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Tax Optimality in Turkey: An Analysis for Total Tax Revenues[1]

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Abstract

Within the scope of optimal tax theory, the optimality problem of fiscal policies in the Turkish tax system for the period 1980-2019 will be discussed from the perspective of the Laffer curve. The study, it is aimed to obtain the real Laffer curve showing the relationship between total tax revenues and tax rate for Turkey. Macroeconomic variables such as tax rates, tax revenues, crisis periods, unemployment rates, and real wages are included in the analysis with the help of an econometric package program. Within the scope of time series, the effect of the tax rate on tax revenues was investigated using Johansen and ARDL cointegration approaches. According to the findings obtained from the analyses, the total tax rates in Turkey are on the right of the Laffer curve, in other words, the Laffer curve exceeds the optimal point. Based on the hypothetical existence of Laffer theorem's in Turkey, the optimal tax rates were calculated for the total tax revenues, and the current tax rates of each year were compared with the optimal tax rates. It has been determined that the total tax rates in the specified period are in the forbidden region of the Laffer curve. This situation, which states that the tax burden has increased, reveals that the taxation process should be revised. There is no comprehensive empirical analysis of Turkey. The findings will guide the applications that will contribute to the field. The originality of the work; is based on the inclusion of time series analysis of macroeconomic data such as crisis periods, unemployment rates, real wages as independent variables in determining the relationship between tax revenues and tax rates. The validity of the Laffer curve for each tax (Income Tax, Corporation Tax, VAT) in the Turkish tax system can be examined with the data and methods used in the research.

Keywords: Optimal taxation; The laffer curve; Tax rate in Turkey; Johansen cointegration test.

1. Introduction

With the adoption of the social state concept, protection of the social structure by public authorities, reaching the targeted increase in the level of welfare and the increase in public goods, and services offered in order to sustain welfare in a stable manner has also increased public expenditures. The increasing need for financing in public expenditures has undoubtedly necessitated an increase in public revenues. Public revenues, which are an important concept of public finance, are the goods and services of public enterprises, primarily taxes, fees, fines, etc. It includes income from its administrative activities and from different sources such as gifts and donations. Among the public revenues, tax, as well as being a comprehensive and definite source of income, has inevitable effects in countries in terms of economic, social and political aspects.

At the heart of the social contract, taxation aims at giving everyone a fair and equal opportunity through redistribution. In this direction, an effective and fair tax system; determines policies to reduce income and wealth inequality, to provide accessible and quality health, education and public services for all segments of society, as well as to increase the employment market, consumer protection and social welfare. As a matter of fact, an effective, fair and transparent tax system aims at a redistribution mechanism that ensures optimal use of the collected tax revenue and benefits all individuals without discrimination (Fair Tax Reports, 2018).

Taxes play a key role in enabling tax systems and making growth sustainable and fair. The main purpose of taxation is to increase the income needed to finance public expenditures. Governments with stable tax revenue; can provide various public goods and services such as ensuring national security, building social infrastructure, and providing welfare services. Tax revenues depend on two variables, tax rates, and tax base, and are considered as a measure of the state's control over its economic resources. In ideal tax systems, policies to increase tax revenue are

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determined by considering the balance between fairness and efficiency. According to optimal taxation, which contributes to the analysis of this balance, the costs that will arise due to efficiency in maximizing fiscal efficiency should be minimized.

According to the optimal taxation approach, the state should increase its income at a certain level. In this context, the state can use especially income tax, consumption tax or both tax groups as a tool. The decisions taken by the government should be consistent with individual or firm optimization and should maximize the social welfare function for different members of the society (Alm, 1996). In this regard, the optimal taxation theory generally follows two different paths: the optimal consumption tax (indirect taxes) theory and the optimal income tax (direct taxes) theory. The greatest achievement of the theories of optimal income and consumption taxes is that, under many assumptions, the tax system determines the rules that must be followed to maximize social welfare. These rules provide formulas for optimal tax rates for different goods or different income levels that are functions of various key parameters in the economy (Boskin, 1976).

One of the studies dealing with tax revenues within the scope of optimal taxation is the Laffer curve. The Laffer curve is based on a theory that describes the balance between tax rates and tax revenues. The theory argues that if tax rates are too high, they will deter taxed activities such as consumption and investment, while too low rates will not generate sufficient income. In this respect, the Laffer curve for determining the optimal tax rate continues to be discussed in current economic policies. Because tax rates have a critical impact on both individuals and the state, from this point of view, the role of Laffer Theorem's is focused on in the study. In this context, firstly, the optimal tax theorem is emphasized and explanations about the Laffer curve models in the literature are included within the scope of optimal taxation. Looking at the literature, the Laffer curve analyses has been made in terms of different taxes for various countries or country groups. However, there is no comprehensive empirical analysis of Turkey. Therefore, what is the relationship between tax rates and tax revenues in the study? On which side of the Laffer curve are tax rates in Turkey? Is there a difference between optimal rates and current rates in Turkey? The answers to the questions were investigated from the perspective of the Laffer curve. First, whether there is a relationship between tax rates and tax revenues in Turkey was estimated by subjecting macroeconomic data (such as crisis periods, unemployment rates, real wages) to time series analysis as independent variables. Developed by Beenstock (1979) in analysis;

