The Analysis of Visible Hand of Government: The Threshold Effect of Government Spending on Economic Growth

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***Abstract*—In this study, the role of government expenditures threshold value in the relationship between government spending and economic growth has been investigated for Turkish economy in period 1998:Q2 - 2015:Q2. At the first stage, government expenditures threshold value has been detected and after that government spending-economic growth relation has been examined using threshold autoregressive (TAR) model. The finding of this study is that, under the first regime which is below the threshold level, low government spending has significantly negative impact on economic growth. On the other hand, under the second regime which is above the threshold level, government spending has significantly positive effect on economic growth. This finding shows that rising government spending is an important factor to faster the economic growth process. Due to this effect, Turkey should follow a determined strategy to raise spending level above threshold value. Besides, the result of the study emphasizes that politicians and decision makers must take into account for this effect.**

***Index Terms*—Economic growth, government expenditure, nonlinearity, threshold autoregressive model.**

I. Introduction

The questions such as "Do government expenditures increase economic growth?" or "What should be the optimal size of government?" are among those in which economists are mainly interested. Such basic questions can be traced back to the Wealth of Nations written by Adam Smith in 1776. During the period from Adam Smith, who is recognized as the father of both economics and liberal economics, to the Great Depression of 1929, the dominant thought was the limitation of the role of public sector in economy and the state's role was restricted to provide only education, health and justice services and to make infrastructure investments. Such restrictions also affected the theory formation and modeling processes of that time. However, with the Great Depression of 1929, the restrictions, assumptions and validity of the classical school of thought started to be questioned and economists began to seek new theories and models that would help pull the economy out of depression. The traditional Keynesian model that emerged as a prominent theory suggested the implementation of active fiscal policies to resist against the existing recession, especially emphasizing the view that the role of government in the economy must be improved by means of fiscal policies. During the period following the Keynesian Revolution, that view was sometimes heavily criticized by various schools of economic thought, but also attracted a large number of supporters as it does today. Therefore, it is possible to say that there are still heated debates ongoing over the impact of the public sector on the welfare of society.

One of the systematic analyses of the role of government size on economy is the one performed by Wagner, which established itself in the literature as *Wagner's Law*. Seeking answers to the questions such as "What should be the government size?" and "What effects does the government size have on economic growth?", Wagner's Law adopts a traditional interpretation and considers public goods and services as luxury goods. Therefore, Wagner's Law argues that there is a positive relation between the government size and economic growth [1]. In the economics literature, with the emergence of Wagner's Law, the relations between the government size and economic growth were classified into three types according to the direction: positive, negative and non-linear (quadratic) relations. Negative relations are based on the view that government expenditures are subject to the law of diminishing returns in the first place and grow out of the idea that additional government spending will gradually reduce economic growth. Another view is that increasing government expenditures put upward pressures on interest rates, leading to a crowding-out effect on private investment. Together with such a process that makes the economy fragile, increasing government expenditures brings about poor investments that disrupt the efficient allocation of resources. Moreover, to meet the budget deficits arising out of increases in the government expenditures, increase of taxation becomes an option, placing an additional burden on the economy [2]. Budget deficits that cannot be financed due to populist concerns can only be restrained by borrowing, leading to the problem of current account deficit. Such a process that leads to the emergence of twin deficits may increase the financial fragility. The potential inflationist pressures arising out of government expenditures also constitute the other side of the coin.

Positive relations which indicate that government expenditures or government size have positive effects on economic growth are based on the view that government expenditures serve as a form of insurance so that private

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property rights can perform their functions on the economy. Government expenditures that are able to increase efficiency in the areas of infrastructure, education and health assume a role of encouraging private investments that dynamize the economic growth, thus allowing the expansion of the scope of investment. Especially the government expenditures on defense, police services and justice may serve as a constitutional contract that allows society to escape the low productivity state of nature. By including property rights, it becomes possible for the society to attain a higher productivity trading relationship and to enjoy the benefits of voluntary exchange [3]. The view that government, which is assigned a critical role in reconciliation of conflicts between private and social interests, provides socially optimal direction to economic growth and development becomes a focus for consideration. Moreover, there are points of view arguing that, in countries that are based on a monopoly market and do not have capital-insurance-information markets, government investments will further increase the efficiency of factor and commodity markets and reveal the effects of externality for the private sector [4].

