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Does the Optimal Size of Defense Expenditure Exist? An Empirical Study on Turkey

Rıza BAYRAK*

Abstract

The purpose of this study was to analyze whether an "inverted U" shape relationship between economic growth and defense expenditure or not, what the optimal ratio of defense expenditure for Turkey is, and whether Turkey's defense expenditure in the period of 1990-2017 was optimal. The dependent variable of the study was the ratio of yearly economic growth, and independent variables were the ratio of defense expenditure in GDP and yearly unemployment rate respectively. Data which covered 1990-2017 period regarding Turkey was analyzed by using Time Series Analysis with FMOLS method. Economic growth and unemployment series were acquired from the Worldbank, while defense expenditure was from SIPRI data bank. According to the results; we have concluded that there is an "inverted U" shape the relationship between economic growth and defense expenditure. In other words, Armey Curve exists for Turkey. Also, we have observed the ratio of defense expenditure as 2.5% of the GDP. The defense expenditure of Turkey from 2010 is under this value of 2.5%. Considering this point; it can be put forward that Turkey may increase its defense expenditure up to 2.5% of the GDP to provide economic growth. Taking into account of the leading position and also the importance of the defense industry in the manufacturing industry, this evaluation is supported not only with the first law of Kaldor but also studies which propose that defense expenditure has positive effects on the economic growth as well.

Keywords: *Economic Growth, Defense Expenditure, Armey Curve, Time Series Analysis (FMOLS Method).*

* Dr, Millî Savunma Bakanlığı, rbayrak07@hotmail.com

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Optimal Savunma Harcaması Var mıdır? Türkiye Üzerinde Ampirik Bir Uygulama

Öz

Bu çalışmanın amacı; savunma harcamaları ile büyüme arasında "ters U" şeklinde bir ilişkinin olup olmadığını, optimal savunma harcaması oranın ne olduğunu ve Türkiye'nin 1990-2017 yılları arasındaki savunma harcamalarının optimal olup olmadığını analiz etmektir. Çalışmada bağımlı değişken olarak ekonomik büyüme oranı, bağımsız değişkenler olarak da yıllık savunma harcamalarının milli gelir içindeki oranı ile yıllık işsizlik oranları kullanılmıştır. Çalışmada, Türkiye'ye ait 1990-2017 dönemin verileri zaman serisi analizi kullanılarak analiz edilmiştir. Bu verilerden milli gelir büyüme oranı ile işsizlik verileri Dünya Bankası veri tabanından, savunma harcamalarının milli gelir içindeki oranı da SIPRI veri tabanından alınmıştır. Çalışma neticesinde; Türkiye'de Armey Eğrisi'nin geçerli olduğu, bir başka ifadeyle savunma harcamaları ile büyüme arasında "ters U" şeklinde bir ilişkinin olduğu gözlenmiştir. Türkiye'de savunma harcamalarının milli gelir içindeki optimal değeri ise %2,5 olarak tespit edilmiştir. Türkiye'nin 2010 yılı sonrası yıllık savunma harcamaları göz önüne alındığında; yapılan harcamaların %2,5'lik oranın altında olduğu görülmektedir. Buradan hareketle, savunma harcamalarının %2,5 oranına kadar artırılmasıyla, milli gelirin de artırılabileceğini ifade etmek mümkündür. Savunma sanayinin imalat sanayi içinde lokomotif pozisyonu göz önüne alındığında; yapılan bu değerlendirme gerek Kaldor'un birinci yasasıyla gerekse alanda savunma harcamalarının büyüme üzerinde pozitif yönlü etkisini gözlemleyen çalışmalarla tutarlıdır.

Anahtar Kelimeler: *Savunma Harcaması, İktisadi Büyüme, Armey Eğrisi, Zaman Serisi Analizi (FMOLS Method).*

Introduction

The debates on the role of states in the economic structure have continued from the past to the present. According to some opinions originating from the Wagner Law (1883), an increase in the income will also increase the demand arising from the desire for social development, such as education and health and

eventually the expenditure arising from the protective and regulatory function of the state will increase (Chobanov, 2009:8). However, it generally accepted in the literature that the increase in public expenditure has always been of a controversial issue. According to some opinions, the state has a positive impact on economic growth by protecting some economic freedoms such as private property rights, and by making administrative improvements and economic infrastructure investments. On the other hand, according to another view; state interventions such as increasing tax burden and deterioration in the incentive system have negative effects on economic growth.

In this context; defense expenditure, which is part of the public expenditure, has been a matter of discussion from past to present on the grounds that whether it disrupts resource efficiency. Therefore, at this point, it is obvious that empirical studies are required to estimate the ratio of defense expenditure to GDP.

In the first part of this empirical study, the conceptual framework was examined. In the second part, the methodology of the study was discussed while the results obtained and the discussion on the results was presented in the third and fourth parts, respectively. In the last part of the study, some proposals were announced for both the decision makers and future studies in the field.

