The Effects of Public Expenditures on Economic Growth: An Empirical Analysis for Turkey[1]

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Abstract

This study focuses on the importance of public spending for countries and whether education, health, defense, current and public investment spending, which are parts of public spending, have effects on Turkish economy. Empirical part of the study includes an application conducted by using annual data for 1970-2012 periods. After analyzing time-series characteristics of the variables using Zivot-Andrews unit-root tests, Pesaran Bound test analysis was applied to test the variables.

Keywords: Public Expenditures, Economic Growth, Pesaran test

1. Introduction

Turkey, as a country who has been observing open liberal economic policies since 1980, sought out to achieve private-sector led growth during 1983-1991 periods. In this respect, privatization policies were applied alongside changes in rules and regulations that were impeding establishment of private enterprises. However, transfer spending and current spending of the public sector were particularly increasing during elections. Due to occasional bottlenecks, public sector debt was increased and as a precautionary measure, efforts for saving were employed in the public sector.

Proportionally, interest payments constitute a major part of the increases occurred in public spending in 2000s. Significant increases have been observed in education and health spending, due to an increasing population, defense spending, as a reaction to the unique geopolitical location and chaotic conditions occurring in neighboring countries, and personnel spending. In a similar fashion, significant increases in education spending have also been experienced during recent years.

Two major economic crises were experienced post-1980 period, in which liberal policies were dominant. These crises were occurred in 1994 and 2001 and growth rates during these crises were recorded as -6.9%and -9.3%, respectively. Various programs were implemented in order to overcome these crises. After the package implemented in 2001, Turkey has been growing averagely at a rate of 4.8%since 2002.

There are several of empirical studies in the literature on the effects of different types of public spending on economic growth.

Romer (1989), Barro (1991), Çoban (2004) and Lin (2004) have found a positive relationship between education and economic growth. Benos (2005) argues that the effect of education spending on growth is much stronger in poor countries. Ağırand Kar (2003) and Çalışkan et.al. (2013) have also reached similar results for Turkey.

[1]Results of the unpublished Ph.D. Thesis with the same topic submitted by Dr. SerkanKünü are summarized in this study.

Dregerand Remers (2005), who investigated the relationship between health spending and economic growth, argues that there is cointegration between health spending and economic growth. Erdil and Yetkiner (2004) have obtained different causality relationships for low- and middle-income countries and for high-income countries; with the direction of causality is from economic growth to health spending in the former group and vice versa for the latter. Ay et.al. (2013) have found that there is a positive relation between health spending and economic growth in Turkey. Conversely, Taban (2006) has not obtained a causality relation between the number of health institutions and GDP.

There are contradictory results in the literature investigating the relationship between defense spending and economic growth. According to Smith and Dunn (2001), defense spending has no significant effect on investments. Dunne et.al.. (2002) have reached that defense spending have negative effects on investments and growth in developing countries. Dunne and Üye (2009), on the other hand, have argued that defense spending has a negative effect on growth; however, the outcome of this effect is not a big amount. Özmucur (1996) has obtained a negative relationship between defense spending and economic growth in Turkey while Sezgin (1997) found a positive relationship. Kalyoncu and Yücel (2006) have concluded that there is causality between both variables in Turkey, with the direction of causal relationship is from growth to defense spending. Görkemand Işık (2008) have found no causality relations between defense spending and growth. Yılancı and Özcan (2010) have reached that there is no long-term relationship between GNP and defense spending.

A similar discussion can also be seen in the literature regarding the effects of public investment spending and current spending on economic growth. Mankiw, Romerand Weil (1992) have found out that public investment spending has a positive effect on growth. Similar results were also achieved by Kelly (1997) and, for Turkish economy, by Berber (2003). On the contrary, Başaret.al. (2009) have found out that there is no long-term relationship between investment and transfer spending and GNP. Aytaçand Güran (2010)have argued that while there is a one-way causal relationship directing from economic growth to total public spending, there are no causality relationships between growth and investment and transfer spending.On the other hand, Güland Yavuz (2011) have argued that there is a one-way causal relationship from total public spending, current spending, investment and transfer spending to economic growth. Altunç (2011) have presented that there is a positive relationship between public spending an economic growth while there is a negative relationship between public consumption spending and economic growth.