The third approach that combines negative and positive relations and explains the nature of relations between government expenditures and economic growth represents the nonlinear (quadratic) relationships. Since the quadratic relationships, in which the optimal government size and expenditures are questioned and associated with the level of economic growth, were first examined by [5], they are called *Armey Curve* in the economics literature. Arguing that non-existence of a government in a society causes a state of anarchy, Armey (1995) emphasizes that such a social order brings low level of output per capita due to the dysfunction of justice mechanisms such as the rule of law and protection of property rights. Furthermore, indicating that incentives to save and invest will remain at minimum level due to the threat of expropriation, he also discussed that anarchic state becomes the main decision maker in the production processes, leading to a low level output per capita. However, he also emphasizes that in cases of a combination of public and private sector decisions on the optimal allocation of resources, the levels of output per capita will be higher. Armey (1995) also indicates that, in a social order in which private sector has gained a place, output per capita will increase in parallel with increased government expenditures, and argues that the spending will be according to the law of diminishing returns, mainly as a result of a profit loss in the investment projects financed by the government [6]. When considered in the context of negative effects, the processes emerging as a result of the law of diminishing returns prevent the dynamism of economic growth. In other words, the taxes, borrowing and interest levied to finance increased government spending impose a heavy burden on the economic system and cripple the economic growth process. Therefore, according to the Armey Curve analysis, economic growth increases with increased government spending up to a certain threshold value. Beyond this threshold value, the government spending has a negative impact on economic growth.

In the past, there was no agreement on the relationship between government expenditures and economic growth due to existence of both positive and negative effects. However, given the studies in recent years, we can say that the relationship became a focus of attention and now researchers can arrive at a consensus about it to a certain extent. The studies on government expenditures with threshold value show that, in the short term and up to a certain threshold value, government spending has a positive impact on economic growth. However, in the long term, the spending impedes the economic growth when the threshold value is exceeded. In an effort to confirm the existing consensus, this study examines the effects of government expenditures threshold value on economic growth in Turkey for the period of 1998:Q2 - 2015:Q2 by using threshold regression analyses. In line with this aim, the study has been organized in seven sections. Following the second section which covers the literature review regarding the relationship between government expenditures and economic growth, the third section presents the theoretical framework of the study. The fourth section describes the methodology of econometrics, while the fifth section provides the data set. Following the sixth section that presents the findings, the final section concludes with an overview of the study.

II. Literature Review

The disturbances such as oil shocks, financial and economic crises and most importantly, the Gulf War experienced by the world economy especially from the 1970s caused instability in the markets, attracting widespread attention of supporters to the view that the supervisory and regulatory authority of government on the economy must be increased by means of activist fiscal policies. Each factor that disrupted the functioning of *invisible hand* of markets led to an increase in the government's authority on the economy, spurring heated debates on whether the *visible hand* of government is necessary, or not.

The effect of government size on economic growth has become one of the frequently addressed issues in the debates and the relation between government expenditures and economic growth has been examined in the positive, negative and nonlinear direction. The studies by [7]-[18] found statistically significant negative relations between government size and economic growth.

On the other hand, the studies by [19]-[36] indicate that there is a positive relation between government size and economic growth.

Given the studies examining the threshold effect of government expenditures on economic growth, we can say that a consensus has been achieved. The findings in the literature show that government expenditures accelerate economic growth up to a certain threshold value. However, when the threshold value is exceeded, the increase in the government size interrupts the growth. The findings also reveal that the indicated threshold values for government spending vary depending on the levels of economic development. In general, the studies where the government size threshold value is found to be relatively high in underdeveloped countries show that the threshold values decrease with an increase in the level of development. The studies conducted by [2], [6], [37]-[53] show that government

spending accelerates the economic growth up to a certain threshold value and beyond this threshold value, it has the exact opposite effect on economic growth.