Conceptual Framework

As a result of wars, conflicts and major economic crises in the historical process, it is observed that the intervention methods on the economy have also changed together with the changing definition of the state or its changing role in the social life. According to the classical economic view, there are natural laws that direct economic activities (Screpanti and Zamagni, 1993:54). Hence, the intervention of the state should not be very decisive on the economic structure because of the fact that it may prevent natural laws. In other words, the market mechanism must be determined by economic rules (Ersoy, 2008:272). Nevertheless, according to the Keynesian view, the economic system does not have a self-regulating mechanism. Thus, macro-level government intervention might be required to improve deteriorated balances (Minsky, 1975:2-3). Considering these thoughts, it is possible to state that the existence of the state in economic life and the degree of its intervention level is still a controversial issue.

In this context, public expenditure can be generally defined as the spendings for the fulfillment of public services (Uluatam, 1997:147). In other words, it is possible to define public expenditure as the expenditure used by the state in order to ensure the economic and social order and sustain it effectively.

It is seen that the relationship between defense expenditure, which is a part of the public expenditure and is a share of the national income allocated to the provision of internal and external security (Tüğen, 1989:48), and economic growth is dealt with two basic approaches. The first approach, called as a supply-side approach or Military Keynesianism, suggests that defense expenditure has a positive effect on growth due to the externality which it creates. In other words, defense expenditure has an important multiplier effect and the output also can be increased by growing the capacity utilization through the demand emerged by defense expenditure. As a result, capital gain ratio, investment, and growth can be increased as intended (Looney, 1994:46-47).

On the other hand, the second approach, called a demand-side approach or Neoclassical Theoretical approach; states that, due to the transfer of the capital and the other assets to defense rather than investment and additionally due to the crowding-out effect, defense expenditure may have a negative impact on growth (Gökbunar and Yanıkkaya, 2004:161).

When the studies in the field on the relationship between defense expenditure and growth are examined, it cannot be put forward that there is a complete consensus on the impact of defense expenditure on economic growth. According to some researches, defense expenditure positively affects economic growth (Benoit, 1973; Benoit, 1978; Sezgin, 2000; Dunne et al., 2001; Rufael, 2001; Yıldırım et al., 2005; Gökbunar and Yanıkkaya, 2004; Yuttançıkmaz et al., 2012; Bekmez and Destek, 2015; Fatah and Salihoglu, 2016); while according to some other studies, the effect of defense expenditure on GDP is negative (Deger and Smith, 1983; Cappelen et al., 1984; Brempong, 1989; Huang and Mintz, 1990; Ward et al., 1991; Knight et al., 1996; Heo et al., 1998; Antonakis, 1999; Dunne and Tian, 2013; Bekmez and Destek, 2015; Fatah and Salihoglu, 2016). In addition, in some studies conducted, it is observed that there is not any relationship between these two variables (Chowdhury, 1991; Kusi, 1994).

The pioneering researches concerning what ratio of public expenditure to GDP should be are mostly attributed to Barro (1989), Armey (1995), Rahn et al. (1996) and Scully (1994, 2008). Examining the models in these studies, it is seen

that the inverted U-shaped curve model was generally used. Therefore, based on these studies, the inverted U-shaped curve model is also referred to as the BARS Curve in the literature. The Armey Curve developed by Armey (1995) is one of the BARS curves, and as seen in Figure 1. It shows the relationship between the size of the public sector in economic structure (public expenditure / GDP) and the real GDP (or real GDP growth rate). The basic logic behind this curve suggests that in the case of the absence of the state, there might be some problems in protecting the property rights of individuals due to irregularity and disorder that might arise due to its absence. Furthermore, in such environments where uncertainty increases, individuals' desire for investment and saving will also be reduced or eliminated. Hence, the output level produced by the economy (g_0) can be quite low (Chao and Grubel, 1998:55), and theoretically, this level can even be zero (Mavrov, 2007:55).

Together with the presence of the state in the economy; economic growth can be increased to a certain point (g*) in a positive direction with the development of some economic freedoms such as protection of private property rights and also with administrative improvements and some economic infrastructure investments. In other words, within this range, there is a positive relationship between public expenditure and GDP and also national income increases. At the point where economic growth reaches its maximum level (g*), the marginal productivity of public expenditure is equal to the marginal productivity of private sector expenditure. After this point (E*), individuals' saving and investment incentives are reduced due to a number of additional measures, such as the tax burden raised for the financing of increased government spending. With the introduction of the rule of diminishing returns, the direction of the relationship between these two variables turns to negative. In other words, the increase in public expenditure leads to a decrease in economic growth. Therefore, after this point, public spending should be reduced in order to prevent a decrease in economic growth.

