Effect of Average Tax Rates on Long-Run Economic Growth Rate in Turkey

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Abstract: Although tax revenue is one of the important parameters in public sector, its relationship with economic growth has been discussed in fiscal economics theory for a long time. The purpose of this study is to determine whether tax rates affect the long-run economic growth rate both in short and long-run for the period of 1980-2015. In the study, bounds test approach of the ARDL model developed by Pesaran et al. (2001) was employed. The long-run economic growth rates were produced by three different filters. The main finding of the study is that there exists an U-shaped curve relationship between average tax rate and long-run economic growth rate for Turkey.

Keywords: Average Tax Rate; Long-Run Economic Growth, ARDL Bounds Testing Approach

JEL Classification: H20; O40; C32

1. Introduction

Economic influences of tax incomes which have been one of the significant income items in terms of the execution of public services have been extremely discussed in the literature. Thus, they have been a subject of many applied and theoretical researches. Numerous analytical studies have been carried out in order to determine whether tax rates affect economic growth in a positive or negative side through various channels (financial markets, allocation of resources, etc.). Although there are strong analytical reasons about the fact that tax rate is one of the significant variables influencing the economic growth, significant uncertainties still continue to exist about whether the direction of the effect is positive or negative. Thus, the subject on economic influences of tax incomes which are one of the indicators of fiscal policy has been taken into consideration through traditional and modern empirical methods.

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Associated with the recognition of the idea of a social welfare state throughout the history, the intervention of the state to the economic and social life has been raised. Most particularly after the Great World Crisis, tax incomes have become a significant instrument of economic policies. In this respect, the fact that tax incomes have been used as an economic policy instrument produced a lot of effects on economy. The determination of the effects of the taxes, which have been used effectively in fiscal policy upon the rate of growth has become important in terms of the type and extent of state's intervention in the economy.

In the literature, the relationship between taxation and economic growth has been evaluated through two different perspectives in terms of growth models. In the first one, which is called the exogenous growth models, Solow (1956) claims that the growth rate is an exogenous because of diminishing returns of the inputs and decreasing efficiencies of economic policies on economic growth. In addition, it has been stated that the influence of taxation (of tax load and/or average tax rate) upon economic will be limited. On the other hand, in the endogenous growth models developed by Romer (1986) and Lucas (1988), it has been predicted that the economic growth rate is endogenously determined. So, human capital stock has been over emphasized, and it has been assumed that tax policies applied by the governments may have influences upon the growth rate in different ways (Ünlükaplan & Arısoy, 2011, pp. 72-73).

The aim of this study is to investigate the dynamic long-run relationships between average tax rate and long-run economic growth for the case of Turkey. The data are annual and cover the period of 1980-2015. In empirical analysis, the functional relationship between the two variables is assumed to be quadratic. The Laffer curve shaped relationship is estimated by using the Autoregressive Distributed Lag (ARDL) approach and evaluated in terms of long-run coefficients.

2. A Theoretical Overview

Tax income is the economical value collected by the state in regard to its power of sovereignty. The most prominent characteristic of tax which has been collected for the purpose of providing public needs is that it is based on the difficult process of having it. It has been thought that taxes which are the monetary transfer from private economy to state economy are unreturned, certain and unlikeable. In addition, when its extent within public incomes has been considered in terms of fiscal policy, regulations of taxes come into prominence (Tokatlıoğlu & Selen, 2017, p. 36; Heilbroner & Bernstein, 1989).

As known, taxes can affect individual preferences and they are also important economic instruments in terms of the structure of economy. In accordance with the economic influences of the taxes, one of the 18th century economists, Adam Smith

ascertained that tariff rates above certain levels could decrease the import and naturally this situation decreases the tax incomes collected. According to him, high tax rates encourage people to do tax evasion. In the 20th century, Arthur Laffer, who is one of the prominent figures of supply-side economics, stated that high tax rates would decrease the taxable income, tax assessment and thus economic growth. As an example of this, Easterley and Rebelo (1993) pointed out that economies with low tax rates are more successful in terms of having a high rate of economic growth than the others with high rates.