2. Empirical Results

In order to investigate for the effects of different types of public spending on the growth performance of Turkey, existence of a long- or short-term relationship between some types of public spending and real production is tested in this part of the study.

2.1. Data

Annual time series from 1970–2012 periods are used in the study. All data are provided from Central Bank of the Republic of Turkey. The data used in this study are organized as follows:

LGDP	: Real GDP
LHEA	: Health Spending
LEDUC	: Education Spending
LDEF	: Defense Spending
LINV	: Public Investment Spending
LCURR	: Current Spending
LFCI	: Fixed Capital Investments
D1	: Dummy Variable representing Political Uncertainty in 1980
D2	: Dummy Variable representing 1994 Crisis
D3	: Dummy Variable representing 2001 Crisis
D4	: Dummy Variable representing 2009 Global Crisis

All data are in logarithmic form.

2.2. Methodology

Before investigating whether there is a long- and/or short-term relationship between each sub-item of public spending and real GDP, stationarity of variables is checked. In this respect, stationarity analysis of time series used in the study is carried out using Zivotand Andrews (1992)unit-root test (ZA). Long-term relationships between each type of public spending and real GDP are tested using "bounds test" approach developed by Pesaranet.al. (2001) and using Auto Regressive Distributed Lag (ARDL) model. In checking short-term relationship, error correction model based on ARDL is employed.

2.3. Unit-Root Test Results

Zivot-Andrews (ZA) unit-root test is employed in order to determine the levels in which each variable used in the study are stationary. Results of ZA unit-root tests are shown in Table 1.

Table1: Zivot-Andrews Unit-Root Test Results

VARIABLES	CONSTANT	TREND	CONSTANT+TREND
LGDP	-4.7109	-4.0961	-4.7917
	(1990)	(1984)	(2001)
ΔLGDP	-6.6439***	-6.5399***	-6.7898***
	(1978)	(1980)	(1981)
LCURR	-3.7521	-3.3438	-4.4818
	(1990)	(1983)	(1989)
ΔLCURR	-6.8538***	-6.4778***	-7.1163***
	(1986)	(2006)	(2004)
LINV	-3.4817	-3.2071	-3.8868
	(2003)	(1997)	(1995)
ΔLINV	-6.3035***	-5.7697***	-6.0807***
	(1997)	(1981)	(1997)
LHEA	-4.9889	-3.4480	-4.8890
	(1981)	(1985)	(1981)
ΔLHEA	-5.7272***	-5.4315***	-6.1565***
	(1986)	(1981)	(1983)
LEDUC	-731	-3.9591	-4.5281
	(1980)	(1986)	(1989)
ΔLEDUC	-7.63714***	-6.9072***	-7.4069***
	(1987)	(1980)	(1986)
LDEF	-3.5224	-2.74658	-4.0313
	(1996)	(2003)	(1997)
ΔLDEF	-471	-3.3050	-435
	(1989)	(1998)	(1989)
ΔΔLDEF	-11.6183***	-11.1081***	-11.6023***
	(1998)	(1990)	(2000)
LFCI	-4.6886	-3.5308	-4.8802
	(2001)	(1994)	(2002)
ΔLFCI	-5.7665***	-5.4472***	-5.7337***
	(2004)	(1979)	(2004)

(***)represents 1% significance level and numbers in parentheses represent breakdown years or the period which makes test statistics minimum for each variable.

According to the results of ZA unit-root test, defense spending are stationary at the second difference, and due to that it is not possible to determine through bounds test whether there are short- or long-term relations between defense spending and real GDP. Because of this the existence of short- or long-term relationships between health, education, public investment and current spending and real GDP is tested.