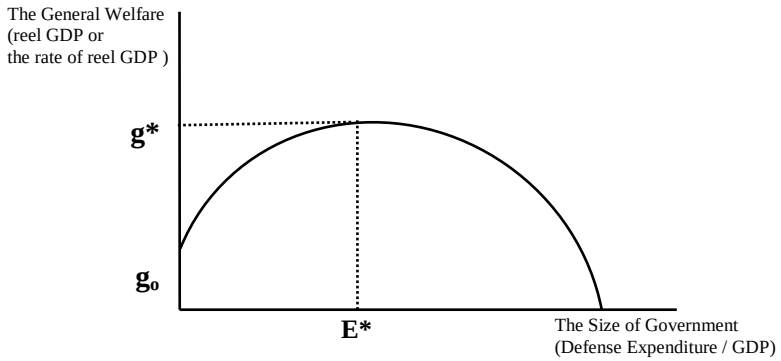


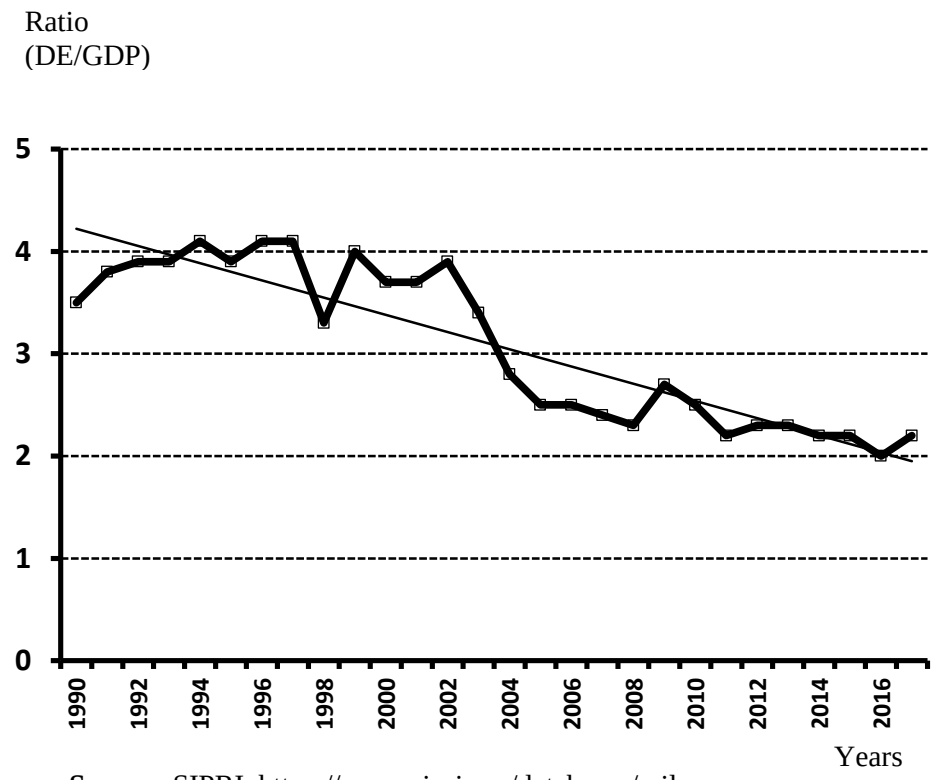
Figure 1. The Size of Government (Armey, 1995)

Friedman's study (1997) is one of the leading studies in the field, which estimate the optimal ratio of public expenditure to GDP. According to Friedman (1997), the ratio of public expenditure to GDP is between 15-50%. Vedder and Gallaway (1998) conducted a study on the USA by using data between 1947-1997 and estimated the optimal ratio of public expenditure to GDP at 17.5%. Facchini and Melki (2001) performed a study on France by using the data from 1871 to 2008 and observed the optimal ratio of public expenditure to GDP to be 30%. Mavrov (2007) carried out a study on Bulgaria by using data between 1990-2004 and estimated the optimal ratio as 4.6% for education expenditure, 4.3% for health expenditure and 13.6% for social security expenditure. In their study on Turkey, Romania, and Bulgaria, Altunc and Aydin (2013) used data from 1995 to 2011 and found that the optimal ratio of public expenditure to GDP ranged between 22% and 25%. Pevcin's (2004) study examined 12 Western European countries by using data between 1950-1996 and he observed that this ratio ranged between 37% and 42%.

Evaluating the studies together; it is possible to state that the ratio of public expenditure to GDP varies between 15-50%. Therefore, the question "Is it possible to consider an optimal defense expenditure?" emerges as a research question.

At the NATO Wales Summit held on 04-05 September 2014 following the Ukraine Crisis, it has been observed that the member states have overemphasized to stop the decreasing defense expenditure and to increase it up to at least 2% of the national income (Bayraklı, 2014:4; Bingöl and Varlık, 2014:5).

To evaluate the defense expenditures of Turkey for the period of 1990-2017, Figure 2 was created and presented below.



Source: SIPRI. https://www.sipri.org/databases/milex

Figure 2. Defense Expenditure of Turkey

As seen in Figure 1; the rate of defense expenditure (DE) to GDP has decreased in the course of time. The decrease of defense expenditure is more obvious after the 2001 crises up to date (from approximately 4% to 2%). But the value has risen up in 2017 with the start of the operations in the southern part of Turkey. It can be said that the defense expenditure ratio in GDP is generally higher than 2% level of NATO declared at Wales Summit in 2014.

In this framework, the answers to the following questions were to be reached in that study.

Research Question-1: Is there an optimal defense expenditure ratio which ensures economic growth?

Research Question-2: What is the optimal defense expenditure ratio for Turkey?

Research Question-3: Has Turkey's defense expenditure been at the optimal level for the period of 1990-2017?

Methodology

Data

In this part, the data used in the study are explained. The information about the dependent and independent variables and the sources of these variables are presented in Table 1.

Table 1: Variables of the Study

Variables	Definition	Sources
Dependent Variable	The Ratio of Reel GDP	World Bank *
Independent Variables	The Ratio of Defense Expenditure in Reel GDP	SIPRI**
	Unemployment Rate	World Bank *

* Worl Bank (WB), http://data.worldbank.org/indicator.