Within economic growth theories, first researches about how tax policies affect the growth have been carried out by Solow (1956) within "neoclassical growth model" and it has been claimed that during the static period (long period) growth would not be affected by the tax policies. In this approach, it has been claimed that tax is only influential upon growth during short or transitional periods. (Tokatlıoğlu & Selen, 2017, p. 302) On the other hand, Romer (1986), including the state policies into the business within the scope of "endogenous growth model" stated that tax incomes, as popular instruments of economic policies, could be main determinant upon long period growth process. According to the endogenous growth models; some decisions of economic policies to be taken could have influences upon growth by decreasing capital stock. In the small-scale open economies where capital mobility is high, the size of the effect of economic policies is large. For example, the policies aiming at income taxes as well as succession duty and consumption tax decrease physical capital investments' rate of return. (Ihori, 2001) Also, they may damage the capital accumulation ratio and decrease economic growth rate. (Umutlu et al., 2011) In the supply side economics, however, the subject of taxation has been evaluated in terms of the supply of the economy. In this approach, it has been argued that economic growth rate and thus total tax income collected will rise under tax cut. (Tokatlıoğlu & Selen, 2017, p. 302)

3. Literature Review

The relation between tax incomes and growth has a rich literature. For this study, the previous studies on this subject were divided into two groups: one is for foreign economies and other one is for Turkish economy. In addition, the following recent literature review was carried out with chronological order.

In his study, Marsden (1983) finds that any increase in tax incomes would cause a decrease in economic growth by using regression analysis on data of 20 economies with high and low income rate for the period of 1970-1979. However, by using panel data on 18 OECD countries covering the period of 1965-1991, Mendoza et al. (1997) conclude that taxes affect only transitional economic growth or variability of economic growth instead of long-run economic growth. In addition, by employing

cross-section time series data of 23 OECD countries for the period of 1950-1980, Padovano and Galli (2001) find that marginal tax rate and tax progressivity are negatively correlated with economic growth. Based on their findings, they argue that previous studies which find no significant correlation between taxation and economic growth are misspecified in terms of tax variable.

On the other hand, Widmalm (2001), argue that there is no direct theoretical argument why there should be a correlation between average tax rate and economic growth. By using pooled cross-section data from 23 OECD countries for the period of 1965-1990, he finds that this correlation is statistically insignificant. In his empirical study, Tomljanovich (2004) finds somewhat different results for the USA. His econometric evidence indicates no higher average tax rates only temporarily lower economic growth for the panel data on the states of the USA for the period of 1972-1998.

However, Fu (2005) recently analyzes the period of 1986-2003 for Chinese economy and ascertains a statistically significant co-integration between tax incomes and gross domestic product. In the same year, Mamatzakis (2005) searches the causal relationship between tax incomes and economic growth for the Greek economy between 1960 and 2003 through vector autoregressions (VAR) methodology and claims that there is a causality from tax incomes to economic growth.

Lee and Gordon (2005) investigate the possible relationship between the two variables for the USA. Their empirical analyses are based on the period of 1970-1997. In their study, they find empirical proof in accordance with the fact that any increase in the corporate tax influences economic growth in a negative way. Similarly, Mahdavi (2008), in his study of panel data analysis, claims that an increase in the total tax income of developing economies would have a decreasing influence upon economic growth. In the same year, Arnold (2008) uses a data set of 21 OECD countries through panel estimation method. He concludes that taxes have a significant negative effect on economic growth. Karras and Furceri (2009) use a data set of OECD countries. In their studies of panel data, they estimate a negative correlation between growth and tax incomes for the period of 1965-2003. In addition, Padda and Akram (2009) investigate empirically the same relationship for Pakistan, India and Sri Lanka. In their studies through VAR method, they find that increase in tax rates have a damaging effect on economic growth.