2.4. Pesaran-Shin-Smith (2001) Test Results

According to bounds test approach, first an unrestricted error correction model (UECM) should be established to test whether cointegration exists. Before establishing UECM equations, real GDP variable is separated from the trend component by using Hodrick-Prescott Filtering Technique. Breakdown years for real GDP are also determined through fluctuations obtained by Hodrick-Prescott Filtering. Thus, graphical representation of real GDP variable is shown in Figure 1.

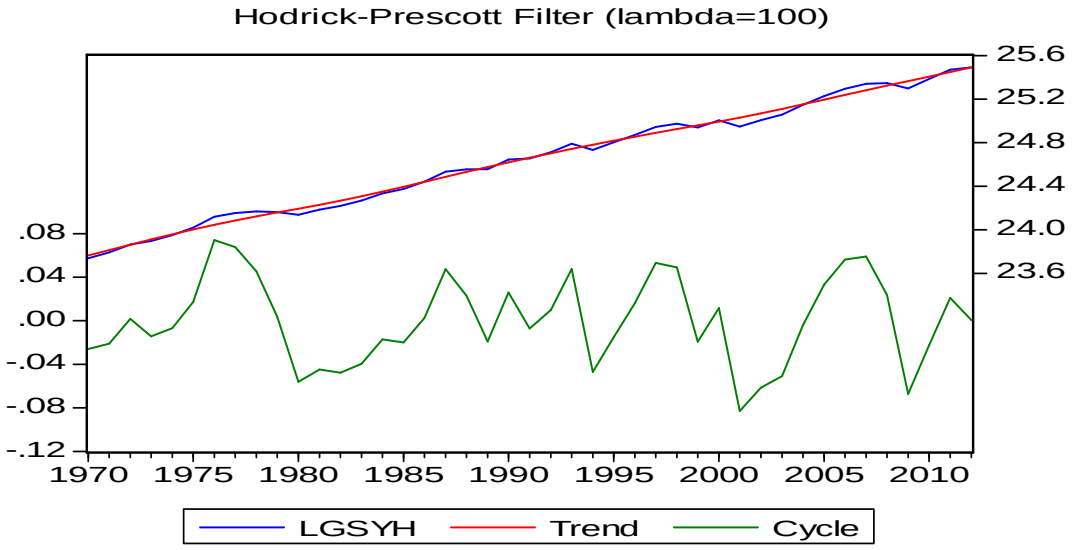

Figure 1: Fluctuations in Real GDP of Turkey, 1970-2012

As it can be seen from Figure 1, structural breakdowns are existent in 1980, when political uncertainty was dominant, and in 1994, 2001 and 2009, when there were economic crises. Thus established UECM models are adjusted to include dummy variables representing the breakdowns of related years. Moreover, a deterministic trend variable is also added to UECM equations considering that real GDP demonstrating a trend inclination.

UECM equations through which the existence of cointegration between different types of public spending and real GDP[2] are as follows:

$$\Delta LGDP_t = \alpha_0 + \alpha_1 D1 + \alpha_2 D2 + \alpha_3 D3 + \alpha_4 D4 + \alpha_5 trend + \beta_1 LGDP_{t-1} + \beta_2 LEXP_{t-1} + \beta_3 LFCI_{t-1} + \sum_{j=1}^{m} \beta_{4,j} \Delta LGDP_{t-j} + \sum_{j=0}^{m} \beta_{5,j} \Delta LEXP_{t-j} + \sum_{j=0}^{m} \beta_{6,j} \Delta LFCI_{t-j} + e_t \quad (1)$$

$$\Delta LEXP_t = \alpha_0 + \alpha_1 D1 + \alpha_2 D2 + \alpha_3 D3 + \alpha_4 D4 + \alpha_5 trend + \beta_1 LEXP_{t-1} + \beta_2 LGDP_{t-1} + \beta_3 LFCI_{t-1} + \sum_{j=1}^{n} \beta_{4,j} \Delta LEXP_{t-j} + \sum_{j=0}^{n} \beta_{5,j} \Delta LGDP_{t-j} + \sum_{j=0}^{n} \beta_{6,j} \Delta LFCI_{t-j} + e_t \quad (2)$$

[2] m and n represent lag distances in UECM equations. Akaike Information Criterion (AIC) is used to determine optimal lag distances in all UECM equations and maximum lag distance is taken as "4".