Tax Income = f (Tax Rate,Tax Rate^2) model was used in three different formulations by adding fixed, trending and previous year GDP variable. The dependent variable in the model is tax income. Tax rate, square of tax rate, real wage and unemployment rate variables were used as explanatory variables. Crisis periods are dummy variables. The data set for the period 1980-2019 was analyzed with the Johansen cointegration test. According to the analysis findings, the coefficient of the tax rate variable was positive and the coefficient of the square of the tax rate variable was negative. This result supports the Laffer curve. In addition, in the results obtained, it has been determined that the current tax rates in total taxes and indirect taxes are above the optimal tax rate in general for the period of 1980-2019 in Turkey, in other words, the total tax rates are in the forbidden region of the Laffer curve in the determined period.

2. The Laffer Theorem in Optimal Taxation

Taxes are the most important element of financial policies for every state, as well as institutions, tax systems are a powerful tool for managing the economy in modern business and market conditions. With the help of taxes, the relations of economic institutions with the relevant budgets, banks, and other market participants are determined and the foreign economic activities of the states are regulated. Taxes are among the economic methods that provide the relationship between national interests and the commercial interests of economic institutions. The tax system of each country is one of the main tools for managing the socio-economic functions of the general economic system and the state (Tsindeliani *et al.*, 2019).

The subject and amount of the tax within the framework of both economics, financial, and socio-economic purposes is an ongoing debate from the past to the present. It also gives information about which resources will be taxed and mainly about the taxable segment in the society. With this situation, there is a conflict of interest regarding taxation among the segments that make up the society. The tariff on which the tax is collected is one of the reasons for the conflict of interest. For this reason, it is important to reach a general consensus on the efforts to collect taxes in the most appropriate amount, through the most appropriate sources, by the most appropriate methods. The important point at this point is how to determine the "optimal" one. The most appropriate tax is generally referred to as the "optimal tax". The criteria that determine the optimality in optimal taxation and the discussions on which of these criteria should be taken into account are discussed in three different areas. This; tax revenue is efficient and justice (Yüksel, 2016). The design of optimal tax policies broadly affects all public services financed by tax revenue and all members of society. Due to information constraints on individuals' abilities, needs, or preferences, the balance that must be struck between the objectives of efficiency and fairness plays a decisive role in the design of optimal tax policy. Optimal taxation theory is largely based on the philosophical foundations[2] of political economy. What matters in optimal taxation is the balance between efficiency and fairness (Tenhunen, 2007). In addition to the said balance, ensuring fiscal efficiency for the state is among the priority objectives in optimal taxation. Therefore, considering the "fiscal limit", which is one of the taxation limits that directly affect the taxation process, it is necessary to stop the rate increase at the point where tax revenues start to decrease. At this point, the tax rate that

[2] The basis of the differences of opinion seen in the early periods of the history of taxation and economic thought is based on Schumpeter (1959), Musgrave (1985), Salanie (2003) and Screpanti and Zamagni (2005).