Recently, Mashkoor (2010) analyzes the causal relationship between the two variable for the period of 1973-2008 of Pakistan. According to his results, there is a one-way causality from taxes to economic growth. In the same year, Romer and Romer (2010) also publish a paper on this subject. Their study focuse on the period of 1947-2007 of the USA. Under time-series analysis, as expected, they find a negative relation between tax incomes and economic growth. Taha et al. (2011) examine the causal relationship between tax incomes and economic growth for the

period of 1970 -2009 of Malaysia. According to their results, causality runs from economic growth to tax incomes. By utilizing a panel data on the period of 1995-2010 27 EU countries, Stoilova and Patonov (2012) conclude that the influential elements of direct taxes supporting economic growth are more efficient. For Chinese economy, Zeng et al. (2013) investigate the period of 1950-2011 by using time-series techniques. They find that economic growth has a considerable influence upon tax incomes.

McNabb and LeMay-Boucher (2014) analyze 100 less developed countries for the period of 1980-2010 by using panel data. Their statistical results indicate that an increase in income taxes has a decreasing influence upon economic growth rates. In order to determine the dynamic relationships between the two variables, Takumah (2014) investigates the period of 1986-201 of Gana by using VAR method. In his study, he concludes that there exists a negative relationship between tax incomes and economic growth in both short and long periods. In addition, he states that tax incomes in both periods affect economic growth in a positive way. In a similar way, Lien (2016) examines the relationship between the two variables for Vietnam. By focusing the period of 2006-2014 on panel data analysis, he finds out that there is a positive interaction between tax incomes and economic growth. The same results are also found by Eugene and Abigail (2016) for Nigeria, and by Babatunde et al. (2017) for Africa.

Among the prominent studies on Turkish economy about the same subject is by Katırcıoğlu (2010) using bounds testing and co-integration techniques. He investigates the short and long run relationships between total tax incomes and economic growth in Turkey for the period of 1960-2008. In his study, he could not determine a long-run relationship between the two variables. The similar results are also obtained by Paksoy and Bakan (2010). However, using the period of 1975-2004 for Turkey, Kuştepeli and Bilman (2009) result that any increase in income tax, capital and goods and service tax has negative effect on economic growth.

Yılmaz and Tezcan (2007) searches the influence of tax revenue and capital asset investments upon economic growth for Turkey. According to the empirical results, there is a positive relationship between GDP and direct taxes, a negative relation between GDP and indirect taxes. On the other hand, Saraç (2015) finds just contrary results for the case of Turkey: negative relationship between direct taxes and GDP, however, positive relationship indirect taxes and GDP. In terms of causality for Turkey, Helhel and Demir (2012) determine a one-way causality relation from direct and indirect taxes to GDP. Similarly, in their studies Erdoğan et al. (2013) find a one-way causality from indirect tax incomes to economic growth both in short and long periods.

4. Data and Methodology

The data used in this study are annual and cover the period of 1980-2015. There are two main variables in this study. The first one is long-run economic growth rate (BO). The second variable is tax burden or average tax rate (VO). The long run economic growth rate is separately produced under three alternative filters. They are Hodrick-Prescott, Baxter-King and Christiano-Fitzgerald filters[1]. Average tax rate is measured by dividing the total amount of taxes into gross national income. The details of all variables are given in Table 1.

Table 1. Description of the Variables

Symbol of Variable	Description of The Variable
BO1	Long-run economic growth rate produced by Hodrick-Prescott filter.
BO2	Long-run economic growth rate produced by Baxter-King filter.
BO3	Long-run economic growth rate produced by Christiano-Fiztgerald filter.
VO	Average tax rate or tax burden (Total Amount of Taxes/GDP)

Since the purpose of the study is to determine whether average tax rate affects long-run economic growth rate in the long-run, the following functional relationship is statistically estimated under modern time series analysis.