Optimal lag lengths calculated for investigating the relationship between health spending and real GDP are shown in Table 2.

Table 2: Determination of Optimal Lag Lengths for Bounds Test

M	AIC	$\chi^2_{(1)}$	n	AIC	$\chi^2_{(1)}$
1	**-5.3028**	2.3948	**1**	-0.8681	1.1428
2	-5.3844	4.0609**	2	-0.8921	1.7447
3	**-5.5347**	9.4168***	3	**-1.0262**	2.2323
4	-5.6311	11.8243***	4	-1.0201	3.1295*

$\chi^2_{(1)}$ representsBreusch Godfrey Test statistic that checks for first degree autocorrelation and insignificance of this statistic means that there is no autocorrelation in the error-term series.

Since integration levels of health spending and real GDP is I(1), Pesaran et.al. (2001) table critical value that should be compared with *F*-statistics is only the upper critical value. According to this, test statistics table critical values for equations (1) and (2) are shown in Table 3.

Table 3: Bounds Test Results

MODEL	k	F	t	*F*-Statistics Table Critical Value		
				%1	%5	%10
(1)	3	7.2913***	-4.0949***	6.31	5.07	4.45
(2)	3	1.9763	-2.0973**			

*k*represents number of independent variables in the equation. *F* represents restricted *F*-statistics calculated for equations (1) and (2) while *t* represents *t*-statictics for the parameter (for β_1) of $LGDP_{t-1}$ and$Health_{t-1}$parameters.(**) and (***) represent 5% and 1% significance levels, respectively.

According to Pesaran et.al. (2001) test results, there is a cointegration relation between health spending and real GDP, with the direction of this relationship is from the former to the latter. According to equation (2) which checks for relationship from Real GDP to health spending, there is no cointegration between Real GDP and health spending. As a result, the long-term relationship between health spending and real GDP is a one-way relationship, working from health spending to real GDP

Optimal laglengths calculated for investigating the relationship between education spending and real GDP are shown below (Table 4).

Table 4: Determination of Optimal Lag lengths for Bounds Test

m	AIC	$\chi^2_{(1)}$	n	AIC	$\chi^2_{(1)}$
1	-5.0951	1.1379	1	-0.5673	4.8641**
2	-5.1719	2.2323	2	**-0.5534**	2.1373
3	**-5.2455**	0.4694	3	-0.4708	6.1942**
4	-5.1197	2.7011	4	-0.5371	4.6082**

$\chi^2_{(1)}$ represents Breusch Godfrey Test statistic that checks for first degree autocorrelation and(**) represents 5% significance level. Significance of this statistic means that there is autocorrelation in the error-term series.

Since integration level of education spending and real GDP is I(1), Pesaran et.al. (2001) table critical value that should be compared with *F*-statistics is only the upper critical value. According to this, test statistics table critical values for equations (1) and (2) are shown in Table 5.

Tablo 5: Bounds Test Results

MODEL	k	F	t	*F*-Statistics Table Critical Value		
				%1	%5	%10
(1)	3	5.6083**	-3.5776***	6.31	5.07	4.45
(2)	3	2.3617	-1.3640			

k represents number of independent variables in the equation. F represents restricted *F*-statistics calculated for equations (1) and (2) while t represents *t*-statictics for the parameter (for β_1) of $LGDP_{t-1}$and$Education_{t-1}$ parameters. (**)and(***) represent 5% and 1% significance levels, respectively.