** SIPRI. https://www.sipri.org/databases/milex

The dependent variable of the study is the real GDP growth rate. This data was obtained from the World Bank (WB) and covers the period 1990-2017. The independent variables of the study are the ratio of defense expenditure to real GDP and the unemployment rate. Data for the ratio of defense expenditure to real GDP was obtained from SIPRI, while the data for the unemployment rate was obtained from the World Bank database.

It was also used dummy variables for two periods in order to measure the effects of the 1994 and 2001 crises.

Analysis Method

In order to test whether there is an inverted U-shaped relationship between defense expenditure and economic growth, the Armey Curve is formulated as below in equation (1).

$$LNGDP_t = \beta_0 + + \beta_1 LNMEXP_t + \beta_2 LNMEXP_t^2 + \beta_3 LNU_t + e_t \quad \beta_2, \beta_3 < 0 \qquad (1)$$

Here;

LNGDP : Natural Logarithm of the Real GDP Growth Rate
LNMEXP : Natural Logarithm of the Ratio of Defense Expenditure to Real GDP
LNU : Natural Logarithm of the Unemployment Rate
D1994 : Dummy Variable (for the 1994 Crisis)
D2001 : Dummy Variable (for the 2001 Crisis)
e_t : Error Term

The natural logarithm of all variables [ln(variable+10)] was taken before they were included in the analysis.

The purpose of including defense expenditure in a quadratic form in the equation is testing whether the Armey Curve is valid or not. Therefore, while the positive and statistically significant coefficient "$\boldsymbol{\beta_1}$" indicates that economic growth is an increasing function of defense expenditure, the negative and statistically significant coefficient "$\boldsymbol{\beta_2}$" also confirms the existence of the Armey curve. Moving from this point forth, equation (2) below, which represents the polynomial concave curve, was used to find optimal defense expenditure.

$$Optimal\ Defense\ Expenditure\ (EXP) = -\beta_1 / 2(\beta_2) \qquad (2)$$

Time series analysis was conducted for the estimations in the study. In the analysis, first, it was examined the correlation among the variables. Thereafter the series were analyzed for the stationarity test; because, in order to apply regression analysis to the time series, all of the series in the model must be stationary.

The method most commonly used for analyzing whether the series is stationary is a unit root test. The easiest way to introduce this test is to use the following model (Gujarati, 1999:718-719).

$$Y_t = \alpha + \beta Y_{t-1} + u_t \quad (3)$$

If Y_{t-1} is subtracted from both sides of the Equation (3), the model then becomes as the following:

$$Y_t - Y_{t-1} = \alpha + \beta Y_{t-1} - Y_{t-1} + u_t \quad (4)$$

$$(Y_t - Y_{t-1}) = \alpha + (\beta - 1)Y_{t-1} + u_t \quad (5)$$

At this point, the hypothesis of the test is determined as follows:

H_0 : There is a unit root $(\beta = 1)$. The series is not stationary. (6)

H_1 : There is not a unit root $(\beta < 1)$. The series is stationary. (7)

Here, if ***β=1*** then it can be said that the series has a unit root. A time series with a unit root is known as a random walk (time series) in the econometrics of time series. A random walk is an example of a non-stationary time series. If we replace ***β=1*** in the equation mentioned above;

$$\Delta Y_t = \alpha + (1 - 1)Y_{t-1} + u_t \quad (8)$$

$$\Delta Y_t = \alpha + u_t \quad (9)$$

$$Y_t - Y_{t-1} = \alpha + u_t \quad (10)$$

$$Y_t = \alpha + Y_{t-1} + u_t \quad (11)$$

In this case, Y_t becomes dependent on Y_{t-1}. Our aim is to make Y_t independent from Y_{t-1}.

If $\beta<1$, it means the effect of shocks will gradually decrease. Which means Y_t will affect Y_{t-1} less. A non-stationary series indicates that the series has permanent shocks.

On the other hand, if the same operations are applied to a model without intersection coefficient, the first-order differences of this series also become

stationary because "u_t"s are stationary by assumption due to the equation of Y_t - Y_{t-1} = u_t

If the first-order difference of a time series is taken and is stationary, the initial series is defined as first-order integrated and demonstrated as *I(1)*. If the second-order difference is taken and the series is stationary, the initial series is defined as second-order integrated and demonstrated as *I(2)*. Therefore, while the unit root test is being examined, the hypothesis test shown in (6) and (7) is used:

Hypothesis H_0 is tested by comparing ***t*** statistics ***τ (tau***) values with the threshold ones obtained by Dickey and Fuller via the Monte Carlo method (Greene, 1997: 850).

The cointegration test is mainly used for the purpose of the long term optimal lag lengths of linear combinations of non-stationary variables at the level, for modeling and estimating the long-term relationship between time series. The existence of cointegration between variables means that there is a long-term relationship between variables. In this study, the cointegration test of the Johansen-Juselius (1990) Test was conducted for the test of cointegration between time series.