III. Theoretical Model

The theoretical model of this study is based on the analysis carried out by [54]. This analysis assumes that the economy consists of two sectors: Government sector (G) and non-government sector (C). Output in each sector depends on labor and capital inputs. The output in the government sector is assumed to have an externality effect on output in the non-government sector:

$$C = C\left(L_C, K_C, G\right) \tag{1}$$

$$G = G\left(L_G, K_G\right) \tag{2}$$

$$Y = C + G \tag{3a}$$

$$L_C + L_G = L \tag{3b}$$

$$K_C + K_G = K \tag{3c}$$

$$\frac{G_L}{C_L} = \frac{G_K}{C_K} = 1 + \delta \tag{4}$$

Equations (1) and (2) are the production function of non-government and government sectors, respectively. The subscripts indicate sectoral inputs. Equation (3a) indicates that the total output is the sum of *C* and *G*. Equations (3b) and (3c) show the total inputs of labor and capital where the total labor (or capital) stock is the sum of labor (capital) input in the non-government and government sectors. Equation (4) is the relative factor productivity in the two sectors. δ indicates the difference of marginal productivity between the factor inputs in the two sectors. In other words, we can say that $\delta > 0$ implies that the marginal productivity of the government sector is higher than that of the nongovernment sector, and $\delta <$ 0 indicates the opposite.

Totally differentiating Equations (1) and (2),

$$dC = \frac{\partial C}{\partial L_C} dL_C + \frac{\partial C}{\partial K_C} dK_C + \frac{\partial C}{\partial G} dG \tag{1*}$$

$$dC = C_L dL_C + C_K dK_C + C_G dG$$

$$dG = \frac{\partial G}{\partial L_G} dL_G + \frac{\partial G}{\partial K_G} dK_G \tag{2*}$$

$$dG = G_L dL_G + G_K dK_G$$

Transforming equations (3a), (3b) and (3c) into total differentials,

$$dY = dC + dG \tag{3a*}$$

$$dL_C + dL_G = dL \tag{3b*}$$

$$dK_C + dK_G = dK \tag{3c*}$$

Substituting Equations (4), (1*), and (2*) into (3a*),

$$\begin{aligned} dY &= C_L dL_C + C_K dK_C + C_G dG + (1+\delta) C_L dL_G + (1+\delta) C_K dK_G \\ &= C_L \left(dL_C + dL_G\right) + C_K \left(dK_C + dK_G\right) + C_G dG + \delta \left(C_L dL_G + C_K dK_G\right) \end{aligned}$$

Based on equations (3b*), (3c*) and (4),

$$dY = C_L dL + C_K dK + C_G dG + \frac{\delta}{1+\delta} dG \tag{5}$$

Dividing Equation (5) by *Y* and multiplying $\frac{G}{G}$ with the last term,

$$\frac{dY}{Y} = C_L \frac{dL}{Y} + C_K \frac{dK}{Y} + \left(C_G + \frac{\delta}{1+\delta} \right) \frac{dG}{G} \frac{G}{Y} \tag{6}$$

Setting $\alpha \equiv C_K$ and $\beta \equiv C_L \left(\frac{L}{Y} \right)$,

$$\dot{Y} = \alpha \frac{I}{Y} + \beta \dot{L} + \left(C_G + \frac{\delta}{1+\delta} \right) \dot{G} \frac{G}{Y} \tag{7}$$

In Equation (7), α and β indicate the marginal production of the capital and the production elasticity of the labor in the non-government sector, respectively. C_G is the marginal externality effect from the production of the government sector imposed on the production of the non-government sector. From Equation (7), the empirical equation to be estimated is the following:

$$\dot{Y} = \delta_0 + \delta_1 \left(\frac{I_t}{Y_t} \right) + \delta_2 \dot{L}_t + \delta_3 \dot{G}_t \left(\frac{G_t}{Y_t} \right) + e_t \tag{8}$$

In Equation (8), $\dot{Y}$ indicates the real GDP growth rates at time *t*, $\frac{I_t}{Y_t}$ indicates private gross fixed capital formation (GFCF) as a share of GDP at time *t*, $\dot{L}_t$ indicates labor force growth rates at time *t*, $\dot{G}_t$ indicates growth rates of government expenditure at time *t*, $\frac{G_t}{Y_t}$ indicates government expenditure as a share of GDP at time *t* , and e_t is the white noise error term. The sign of δ_3 indicates the multiple effects, that is, the government sector affects economic growth through the following two channels: a) a direct government sector channel (factor productivity effect) and b) an indirect government sector channel affecting the non-government sector (externality effect).

IV. Econometric Methodology

The problems in the domestic and foreign markets, political uncertainties following government changes, changes in the government policies and other factors such as crises create breaks in the time series [55]. The breaks can lead to the existence of a nonlinear structure in the econometric models. Therefore, the need for the development of linear models that represent regime switches (shifts) and estimation methods for

these models has emerged.

