100 Countries | Panel Regression | Increasing the level and quality of education positively affects growth. |

| | | | |
|---|---|---|---|
| Hsieh & Lai (1994) | G-7 Countries | Multivariate Time Series Analysis | Not a relationship between growth and education expenditures. |