Johansen-Juselius (1990) approach is used when the number of co-ordinated components that can occur between the set of variables is more than 1. For both variables, if both variables are I(1), it is proved that there are only one "α" cointegration parameter and therefore a single cointegrated vector. If there is a "n" variable, there may be "n-1" cointegrated vector. The Johansen-Juselius cointegration method is based on I (0) and I (1) variables.

$$\Delta Y_t = \mu + \Gamma_1 \Delta Y_{t-1} + \ldots + \Gamma_{k-1} \Delta Y_{t-k+1} - \Pi \Delta Y_{t-k} + \epsilon_t \quad (12)$$

Here;

Γ_i = -1 + Π_1 + ….+ Π_i , i= 1,2, … k-1, Π = 1- Π_1 - Π_k, Δ first difference operator, μ fixed term, and ϵ_t is the vector of error term without autocorrelation and normally distributed. The model is the traditional vector autoregressive model in which the first order difference is used if the term $\Pi \Delta Y_{t-k}$ is not used.

Empirical Results

Table 2 shows the unit root tests of the variables at the level and first-order difference. As can be seen in Table 2, the series is non-stationary at the level. However, first-order differences are stationary.

Table 2: Results of Unit Root Tests

(Level)						
Variable	**ADF (None)**		**ADF (Intercept)**		**ADF (Intercept / Trendy)**	
LNGDP	-0.424928	***-2.656915***	-5.641646	***-3.699871****	-5.750308	***-4.339330****
		-1.954414		***-2.976263***		***-3.587527***
		-1.609329		***-2.627420***		***-3.229230***
LNMEXP	-0.870065	***-2.653401***	-3.150513	***-4.339330***	-0.721648	***-3.699871***
		-1.953858		***-3.587527***		***-2.976263***
		-1.609571		***-3.229230****		***-2.627420***
LNU	0.257763	***-2.653401***	1.786094	***-3.699871***	-3.348562	***-4.356068***
		-1.953858		***-2.976263***		***-3.595026***
		-1.609571		***-2.627420***		***-3.233456****
(1st Difference)						
Variable	**ADF (None)**		**ADF (Intercept)**		**ADF (Intercept / Trendy)**	
Δ LNGDP	-9.507506	***-2.656915****	-9.312800	***-3.711457****	-4.548379	***-4.498307****
		-1.954414		***-2.981038***		***-3.658446***
		-1.609329		***-2.629906***		***-3.268973***
ΔLNMEXP	-6.171625	***-2.656915****	-6.378191	***-3.711457****	-6.246211	***-4.356068****
		-1.954414		***-2.981038***		***-3.595026***
		-1.609329		***-2.629906***		***-3.233456***
Δ LNU	-4.307086	***-2.656915****	-4.260276	***-3.711457****	-4.193863	***-4.356068***
		-1.954414		***-2.981038***		***-3.595026****
		-1.609329		***-2.629906***		***-3.233456***

Note: Values indicated as dark italic represents (α) critical values at .01, .05 and .10 significance levels respectively. (*) sign represent valid values which exceed critical values.

Whether these series, which were found to be non-stationary according to the unit root tests, have a linear combination, were tested using the Johansen Cointegration Analysis Method due to the fact that there are more than two variables.

Co-integration means that the linear combination of two or more time series, which are non-stationary as a single series, is stationary and it indicates a long-term relationship between them (Gujarati 1999: 730).

Despite the persistent external shocks affecting the variables in the system, the existence of long-term co-integration between the variables is possible only if these variables are exposed commonly and the same kind of trend (Greene, 1997: 855). If there is co-integration between variables, these variables are of the same wavelength and the regression of the two variables is significant (i.e. not falsified).

This analysis is not very clear in multivariate cases. Therefore, it is necessary to take into account the possibility that there might be many co-integration vectors (Harris, 1995:138).

It was previously stated that even though the series of economic variables that set up the system is non-stationary, these series may have a stationary linear combination and that they can be estimated econometrically by Cointegration Analysis. The maximum lag length to be used in the VAR model must be estimated before applying the Johansen method. The results of the lag length estimations are presented below.

Table 3: Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	93.17059	NA	9.38e-09	-7.133647	-6.938627	-7.079557
1	136.5103	**69.34351***	**1.08e-09***	**9.320823***	**-8.345722***	**9.050371***
2	144.8925	10.72920	2.22e-09	-8.711398	-6.956217	-8.224585
3	166.1324	20.39036	2.00e-09	-9.130594	-6.595332	-8.427420

As seen in Table 3; the most appropriate lag length was selected as 1 according to all information criteria in the model. Since the variables are stationary at the same level, the Johansen co-integration test was applied to examine the long-term relationship between them. The result of the Johansen co-integration test is presented in Table 4.

Table 4: Cointegration Analysis

Serial	: LNGDP LNMEXP LNMEXP^2 LNU
Exogenous Variables	: D1994 D2001
Lag Lenght	: 1-1

Hypothesis	Eigenvalue	Trace Statistics	Critical Value (.05)	p
r=0*	**0.696195**	**53.77946**	**47.85613**	**0.0125**
r≤1	0.417005	22.80383	29.79707	0.2558
r≤2	0.276504	8.774825	15.49471	0.3866
r≤3	0.013738	0.359658	3.841466	0.5487

(*) represents that hypothesis is not rejected at the .05 significance level. It means that there is one cointegration vector at that significance level.