One of the most frequently used methods in estimation of nonlinear models is the Threshold Autoregressive Model (TAR) which was proposed by [56] and developed by [57]-[60]. The basic feature of this model is its determination of one or more threshold values, thus allowing the estimation of different linear models for different regimes. In this model, the value that indicates the regime switching is threshold, while the variable causing the regime switching is called threshold variable.

The theoretical model derived from Equation (8) provides a structure for estimating the impact of government expenditures on economic growth. However, it does not give us information about how the changes in the level of spending affect the relationship between government spending and economic growth. This indicates the existence of a nonlinear relation between economic growth and government spending [44]. The TAR model is one of the approaches used in estimating a nonlinear relationship. It allows the data to determine if nonlinearity exists between economic growth and government spending and to estimate the size of any differences in effect.

Equation (9) is the two-regime Threshold Autoregressive (TAR) model that estimates a nonlinear relationship between economic growth and government spending:

$$\dot{Y}_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \dot{Y}_{t-i} + \varepsilon_{1t} \; eğer \left[s_{t-d} \le \theta \right] \tag{9}$$

$$\dot{Y}_t = \beta_0 + \sum_{i=1}^{p} \alpha\beta_i \dot{Y}_{t-i} + \varepsilon_{2t} \; eğer \left[s_{t-d} > \theta \right]$$

where $\dot{Y}_t$ is the dependent variable, s_{t-d} is the threshold variable causing the regime switching, θ is the threshold value, d is the delay parameter, p is the proper delay time and ε_{1t} and ε_{2t} are independent and identically distributed random error terms. $s_{t-d} \le \theta$ follows an autoregressive process with parameters α_0 and α_i, while $s_{t-d} > \theta$ follows a different autoregressive process with β_0 and β_i. The linear model Equation (8) which estimates the effect of government spending on economic growth can be transformed into a two-regime TAR model and expressed as follows:

$$\dot{Y}_t = \left(\delta_{10} + \delta_{11} \left(\frac{I_t}{Y_t} \right) + \delta_{12} \dot{L}_t + \delta_{13} \dot{G}_t \left(\frac{G_t}{Y_t} \right) \right) I \left[\left(\frac{G}{Y} \right)_{t-d} \le \theta \right]$$
$$+ \left(\delta_{20} + \delta_{21} \left(\frac{I_t}{Y_t} \right) + \delta_{22} \dot{L}_t + \delta_{23} \dot{G}_t \left(\frac{G_t}{Y_t} \right) \right) I \left[\left(\frac{G}{Y} \right)_{t-d} > \theta \right] + \varepsilon_t \tag{10}$$

In Equation (10), $\dot{Y}_t$ is the dependent variable, δ_{10} and δ_{20} are constant parameters, $\frac{I_t}{Y_t}$, $\dot{L}_t$ and $\dot{G}_t$ are control variables, $I_t(\theta)$ is the indicator function and ε_t is the independent and identically distributed random error term. The indicator function is $I = 1$ where $I_t(\theta) = \left[\left(\frac{G}{Y} \right)_{t-d} \le \theta \right]$, ? $\left(\frac{G}{Y} \right)_{t-d} \le \theta$, and $I = 0$ otherwise.

In transforming the linear model into a TAR model, Akaike or Schwarz information criterion is used to select the proper delay time (p) of the threshold value for the linear AR model. Then the delay parameter (d) is selected through a nonlinearity testing separately conducted for each delay and the rejection of the null hypothesis of nonlinearity. Then the threshold number and threshold values are determined. Finally, different linear models are constructed for different regimes and the models are estimated [55].

The linearity test is conducted by using the statistic $F(p,d)$ that follows an F distribution. Following is the equation (11) to compute the statistic $F(p,d)$:

$$F(p,d) = \frac{\left(\sum \varepsilon_t^{\,2} - \sum \varepsilon_t^{\,2} \right) / (p+1)}{\sum \varepsilon_t^{\,2} / (n-d-b-p-h)} \tag{11}$$

In the Equation (11), $\varepsilon_t^{\,2}$ indicates the residual sum of squares (RSS) obtained by using recursive least squares from the autoregressive process arranged as AR (p) for the observation n, while $\varepsilon_t^{\,2}$ is the RSS derived from the linear regression model by using least squares. p indicates the proper delay and d indicates the delay parameter. b and h are computed via $b = (n/10) + p$ and $h = p+1-d$ [60]. In testing the existence of threshold value, likelihood ratio (LR) and bootstrap method are used since the threshold value is unknown [58]. Equality of coefficients across different regimes in LR testing is tested under a null hypothesis $H_0 : \alpha_i = \beta_i$? $i =$ … p of no threshold effect for Equation (9).