According to Pesaran et.al. (2001) test results, the long-term relationship between education spending and real GDP is a one-way relationship, and this relationship is assumed to be in the direction of health spending to real GDP.

Optimal lag lengths calculated for investigating the relationship between public investment spending and real GDP are given below in Table 6.

Table 6.Determination of Optimal Lag lengths for Bounds Test

m	AIC	$\chi^2_{(1)}$	n	AIC	$\chi^2_{(1)}$
1	**-5.1752**	0.5989	1	-0.9142	1.9002
2	-5.0945	2.8383*	2	-0.9602	0.5746
3	-5.2088	1570**	3	**-1.0713**	0.1766
4	-5.2018	12.1577***	4	-1.0225	1.3393

$\chi^2_{(1)}$ representsBreusch Godfrey Test statistic that checks for first degree autocorrelation and (*), (**) and (***) represent 1%, 5% and 10% significance levels, respectively. Significance of this statistic means that there is autocorrelation in the error-term series.

Integration level of public investment spending and real GDP is I(1), as well. Thus, test statistics table critical values for equations (1) and (2) are shown in Table 7.

Table 7: Bounds Test results

MODEL	k	F	t	*F*-Statistics Table Critical Value		
				%1	%5	%10
(1)	3	4.5444*	-3.2005***	6.31	5.07	4.45
(2)	3	3.8482	-2.6337**			

k represents number of independent variables in the equation. F represents restricted F-statistics calculated for equations (1) and (2) while t represents *t*-statictics for the parameter (for β_1) of $LGDP_{t-1}$ and $Investment_{t-1}$ parameters. (*), (**) and (***) represent 10%, 5% and 1% significance levels, respectively.

According to these results, the long-term relationship between public investment spending and real GDP is a one-way relationship, and this relationship is accepted to be in the direction of public investment spending to real GDP.

Optimal lag lengths calculated for investigating the relationship between current spending and real GDP are given below (Table 8).

Table 8: Determination of Optimal Lag lengths for Bounds Test

M	AIC	$\chi^2_{(1)}$	n	AIC	$\chi^2_{(1)}$
1	-5.0961	2.8836*	1	-1.3303	2.8935*
2	-5.3486	7.4848***	2	-1.5114	0.0664
3	**-5.3620**	1.1030	3	**-1.5268**	1.1282
4	-5.2983	1370**	4	-1.3858	1.1534

$\chi^2_{(1)}$ represents Breusch Godfrey Test statistic that checks for first degree autocorrelation and (*), (**) and (***) represent 1%, 5% and 10% significance levels, respectively. Significance of this statistic means that there is autocorrelation in the error-term series.

Since integration level of variables is I(1), Pesaran et.al. (2001) table critical value that should be compared with *F*-statistics is again only the upper critical value. Critical values are as follows Table 9.

Table 9: Bounds Test Results

MODEL	k	F	t	*F*-Statistics Table Critical Value		
				%1	%5	%10
(1)	3	6.1842**	-3.1169***	6.31	5.07	4.45
(2)	3	3.6272	-2.8621**			

k represents number of independent variables in the equation. F represents restricted *F*-statistics calculated for equations (1) and (2) while t represents *t*-statictics for the parameter (for β_1) of $LGDP_{t-1}$ and$Current_{t-1}$ parameters. (**) and (***) represent 5% and 1% significance levels, respectively.

According to the results of estimation, there is a one-way long-term relationship between current spending and real GDP.

Empirical Results of Auto Regressive Distributed Lag (ARDL) Model

An Auto Regressive Distributed Lag (ARDL) is constructed to determine short- and long-term relations between variables which are accepted to have cointegration relationship.