When Table 4 is examined, it was found that there is one co-integration vector in the model at the 5% significance level because the value of the Trace statistics calculated as a result of the Johansen cointegration test was greater than the critical value. Also, it can be put forward that there is a long-term relationship between the variables.

Estimation of long-term coefficients by ordinary least squares method may give biased results due to autocorrelation and endogeneity problems. To that end, the FMOLS (Full Modified Ordinary Least Square) method developed by Pedroni in 2000 was used to estimate the coefficients of this regression after the unit root and the co-integration tests.

The FMOLS method improves deviations (resulting from problems such as autocorrelation, heteroscedasticity) in standard fixed-effect estimators (Kök et al., 2010:8). "The FMOLS method of Pedroni, which permits significant heterogeneity between the individual sections, takes into account the existence of a possible correlation among the constant term, the difference between the error term and the independent variables. Pedroni (2001) had gone through the power of the FMOLS method in small samples and calculated that the performance of t statistics in small samples was good in the Monte Carlo simulations" (Kök and Şimşek, 2006: 7-8). The results of the FMOLS are presented in Table 5.

Table 5: Long-Term Regression Results

Variable	Coefficient	Standard Error	t-statistic	p
LNMEXP	1.585311	0.427741	3.706243	0.0012
$LNMEXP^2$	-0.314630	0.154267	-2.039512	0.0402
LNU	-0.032980	0.013307	-2.478333	0.0214
D1994	-1.106590	0.093689	-11.81133	0.0000
D2001	-1.596121	0.091092	-17.52199	0.0000

R^2 : 0.503627 Durbin-Watson Statistics: 1.485990
Adjusted R^2 : 0.385443 Long-Term Variance : 0.003949

Note: Newey-West automatic method was used while estimating FMOLS long-term covariance.

In the light of the findings; considering both the direction and significance of the coefficients, it was observed that the Armey Curve is valid for Turkey. In other words, it might be talked about the existence of an optimal defense expenditure for Turkey.

Comparison of the values obtained from the analysis with Turkey's Defense Expenditure is presented in Table 6.

Table 6. The Defense Expenditure of Turkey (1990-2017)

Is Armey Curve valid?	**The Ratio of Optimal Defense Expenditure (%)**	**The Ratio of Defense Expenditure in GDP (%)**										
		1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	$\bar{x}$
		3.5	3.8	3.9	3.9	4.1	3.9	4.1	4.1	3.3	4.0	
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	
Yes	**2.5**	3.7	3.7	3.9	3.4	2.8	2.5	2.5	2.4	2.3	2.7	**3.2**
		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	-	-	
		2.5	2.2	2.3	2.3	2.2	2.2	2.0	2.2	-	-	

Source: SIPRI. https://www.sipri.org/databases/milex

In this context, the optimal ratio of defense expenditure to GDP in Turkey was estimated to be 2.5%. This ratio is more than the ratio of 2% (determined in the NATO Wales Summit in 2014), but lower than that of Turkey after 2010. Therefore, considering the Armey Curve; as previously explained, it might be suggested that Turkey might increase its defense expenditure to the level of 2.5% as it can make a positive contribution to its economic growth.

Conclusion and Discussion

The share of defense expenditure in the national income has been a controversial issue from the past to the present. In other words, an optimal defense expenditure on which everyone agrees has not yet been determined.

In this study on which Armey (1995) curve was applied to Turkey on the basis of the curve's non-linear structure, it has been sought for answers to the three following questions. The first question is whether there is an optimal ratio of defense expenditure; the second one is whether this ratio is different from the value of 2% accepted by NATO in 2014 and the third one is whether Turkey's defense expenditure for the period of 1990-2017 has differed from this estimated optimal value or not.

In terms of the first question; it was observed that both the sign and values of the coefficients were as expected. Therefore, it can be stated that the Armey Curve is valid. In other words, it is possible to talk about the existence of the optimal ratio of defense expenditure to ensure economic growth.

Evaluating the second question; it was estimated that the ratio of optimal defense expenditure to national income is 2.5% in Turkey. This ratio is greater than that (2%) of NATO decided in the Wales Summit in 2014.

Within the scope of the third question, it was observed that Turkey's defense expenditure lower than the value of 2.5% after 2010. Also, considering that the optimal ratio of 2.5%, it can be stated that, according to the Armey Curve, the national income will increase in accordance with increasing of defense expenditure up to the ratio of 2.5%. This result is also consistent with the supply-side approach called Military Keynesianism (Looney, 1994: 46-47), which suggests that defense expenditure will have a positive effect on growth by means of the use of unutilized capacity, the result of the externality and the additional increase in demand created by the defense expenditure.

Considering the leading position of the defense industry in the manufacturing industry; this evaluation is in line with the first law of Kaldor (1966; 1968), which states that there is a positive relationship between the growth of the manufacturing industry and the growth of GDP. In addition, it can be said that this evaluation is supported by studies (Benoit, 1973; Benoit, 1978; Sezgin, 2000; Dunne et al., 2001; Rufael, 2001; Gokbunar and Yanikkaya, 2004; Yuttançıkmaz et al., 2012; Bekmez and Destek, 2015; Fatah and Salihoğlu, 2016) which conclude that defense expenditure has a positive effect on growth.