BO = f(VO, VO2)

In related empirical literature, there is a strong consensus on the U-shaped relationship between the two variables. To investigate the U-shaped effect of average tax rate on long-run economic growth rate in this study, the following quadratic regression is estimated by the ARDL model.

$$BO_t = \beta_0 + \beta_1 VO_t + \beta_2 VO_t^2 + \varepsilon_t$$

If β_1 and β_2 in the estimated long-run regression are found to be negative and positive respectively, it is then said that there exists an U-shaped relationship between average tax rate and long-run economic growth rate. So, the average tax rate minimizing the long-run economic growth rate will equal to $\beta_1/2\beta_2$. (Yamak ve Yamak, 1995)

In this study, the ARDL co-integration approach developed by Pesaran and Shin (1999) was used to examine the long-run relationship between long-run economic growth rate and average tax rate. The ARDL approach does not require prior knowledge on the order of integration of the variables. It can be easily used for the variables with different orders of integration (Tanriover &Yamak, 2015). At this

[1] For the application of Hodrick-Prescott filter, see Yamak and Topbaş (2008).

point, it should be noted that all variables should be I(0) or I(1), but not higher than I(1).

5. Empirical Findings

Even though the ARDL approach does not require prior knowledge on the order of integration of the variables, the order of integration must be determined for each variable in order to decide whether the use of the ARDL is appropriate. For this purpose, the Augmented Dickey-Fuller (ADF)[1] unit root test was first performed for the level and first difference of each variable. Table 2 presents the results of the ADF test with and without the inclusion of a trend detecting a unit root in the levels and first differences of the variables[2]. As seen from the table, the ADF- t statistics calculated for the levels of all variables except BO3 indicate that the non-stationary of the levels of the variables can not be rejected at any significant level. However, the first difference of each appears to be stationary according to the ADF test statistics.

Table 2. ADF Unit-Root Test Results

Variables	Level		First Difference	
	Constant	Constant+ Trend	Constant	Constant + Trend
$BO1$	-1.586	-1.637	-5.126 ***	-5.045 ***
$BO2$	-2.256	-2.204	-6.121 ***	-5.985 ***
$BO3$	-5.806 ***	-5.639 ***	-5.045 ***	-4.990 ***
VO	-1.065	-2.243	-7.316 ***	-7.236 ***
VO^2	-1.237	-2.312	-7.360 ***	-7.261 ***

Note: Lag length was selected by using Akaike information criteria (AIC). The maximum lag length was set to 8. *** denotes significance level of 1%.

As noted before, in the ARDL approach all variables should be I(0) or I(1), but not higher than I(1). According to the ADF unit root test results, all variables are found to be stationary in their first levels. Thus, the ARDL approach can be easily used to investigate the possible long-run relationship between long-run economic growth and average tax rate. As required by ARDL approach, firstly bounds test is applied to determine the presence of long-run relationship between the variables.

The results of the ARDL bounds test are shown in Table 3. As seen from the table, only one of the F-statistics, calculated as 1.827, is not greater than the upper critical value at 10% significance level. Thus, the null hypothesis of no long-run relationship between long-run economic growth and average tax rate in Model 1 can not be rejected. For other co-integration regressions (Models 2 and 3), the calculated F-

[1]Dickey and Fuller (1979).
[2]The number of lags used in the ADF regressions were selected using the information criterion provided by AIC.

statistics are greater than the upper critical value bounds, so the null hypotheses of no long-run relationship between the variables are rejected at least at 10% significance level.

According to the ARDL bounds test results, in Models 2 and 3 where long-run economic growth rates are produced by using Baxter-King and Christiano-Fiztgerald filters, respectively, there is a quadratic long-run relationship between average tax rate and long-run economic growth rate.

Table 3. ARDL Bounds Test Results

Model	F-Statistics	Conclusion
1	1.827	Not co-integrated
2	4.575 **	Co-integrated
3	17.775 ***	Co-integrated

Note: *** and ** denote significance at the 1% and 5% levels, respectively. Critical value bounds are 5.00 at 1%, 3.87 at 5% and 2.63 at 10%, respectively.