ARDL model through which long-term relationship from types of public spending to real GDP is formulated as follows (Equation 3):

$$LGDP_t = \alpha_0 + \alpha_1 D1 + \alpha_2 D2 + \alpha_3 D3 + \alpha_4 D4 + \alpha_5 trend + \sum_{j=1}^{p} \beta_{1,j} LGDP_{t-j} + \sum_{j=0}^{q} \beta_{2,j} LEXP_{t-j} + \sum_{j=0}^{r} \beta_{3,j} LFCI_{t-j} + \varepsilon_t \qquad (3)$$

ARDL (1,2,2) estimation results for health spending can be seen in Table 10.

Table 10: Estimation Results for ARDL (1,2,2) Model

Variables	Coefficient	*t* - statistics
Constant	16.0656	6.1389***
Trend	0.0261	6.0894***
D1	-0.0477	-2.9329***
D2	-0.0503	-2.8984***
D3	-0.0452	-2.5256**
D4	-0.0383	-2.1368**
$LGDP_{t-1}$	0.1527	1.0781
$LHEA_t$	0.0421	2.1453**
$LHEA_{t-1}$	0.0105	0.4075
$LHEA_{t-2}$	-0.0274	-1.5117
$LFCI_t$	0.2235	7.4443***
$LFCI_{t-1}$	-0.0204	-0.3712
$LFCI_{t-2}$	-0.0399	-1.4488
Long-term Coefficients		
Constant	18.9625	1045.0410***
ϕ_{HEA}	0.0298	5.9250**

ϕ_{HEALTH} represents calculated long-term coefficient while (***)and(**) represent1%and5% significance levels, respectively.

According to estimation results, long-term coefficient calculated for health spending is determined to be positive and significant, therefore, it is accepted that there is positive relationship from health spending to real GDP in the long-term.

Estimation results for ARDL (1, 1, 4) model which checks for a long-term relationship from education spending to real GDP are shown in Table 11.

Table 11: Estimation Results for ARDL (1, 1, 4) Model

Variables	**Coefficient**	***t* - statistics**
Constant	20.2556	6.4482***
Trend	0.0329	6.3748***
D1	-0.0351	-2.0214**
D2	-0.0498	-2.8304***
D3	-0.0214	-1.1312
D4	-0.0265	-1.5507
$LGDP_{t-1}$	-0.0567	-0.3469
$LEDU_t$	0.0252	1.4106
$LEDU_{t-1}$	0.0282	1.6061
$LFCI_t$	0.2635	8.5737***
$LFCI_{t-1}$	-0.0154	-0.2747
$LFCI_{t-2}$	-0.0021	-0.0547
$LFCI_{t-3}$	-0.0009	-0.0263
$LFCI_{t-4}$	-0.0727	-2.4463**
Long-term Coefficients		
Constant	19.1680	1288.4930***
ϕ_{EDU}	0.0505	21.7502***

$\phi_{EDUCATION}$represents calculated long-term coefficient while (***) and (**) represent1%and5% significance levels, respectively.

According to estimation results, there is positive and statistically significant relationship from education spending to real GDP in the long-term.

Estimation results for ARDL (1,1,1) model which controls for a long-term relationship from public investment spending to real GDP are shown in Table 12.

Table 12: Estimation Results for ARDL (1, 1, 1) Model

Variables	**Coefficient**	***t* - statistics**
Constant	13.3758	5.5089***
Trend	0.0226	5.4647***
D1	-0.0507	-3.1069***
D2	-0.0607	-3.6097***
D3	-0.0373	-2.0172**
D4	-0.0417	-2.1907**
$LGDP_{t-1}$	0.2514	1.7255*
$LINV_t$	0.0398	2.2229**
$LINV_{t-1}$	-0.0174	-1.0597
$LFCI_t$	0.2347	7.7714***
$LFCI_{t-1}$	-0.0557	-1.2509
Long-term Coefficients		
Constant	17.8683	693.2750***
ϕ_{INV}	0.0298	5.1361**

$\phi_{INVESTMENT}$represents calculated long-term coefficient while (***) and (**) represent1%and5% significance levels, respectively.