Limitations of the Study and Future Implication

The data used in the study are limited to the years 1990-2017. In the literature, it is seen that studies on threshold value have been performed by using the BARS curves. The results of this study were also obtained from the analysis of the Armey Curve, which is one of the BARS curves. In this analysis carried out by using the Armey Curve, the effect of other variables on growth was accepted as constant. Therefore, this limitation should be considered when making generalizations.

In light of these thoughts; the validity of these results can be increased in future studies by the use of other estimation methods in the field in order to determine the optimal value. Moreover, it can be stated that differentiating the data by extending the time range and including different countries can increase the explanatory power of the study.

Genişletilmiş Özet

Giriş

Devletlerin ekonomik yapı üzerindeki rolünün ne olması gerektiğine yönelik tartışmalar geçmişten günümüze kadar süregelmiştir. Wagner Kanunu (1883)'ndan kaynaklı bir kısım görüşe göre de gelirin artmasıyla, bireylerin de eğitim, sağlık gibi sosyal gelişme arzusundan kaynaklanan talebi artacak ve bunun neticesinde de devletin koruyucu ve düzenleyici fonksiyonundan kaynaklanan harcamaları artacaktır (Chobanov, 2009:8). Fakat literatürde bu noktada devletin artan harcamalarının sürekli tartışmalı olduğu görülmektedir. Bir takım görüşe göre; devlet, özel mülkiyet hakları gibi bir kısım ekonomik özgürlükleri koruyarak,

yönetimsel iyileştirmeler ve ekonomik altyapı yatırımları yaparak ekonomik büyümeyi pozitif yönde etkilemektedir. Fakat bunun yanında diğer bir görüşe göre de vergi yükünün artması ve teşvik sisteminde zamanla ortaya çıkan bozulmalar gibi devlet müdahaleleri, ekonomik büyüme üzerinde negatif yönde etki yaratmaktadır.

Bu çerçevede; kaynak etkinliğini bozduğu gerekçesiyle, kamu harcamaları içinde yer alan savunma harcamalarının da geçmişten bugüne kadar beri ayrı bir tartışma konusu olduğu görülmektedir. Dolayısıyla, bu noktada savunma harcamalarının GDP içindeki yerinin tespitine yönelik amprik çalışmalara ihtiyaç olduğu aşikârdır.

Uygulanan bu çalışmanın ilk bölümünde, kavramsal çerçeve irdelenmiştir. İkinci bölümde çalışmanın metodolojisine, üçüncü ve dördüncü bölümlerde ise sırasıyla elde edilen sonuçlara ve tartışmaya yer verilmiştir. Çalışmanın son bölümünde ise hem karar vericilere ve hem de alanda ileride yapılacak çalışmalara yönelik bir kısım öneriler geliştirilmiştir.

Kavramsal Çerçeve

Kamu harcamalarının milli gelir içinde hangi oranda olması gerektiği yönünde yapılan öncü çalışmalardan Armey (1995) tarafından geliştirilen ve Şekil-1'de görülen Armey Eğrisi, ekonomik yapı içinde kamu sektörünün büyüklüğü (Kamu Harcamaları/GDP) ve reel GDP (veya reel GDP büyüme oranı) arasındaki ilişkiyi göstermektedir. Bu eğrinin arkasında yatan temel mantığa göre; devletin olmadığı durumda, ortaya çıkabilecek düzensizlik ve karışıklıktan dolayı bireylerin mülkiyet haklarının korunmasında birtakım sıkıntılar baş gösterebilecektir. Ayrıca bu tür belirsizliğin arttığı ortamlarda bireylerin yatırım ve tasarruf arzusu da azalacak veya ortadan kalkacaktır. Dolayısıyla ekonominin ürettiği çıktı düzeyi (g_0) de oldukça düşük düzeyde olabileceği gibi (Chao ve Grubel, 1998:55) teorik olarak bu çıktı düzeyi sıfır da olabilir (Mavrov, 2007:55).

Devletin ekonomide varlığıyla birlikte; özel mülkiyet haklarının korunması gibi bir kısım ekonomik özgürlüklerin geliştirilmesi, yapılan yönetimsel iyileştirmeler ve bir takım ekonomik altyapı yatırımları ile ekonomik büyüme pozitif yönde belirli bir noktaya (g*) kadar arttırılabilir. Bir başka ifadeyle, bu aralıkta kamu harcamaları ve GDP arasında pozitif bir ilişki ortaya çıkar ve milli gelirde de artış sağlanır. Ekonomik büyümenin maksimum düzeye (g*) ulaştığı

noktada ise kamu harcamalarının marjinal verimliliği, özel sektör harcamalarının marjinal verimliliğine eşittir. Bu nokta (E*)'dan sonra ise artan devlet harcamalarının finansmanı için vergi yükünün artırılması gibi alınan bir takım ilave tedbirlerden dolayı, bireylerin tasarruf ve yatırım güdüleri azalır. Azalan getiriler kanunun devreye girmesiyle iki değişken arasındaki ilişkinin yönü de negatife döner. Diğer bir deyişle, kamusal harcamaların artması ekonomik büyüme hızının düşmesine yol açar. Dolaysıyla bu noktadan sonra ekonomik büyümede ortaya çıkan azalmanın önüne geçebilmek için kamusal harcamaların azaltılması gerekir.