After determining the presence of long-run relationship between the bi-variates, the long-run elasticity of average tax rate on the long run growth is estimated for both models and the results are given in Table 4. As seen from the table, the estimated long-run elasticities are negative and statistically significant at least at 10% level. The size of the long-run elasticity coefficient is almost the same for both models. In Model 2 where long-run economic growth rates are produced by using Baxter-King filter, the estimated long-run elasticity coefficient is -0.948. It is -1.162 when long-run economic growth rates are produced by using Christiano-Fiztgerald filter. In addition, the estimated intercepts are found to be 0.119 and 0.146 for Models 1 and 2, respectively. Both intercepts are statistically significant at 1%.

Table 4. Long-Run Coefficients

Dependent Variable	VO	VO^2	Intercept	ARDL Model
$BO2$	-0.948 *	2.752*	0.119 **	(4,4,4)
$BO3$	-1.162 **	3.354**	0.146 **	(2,4,4)

Note: ** and *, denote significance at the 5% and %10 levels, respectively. The optimum ARDL model order is determined by the information criteria based on Akaike information criteria (AIC).

The results of diagnostic tests on the residuals for serial correlation, normality, heteroscedasticity and stability are reported in Table 5. Firstly, there is no any model suffering from any autocorrelation problem. In both estimated models, the calculated χ^2 is not greater than the critical value. Therefore, the null hypothesis that indicates non-existence of autocorrelation can not be rejected for each model at any significant level. Secondly, for both models, heteroscedasticity does not seem to be a diagnostic problem on residuals. Thirdly, the JB tests indicate that the residuals in Models 2 and 3 are normally distributed. At this point, both models pass the

diagnostic tests of the ARDL model in terms of stability. Figures 1-2 present CUSUM and CUSUMSQ of both models. As can be seen from Figures 1-2, the plots of CUSUM and CUSUMSQ statistics stay approximately within the critical bonds of 5% level of significance. Thus, the null hypothesis that all coefficients in the given regression are stable can not be rejected at the 5% level.

Table 5. Diagnostic Test Results of ARDL Model

Dependent Variable	Heteroscedasticity χ^2	Serial Correlation χ^2	Normality JB	Is model stable?
BO2	12.105	4.501	3.948	**Yes**
BO3	16.437	2.217	2.673	**Yes**

Note: ** and * denote significance at the 5% and 10% levels, respectively.