$$LR_1 = \frac{\sigma_0 - \sigma_1(\theta)}{\sigma^{\,2}} \tag{12}$$

In the Equation (12), σ_0 and σ_1 are RSS values estimated under the null hypothesis (H_0) and the alternative hypothesis (H_a), respectively. $\sigma^{\,2}$ indicates the variance of error terms. In cases of rejection of the null hypothesis, the new hypothesis for threshold value is $H_0 : \theta = \theta_0$ and the likelihood statistics LR_1 in Equation (12) turns into the one in Equation (13):

$$LR_2 = \frac{\sigma_1(\theta) - \sigma_1(\theta)}{\sigma_1(\theta)} \tag{13}$$

In Equation (9), the threshold value (θ) is estimated by using ordinary least squares (OLS) and the optimal threshold value is computed via $\theta = argmin\sigma_1(\theta)$ [33]. After determining the threshold value, the appropriate TAR model is constructed.

V. Data

This study aims to reveal the relationship between government expenditures and economic growth in Turkey

using the data obtained in the period of 1998:Q2 - 2015:Q2. To measure the economic growth, quarterly growth rates of GDP (*Growth*) were used. Government spending as a percentage of GDP constituted the independent variable of the model. Government expenditures were classified into three categories: final consumption expenditure (*FCons*), investment expenditure (*GInvest*) and total government expenditure (*TotExp*). The relationships between economic growth and each of these expenditure types were separately analyzed.

In order to see the effect of other macroeconomic variables related to government spending on economic growth, we used the following control variables according to the theoretical model: private sector investments as a percentage of GDP (*PInvest*), labor force growth (*LabourGrowth*), and government expenditure growth rates (*FconsGrowth*, *GinvestGrowth*, *TotExpGrowth*).

The data regarding the variables used in this study were obtained from the Central Bank of the Republic of Turkey (TCMB) data distribution system. To remove the estimates of seasonality from the data, the quarterly growth rates of GDP were adjusted in a way to reflect the changes compared to the corresponding quarter of the previous year. Table I shows the basic information about the variables.

TABLE I: BASIC INFORMATION ABOUT THE VARIABLES

Variable	Explanation	Unit
Growth	GDP Growth Rate (1998 Constant Prices)	%
FCons	Government Final Consumption Expenditure / GDP (1998 Constant Prices)	%
GInvest	Government Gross Fixed Capital Formation / GDP (1998 Constant Prices)	%
TotExp	(Final Consumption+ Final Consumption) /GDP (1998 Constant Prices)	%
FConsGrowth	Real Government Final Consumption Expenditure (1998 Constant Prices)	%
GInvestGrowth	Real Government Gross Fixed Capital Formation (1998 Constant Prices)	%
TotExp Growth	Real Total Government Expenditure (1998 Constant Prices)	%
PInvest	Private Gross Fixed Capital Formation / GDP (1998 Constant Prices)	%
LabourGrowth	Labour Participation Rate Growth	%

TABLE II: DESCRIPTIVE STATISTICS

Variables	Mean	Max.	Min.	Std. dev.	Skewness	Kurtosis	Jarque Bera pvalue	DF τ stat
Growth	0.017	0.234	-0.203	0.115	0.145	1.831***	0.124	-8.216*
PInvest	0.293	0.459	0.123	0.098	-0.179	1.669***	0.065	-3.458*
LabourGrowth	0.280	5.746	-4.217	2.161	0.568**	3.173***	0.150	-8.174*
FCons	0.165	0.282	0.101	0.043	0.682**	2.943***	0.069	-4.337*
FConsGrowth	0.039	0.433	-0.363	0.226	-0.428	2.121***	0.115	-17.252*
GInvest	0.061	0.122	0.024	0.020	0.737**	3.470***	0.032	-5.125*
GInvestGrowth	0.081	0.866	-0.569	0.354	-0.226	2.346***	0.403	-16.175*
TotExp	0.226	0.399	0.132	0.062	0.776**	3.207***	0.029	-4.576*
TotExp Growth	0.046	0.388	-0.401	0.245	-0.632	2.035***	0.026	-18.071*

* Since the τ value exceeds the critical value (-3.526) at the 1% significance level, the variable is assumed to be stationary.** Since Skewness exceeds the critical value (0.534) at the 5% significance level, the assumption of normality for the variable is rejected *** Since Kurtosis exceeds the critical point (1.33) at the 5% significance level, the assumption of normality for the variable is rejected.