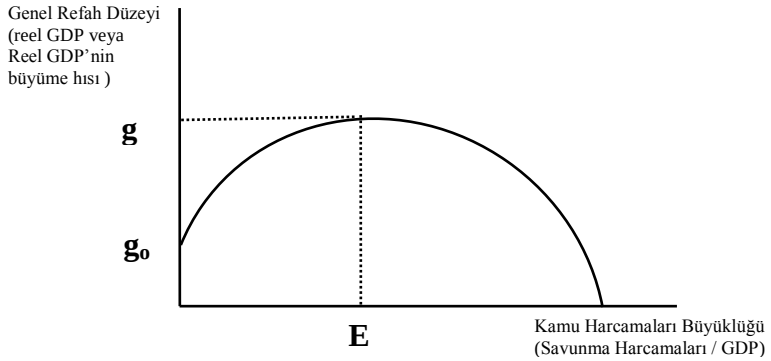


Figure 1. Kamusal Harcamaların Büyüklüğü (Armey, 1995)

Bu temel çerçevede, uygulanan bu çalışmada aşağıdaki soruların cevapları aranmıştır.

Araştırma sorusu-1: Ekonomik büyümeyi temin edecek optimal bir savunma harcaması oranı var mıdır?

Araştırma sorusu-2: Türkiye için optimal savunma harcaması oranı nedir?

Araştırma sorusu-3: 1990-2017 döneminde Türkiye'de yapılan savunma harcaması optimal midir?

Metodoloji

Bu kısımda, çalışmada kullanılan verilere yönelik açıklamalar yapılmıştır. Bağımlı ve bağımsız değişkenlerin neler olduğu ve bu değişkenlerin elde edildiği kaynaklara ilişkin bilgiler Tablo 1'de sunulmuştur.

Table 1: Çalışmanın Değişkenleri

Değişkenler	**Tanımları**	**Kaynakları**
Bağımlı Değişken	Reel GDP Büyüme Oranı	World Bank *
Bağımsız Değişkenler	Reel GDP içindeki Savunma Harcamaları Oranı	SIPRI**
	İşsizlik Oranı	World Bank *

* Worl Bank (WB), http://data.worldbank.org/indicator.

** SIPRI. https://www.sipri.org/databases/milex

Savunma harcamaları ve ekonomik büyüme arasında "ters U" şeklinde bir ilişkinin var olup olmadığını test etmek için, Armey Eğrisi aşağıda (1) numaralı denklemdeki gibi formüle edilmiş ve çalışmanın tahmini için zaman serisi analizi yapılmıştır.

$$LNGDP_t = \beta_0 + + \beta_1 LNMEXP_t + \beta_2 LNMEXP_t^2 + \beta_3 LNU_t + e_t \quad \beta_2, \beta_3 < 0 \qquad (1)$$

Burada;

LNGDP : Reel GDP Büyüme Oranının Doğal Logaritması

LNMEXP : Savunma Harcamalarının Reel GDP İçindeki Oranının Doğal Logaritması

LNU : İşsizlik Oranının Doğal Logaritması

D1994 : Dummy Değişken (1994 Krizi)

D2001 : Dummy Değişken (2001 Krizi)

e_t : Hata Terimi.

Amprik Bulgular ve Sonuç

Elde edilen bulgular ışığında; katsayıların gerek yönü ve gerekse anlamlılık derecesi Armey Eğrisi göz önüne alındığında, Armey Eğrisi'nin Türkiye için geçerli olduğu gözlenmiştir. Bir başka ifadeyle Türkiye için optimal bir savunma harcamasının varlığından söz edilebilir.

Analiz neticesinde elde edilen değerler ile Türkiye'nin yaptığı savunma harcamalarının karşılaştırılması aşağıda Tablo 6'da sunulmuştur.

Tablo 6. Türkiyenin Savunma Harcaması Oranı (1990-2017)

Army Eğrisi Geçerli mi?	**Optimal Savunma Harcaması Oranı (%)**	**Ssavunma Harcamasının GDP'ye Oranı (%)**										
		1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**x̄**
Evet	**2.5**	3.5	3.8	3.9	3.9	4.1	3.9	4.1	4.1	3.3	4.0	**3.2**
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	
		3.7	3.7	3.9	3.4	2.8	2.5	2.5	2.4	2.3	2.7	
		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	-	-	
		2.5	2.2	2.3	2.3	2.2	2.2	2.0	2.2	-	-	

Kaynak: SIPRI. https://www.sipri.org/databases/milex

Bu çerçevede; Türkiye için optimal savunma harcaması oranı %2,5 olarak tespit edilmiştir. Bu oran, NATO'nun 2014 yılında Galler Zirvesi'nde belirlediği %2 orandan fazla olmakla beraber; Türkiye'nin 2010 yılından itibaren yaptığı savunma harcaması oranının üzerindedir. Dolayısıyla, Armey Eğrisi göz önüne alındığında; ekonomik büyümeye olumlu katkısı olacağı düşüncesiyle, Türkiye'nin savunma harcamalarını %2,5 düzeyine kadar artırabileceği ileri sürülebilir.

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