According to estimation results, there is positive and statistically significant relationship from public investment spending to real GDP in the long-term.

Estimation results for ARDL (1,1,4) model which controls for a long-term relationship from current spending to real GDP and long-term coefficients are shown in Table 12.

Table 13: Estimation Results for ARDL (1, 1, 4) Model

Variables	**Coefficient**	***t* - statistics**
Constant	17.0268	5.8785***
Trend	0.0277	5.7427***
D1	-0.0300	-1.7536*
D2	-0.0643	-4.1126***
D3	-0.0290	-1.5518
D4	-0.0111	-0.6436
$LGDP_{t-1}$	0.1351	0.8998
$LCURR_t$	0.0584	2.3138**
$LCURR_{t-1}$	0.0219	0.7649
$LFCI_t$	0.2586	8.5328***
$LFCI_{t-1}$	-0.0690	-1.2816
$LFCI_{t-2}$	0.0048	0.1272
$LFCI_{t-3}$	-0.0339	-0.9326
$LFCI_{t-4}$	-0.0767	-2.2978**
Long-term Coefficients		
Constant	19.6872	914.5800***
ϕ_{CURR}	0.0929	15.3830***

$\phi_{CURRENT}$represents calculated long-term coefficient while (***) and (**) represent1%and5% significance levels, respectively.

Estimation results suggest that there is positive and statistically significant relationship from public investment spending to real GDP in the long-term.

Empirical Results of Error Correction Model based on ARDL Method

Short-term relations between types of public spending and Real GDP are tested using an error correction model based on ARDL method. Error correction model which controls for short-term relations from health, education, public investment and current spending to real GDP is established as follows (Equation 4):

$$\Delta LGDP_t = \alpha_0 + \alpha_1 D1 + \alpha_2 D2 + \alpha_3 D3 + \alpha_4 D4 + \alpha_5 trend + \alpha_6 \varepsilon_{t-1}^{\exp} + \sum_{j=1}^{p} \beta_{1,j} \Delta LGDP_{t-j} + \sum_{j=0}^{q} \beta_{2,j} \Delta LHEA_{t-j} + \sum_{j=0}^{r} \beta_{3,j} \Delta LFCI_{t-j} + e_t \quad (4)$$

Estimation results and coefficients for error correction models are given in Table 14.

Tablo 14: Results of Error Correction Model

	ARDL	ε_{t-1}	**ERROR CORRECTIONCOEFFICIENT**	**WALD TEST**	$\chi^2_{(1)}$
	ARDL(2,2,4)	$\varepsilon_{t-1}^{saglik}$	-0.7617**	2.7780*	0.6817
	ARDL(2,1,4)	$\varepsilon_{t-1}^{egitim}$	-0.6515**	3.5477**	0.0190
	ARDL(2,4,4)	ε_{t-1}^{kamu}	-0.8456***	3.7307**	1.2878
	ARDL(2,4,4)	ε_{t-1}^{cari}	-0.7835***	2.5518*	0.0063

Statistically significant relations are detected from health, education, public investment and current spending to real GDP in the short-term, according to results of the Wald Test. In other words, sub-items of public spending are causes of growth in real GDP.

Conclusion

The relationship between public spending and growth in Turkey was investigated in this study. Study is original in the sense that it focuses on the effects of various sub-items of public spending (e.g. health spending, education spending, public investment spending, defense spending, current spending etc.) on economic growth.

There is a one-way relationship from health, education, public investment and current spending to real GDP in Turkey in both short- and long-term. Therefore, ublic spending under these categories positively affects real GDP in Turkey in both short- and long-term. These results also suggest prevalence of Keynesian approach for Turkey.

Since health, education, public investment and current spending significantly and positively affect increases in real GDP, these types of spending should be increased by governments to achieve a continuous growth.

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