TABLE III: LINEARITY TEST RESULTS

FCons	*d*=1	*d*=2	*d*=3	*d*=4	*d*=5	*d*=6	*d*=7	*d*=8
F-stat	**21.631**	10.959	17.043	14.286	19.810	11.714	13.498	13.275
p-value	**0.034**	0.623	0.153	0.308	0.058	0.547	0.369	0.387
GInvest								
F-stat	22.893	22.417	12.890	25.465	**37.975**	18.314	11.808	13.927
p-value	0.023	0.023	0.424	0.007	**0.000**	0.103	0.512	0.325
TotExp								
F-stat	11.751	**22.656**	16.244	1.237	0.994	0.898	1.055	0.957
p-value	0.000	**0.000**	0.000	0.282	0.489	0.608	0.461	0.578

VI. ESTIMATION RESULTS

A. Testing the Presence of Government Spending Threshold Effect

The first step of the analysis was to calculate the descriptive statistics for the variables used in the model and to test the stationarity of these variables. Table II shows the findings obtained from the analysis.

Table II shows that all variables used in the model are stationary at 1% significance level according to the Dickey-Fuller (1979) test statistics. Following the test for stationarity, the approach proposed by [60] was used to reveal the nonlinear structure between the government expenditure types and economic growth. Table III shows the results of the linearity test for each government expenditure type depending on different delay parameters.

According to the p-values and F statistics presented in the Table III, the linearity for final government consumption expenditure is most strongly rejected when *d=1*, while the linearity for government investment expenditure and total government expenditure is most strongly rejected when *d=5* and *d=2*, respectively. Therefore, the delay parameters (*d*) for the final government consumption expenditure, government investment expenditure and total government expenditure were selected as 1, 5 and 2, respectively. The findings show that final government consumption expenditure, government investment expenditure and total government expenditure

imply a regime switching one period, two periods, and five periods in advance respectively. In that case, the threshold values for the final government consumption expenditure, government investment expenditure and total government expenditure are $Fcons_{t-1}$, $GInvest_{t-5}$ and $TotExp_{t-2}$, respectively.

TABLE IV: THRESHOLD TEST RESULTS

Threshold variable	Threshold regime (The ratio to GDP)	LR-stat	Bootstrap p-value
Government Final Consumption Expenditure (FCons)			
1st threshold $\left(H_0^1: No threshold\ value\ exists\right)$	0.1322	21.631	0.034
2nd threshold $\left(H_0^2: A threshold\ value\ exists\right)$	-	12.062	0.148
Government Investment (GInvest)			
1st threshold $\left(H_0^1: No threshold\ value\ exists\right)$	0.0469	22.893	0.023
2nd threshold $\left(H_0^2: A threshold\ value\ exists\right)$	-	3.485	0.900
Total Government Expenditure (TotExp)			
1st threshold $\left(H_0^1: No threshold\ value\ exists\right)$	0.1630	23.402	0.018
2nd threshold $\left(H_0^2: A threshold\ value\ exists\right)$	-	9.434	0.755

TABLE V: REGRESSION RESULTS (THRESHOLD VARIABLE: FCONS(-1))

		(1)	(2)
Threshold value	Linear model	<= 0.1322	> 0.1322
PInvest	-0.066	0.208	0.421***
	(-1.46)	(0.79)	(3.68)
LabourGrowth	0.023***	-0.008	0.023***
	(8.50)	(-0.78)	(6.25)
FConsGrowth x FCons	0.287**	-5.778***	0.290*
	(2.61)	(-5.431)	(1.92)
Constant	0.027*	0.172	-0.162***
	(1.76)	(2.81)**	(-4.05)
Obs.	69	22	46
R^2	0.198	0.796	0.572

***, **, and * indicate significant at 1 percent, 5 per, and 10 percent levels respectively

The next step of the analysis was to find out whether there was a threshold value for a specific expenditure type that causes regime switch in the series, and if so, to determine this value. The approach proposed by [57] and [58] was used in determining and estimating the threshold value that allowed for regime switching. Table IV shows the *LR* statistics estimated with RATS 8.0 and Matlab 7.0.4 as well as the threshold values for each expenditure type. *LR* statistics were obtained using 5000 bootstrap replications.