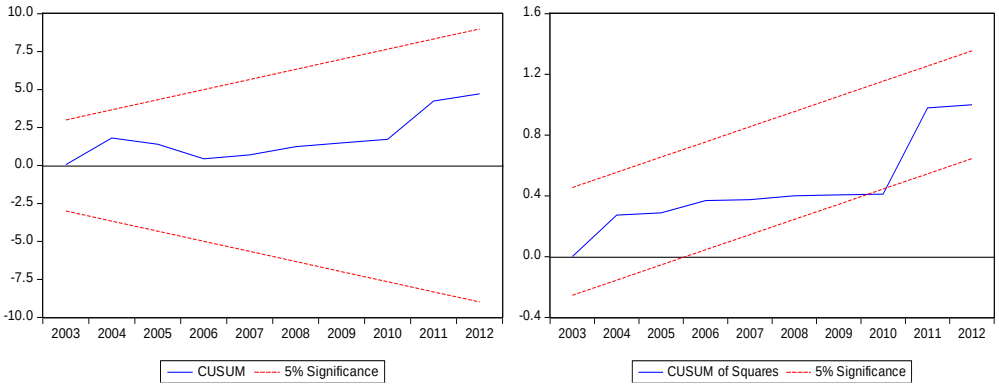

Figure 1. Plot of Cumulative Sum of Squares of Recursive Residuals for Model 2

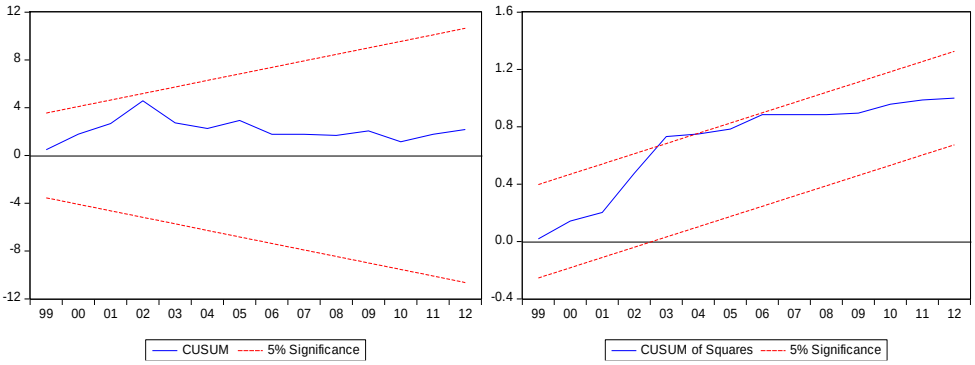

Figure 2. Plot of Cumulative Sum of Squares of Recursive Residuals for Model 3

As previously mentioned, all long-run coefficients in ARDL models are statistically significant at least at the 10% level and have also expected signs. Since the coefficient of VO^2 is positive and statistically different from zero, the relationship

between the two variables is quadratic. In addition, the coefficient of VO is found to be positive and statistically significant. This means that the relationship between long-run economic growth rate and average tax rate is the U-shaped curve. According to ARDL results, the long-run growth rate is 0.119 and 0.146 for Models 1 and 2, respectively when the average tax rate zero. For both models, the average tax rate which minimizes long-run economic growth rate is about 0.17. When the average tax rate starts to increase to 0.17 from zero, long-run economic growth rate is starting to decrease. After that point (0.17), long-run economic growth rate re-starts to increase gradually. At present time in Turkey the effective tax rate is about 0.21.

In order to determine whether the tax policy conducted in Turkey for the period of 1980-2015 is effective in terms of the long-run economic growth rate, the tax rate minimizing the long-run economic growth rate must be compared to the actual average tax rates. If the actual or effective tax rate is above the minimum level of the U-shaped curve, the fiscal authority has power to increase the long-run economic growth by reducing the effective tax rate. According to the results of the ARDL estimation in this study, the tax policy applied in Turkey for the period of 1980-1999 is mostly effective in keeping the average tax rate lower than its optimal level. However, especially for the period of 2000-2005, it is higher than the optimal rate. It was possible to get the same long-run economic growth by lowering the average tax rate. As a result, after 2000's tax policy implemented in Turkey is not certainly effective in keeping the long-run economic growth rate by causing welfare cost.

6. Conclusion

In this paper, the ARDL technique was used to identify the long-run relationship between the average tax rate and long-run economic growth rate in Turkey for the period of 1980-2015. The long run economic growth rate is separately produced under three alternative filters. They are Hodrick-Prescott, Baxter-King and Christiano-Fitzgerald filters.

There are two main findings of this study. The first finding implies there is a long-run relationship between the average tax rate and long-run economic growth according to the bounds test of the ARDL. The second finding is related to the functional form of the relationship between long-run economic growth and actual average tax rate. According to results of the ARDL, the relationship between the two variables is quadratic. This result implies that there are two different average tax rates for any level of long-run economic growth, but only one for the minimum level of long-run economic growth. Nowadays, the average tax rate in Turkey is about 0.21. Since it is greater than 0.17 for the minimum level of long-run economic growth, tax policy implemented in Turkey is certainly ineffective in terms of long-

run economic growth. It is possible to get the same long-run economic growth rate by applying an average tax rate of 0.14 instead of 0.21.

7. References

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