According to the results presented in the Table IV, the *LR* statistics are 21.631, 21.893 and 23.402, and the bootstrapped p-values are 0.034, 0.023 and 0.018 for the final government consumption expenditure, government investment expenditure and total government expenditure, respectively (when d=1, d=5 and d=2). At the 5% significance level, the null hypothesis H_0^1 that no threshold value exists was rejected for each expenditure type. Another hypothesis was constructed to test the existence of a second threshold value and the *LR* statistics were found to be 12.062, 3.485 and 9.434, and the bootstrapped p-values were found to be 0.148, 0.900 and 0.755, respectively. At the 5% significance level, the null hypothesis H_0^2 that a threshold value exists was not rejected for all expenditure types, suggesting the existence of one-threshold effect in the series. At the end of the analysis, the relation between economic growth and each expenditure type was found to be nonlinear and threshold values for each expenditure type were determined to be 13.22%, 4.69% and 16.3%, respectively.

B. The Relationship between Government Expenditures and Economic Growth

We used TAR model to determine whether the effect of government expenditure types on economic growth differs above and below the threshold and to find out the direction of the effect. The TAR model estimating the spending-economic growth relation below the threshold was obtained by transforming Equation (10).

Table V shows the results of the two-regime TAR model used to reveal the relationship between economic growth and final government consumption expenditure below the threshold for final government consumption expenditures.

The linear model given in Table V shows the linear relationship between economic growth and final government consumption expenditure, while Model 1 and 2 show the spending-economic growth relation when the final government consumption expenditures are below and above the threshold, respectively. The results of the linear model show that there is a statistically significant and positive relation (at 10% level) between final government consumption expenditure and economic growth. According to Model 1 which shows the cases where the final government consumption expenditures are below the threshold, there is a statistically significant (at 1% level) and negative relation between final government consumption expenditures and economic growth when the government spending as a percentage of GDP is below 13.22%. According to Model 2, there is a statistically significant (at 1% level) but positive relation between final government consumption expenditure

and economic growth when the government spending as a percentage of GDP is above 13.22%. On the other hand, according to the results of the linear model, there is a statistically insignificant but negative relation between private sector investments and economic growth. The relationship becomes statistically insignificant but positive when the spending is below the threshold, and statistically significant and positive when the spending is above the threshold. The comparison of Model 1 and 2 shows that the effect of private investments on economic growth is greater when final government consumption expenditure as a percentage of GDP is above 13.22%, which suggests that an increase in the final consumption expenditures does not create a crowding-out effect on the private sector.

TABLE VI: REGRESSION RESULTS (THRESHOLD VARIABLE: GINVEST (-5))

		(1)	(2)
Threshold value	Linear model	<= 0.0469	> 0.0469
PInvest	-0.078	-0.237	-0.027
	(-0.60)	(-1.07)	(-0.34)
LabourGrowth	0.019**	0.008	0.026***
	(3.19)	(0.96)	(5.40)
GInvestGrowth x GInvest	1.386**	-0.335	0.812*
	(2.06)	(-0.26)	(1.74)
Constant	0.023	0.147**	0.007
	(0.59)	(2.31)	(0.25)
Obs.	69	14	49
R^2	0.239	0.111	0.234

***, **, and * indicate significant at 1 percent, 5 percent, and 10 percent levels respectively

The linear model given in the Table VI shows the linear relationship between economic growth and investment expenditures, while Model 1 and 2 show the spending-economic growth relation when government spending is below and above the threshold, respectively. The results of the linear model show that there is a statistically significant and positive relation (at %5 level) between investment expenditure and economic growth. According to Model 1 which shows the cases where the investment expenditures are below the threshold, there is a statistically insignificant relation between investment expenditures and economic growth when the government spending as a percentage of GDP is below 4.69%.

According to Model 2, there is a statistically significant (at 10% level) and positive relation between investment expenditure and economic growth when the government spending as a percentage of GDP is above 4.69%. On the other hand, the linear model and Model 2 (government spending above the threshold) also show that there is a statistically significant and positive relation between labor force growth and economic growth. Comparison of these two models shows that the effect of labor force growth on economic growth is greater in Model 2 than in the linear model when investment expenditure as a percentage of GDP is above 4.69%, which suggests that investment expenditure above 4.69% of GDP will generate more employment.

TABLE VII: REGRESSION RESULTS (THRESHOLD VARIABLE: TOTEXP(-2))

		(1)	(2)
Threshold value	Linear model	<= 0.1630	> 0.1630
PInvest	-0.072	-0.262	0.194***
	(-1.56)	(-1.02)	(3.97)
LabourGrowth	0.023***	0.067	0.022***
	(8.18)	(1.42)	(7.77)
TotExpGrowth x TotExp	0.301***	-4.698***	0.367***
	(3.08)	(-6.32)	(2.87)
Constant	0.027*	0.270***	-0.080***
	(1.73)	(3.47)	(-4.80)
Obs.	69	8	59
R^2	0.210	0.891	0.419

***, **, and * indicate significant at 1 percent, 5 percent, and 10 percent levels respectively

The linear model given in the Table VII shows the linear relationship between economic growth and total government expenditure, while Model 1 and 2 show the spending-economic growth relation when the total government expenditures are below and above the threshold, respectively. In all three models, there is a statistically significant relation (at 1% level) between total government expenditure and economic growth. The relation is positive in the linear model and Model 2 which shows the case where total government expenditures as a percentage of GDP are above 16.3%, while it is negative in Model 1 which shows the case where spending is below 16.3%. On the other hand, there is a statistically significant and positive relation between labor force growth and economic growth in all three models.

The findings regarding the models can be summarized as follows: a) The analysis of the period of 1998:Q2-2015:Q2 shows that the regime switches in the series regarding the final government consumption expenditure, government investment expenditure and total government expenditure can be predicted one, five and two periods in advance respectively. In other words, any change in each expenditure type gives an indication one, five and two periods beforehand. b) The findings show that there is a nonlinear relation between government spending and economic growth; the relationship follows a one-threshold and two-regime process; the effect varies above and below the threshold; the effect of government spending on economic growth is significant and negative when the government spending is below the

threshold, and is significant and positive when the government spending is above the threshold.

VII. Conclusion

This study assumes that, contrary to popular belief in recent years, there is a nonlinear relation between government expenditures and economic growth, and tries to determine whether such nonlinear relation applies to Turkey, or not. The analysis was carried out using the data from the period of 1998:Q2 - 2015:Q2.

The first step of the analysis was to examine the relationship between quarterly growth rates of GDP and three different government expenditure types: final government consumption expenditure, government investment expenditure and total government expenditure. It was then followed by the detection of nonlinearity in the series which were previously found to be stationary. The results of the testing based on the approach proposed by [56], [57], and [58] showed that there exists only one threshold for each expenditure type. Proper TAR models were constructed for each expenditure type and the models were estimated. For the entire period of analysis, the threshold values for final government consumption expenditure, government investment expenditure and total government expenditure were found to be 13.22%, 4.69% and 16.30%, respectively. The findings also showed that the relationship between government spending and economic growth may differ above and below the threshold value: the effect of government spending on economic growth is statistically significant and negative when the spending is below the threshold, and is statistically significant and positive when the spending is above the threshold.

In conclusion, the finding that government spending below the threshold has a significant and negative effect on economic growth, while spending above the threshold has a significant and positive effect on growth reveals that the level of government spending is important for economic growth in Turkey and the government must keep the spending above the threshold level to achieve a steady and sufficient growth. Due to the existence of a threshold value, increased government spending has an important role in the economy since it can cause factor productivity and crowding-out. Moreover, as can be clearly seen from the analysis results, it is of high importance to achieve the positive effects of increased government spending above the threshold on economic growth without causing a budget and current account deficit. Otherwise, a decrease can be observed in the private investment volume due to the crowding-out effect which may arise out of high tax and interest rates. In such a case which will affect first the internal and then the external balance, it will be inevitable to experience economic instability. Such an economic structure which may cause losses in production and consumption will lead to a decrease in society's overall welfare. Therefore, in addition to increasing the government spending, it will also be necessary to gradually incorporate other macroeconomic policies that may ensure economic balance into the process. Furthermore, since the investors making investments at a global scale may feel uncomfortable due to the impression that both real and financial markets are mostly regulated by the public sector, an economic structure in which private sector is consistently encouraged must be ensured and policy measures must be taken to allow the transfer of government expenditures to the private sector within a certain period of time and without any decrease. It must be realized that an economic order in which public and private sectors work hand in hand in the beginning needs to be transformed into a market economy in the following periods of development.

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