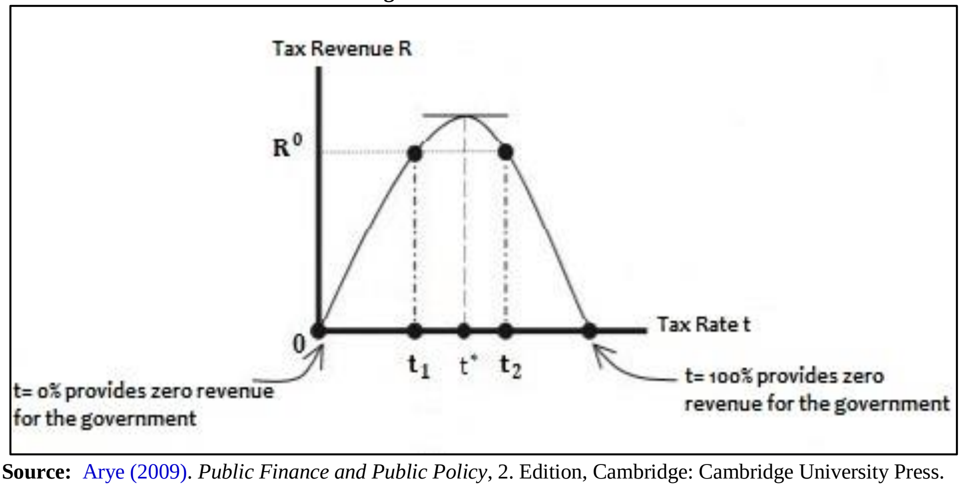
maximizes tax revenues is accepted as the "optimal tax rate". The perspective that evaluates tax revenues as a criterion in this way belongs to the supply-side school of economics. Especially Arthur Laffer; analyzed and revealed the famous Laffer curve, named after him, in which he explains the criterion of tax revenues (Panades, 2003; Yüksel, 2016) and advocated tax cuts, free trade, and deregulation[3] rather than open budget spending and flexible monetary policy. According to Laffer, the state; should encourage production and supply, not consumption and demand. Because the strongest barrier to working, saving, and investing is high progressive taxes (Skousen, 2007). Laffer theory deals with the effect of changing the tax rates on income (Hillman, 2009). When the tax rate is below a certain point, raising the tax rate can increase the state's tax revenue. However, when this limit is exceeded, the continued increase in the tax rate may reduce the tax revenue of the state. Because, higher tax rates; will curb economic growth, narrow the tax base, and subsequently reduce tax revenues. Tax cuts, on the other hand, can stimulate economic growth, expand tax bases and increase tax revenues (Lin and Jia, 2019). The curve represents the relationship between the tax rate and tax revenue. According to Laffer's definition, if the tax rate is zero or 100 percent, the tax revenue will be zero because no rational individual would create a tax base for a 100 percent tax. Between these two extremes, when the tax rate is increased from zero to 100 percent, tax revenue must first increase, reach a maximum, and eventually decrease (Eklund and Malmsten, 2019).

The Laffer curve is important for policy applications in countries whose taxation objective is to increase their income in general (Lundberg, 2017). Arthur Laffer, who developed the idea that was limitedly proposed by the philosopher and social scientist Ibn-i Khaldun in the 1377s, speaks of an income-maximizing tax rate between zero and one hundred percent for the relationship between tax rate and tax income. Accordingly, the relationship between tax rate and tax revenue is not a simple straight line, and if the tax rate continues to increase after a certain point, it will cause tax revenues to decrease. Hence, there is an income maximizing tax rate. Tax rates above this maximal rate (the "prohibitive range" according to Laffer) are considered inefficient in that they harm the economy and can reduce tax revenues as they cause loss of taxable income. Tax rates that are below the rate that maximizes income are more preferred because they cause less income and also contribute to the faster growth of the economy (Pascoe, 2019). As a matter of fact, the high tax rates arbitrarily determined by the states that want to maximize their income in order to obtain the majority of their tax revenues from the private sector are not an acceptable practice in terms of optimality (Panades, 2003).

The Laffer curve, which is a product of the supply-side approach, argues that the current tax rate is generally higher than the optimal rate, and therefore a decrease in tax rates will provide benefits in terms of public revenues and economic growth, and shows the relationship between tax revenues and tax rates (Yüksel, 2016), evaluates whether tax reductions increase or decrease tax revenues within the framework of certain basic principles. Change in tax revenues; It may vary according to the income reactions to changes in tax rates, the functioning of the tax system, the ease of transition to economic activities, the level of tax rates currently in effect, the prevalence of legal and accounting tax gaps and the trends of production factors (Laffer, 2004).

In Figure 1, the Laffer curve, which expresses the relationship between tax revenue and tax rate, is given.

Figure-1. The Laffer Curve



Source: Arye (2009). *Public Finance and Public Policy*, 2. Edition, Cambridge: Cambridge University Press.

The Laffer curve is based on the observation that zero tax revenue will be generated when the tax rate is 0% and 100%. In this case, it is an expected response that individuals stop working before tax rates reach 100%. The tax revenue in Figure 1 is R^0; a low tax rate; t_1 or high tax rate; t_2 it can be obtained by applying. All tax rates that exceed the income-maximizing point t^* are on the "forbidden" side of the Laffer curve. On the "forbidden" (deterrent) side of the Laffer curve, the same income can be obtained at a lower tax rate and therefore with a lower tax burden. Hillman (2009). Therefore, increases in tax rates that exceed the optimal point cause a decrease in tax revenues (Walewski, 1999).

[3] Deregulation, which means 'deregulation'; refers to regulatory reforms aimed at removing regulations in sectors such as telecom networks, air and road transport (Newbery and Pollitt, 1997: 269.)

2.1. The Laffer Theorem in Literature

The history of empirical studies on this subject is quite old. While some of the studies are at the country level, some of them cover country groups. Some of the studies on the Laffer curve theorem in order to estimate income maximizing tax rates are as follows. The first study is the work of Beenstock, which creates the equations of the models that are decisive in the analysis part. The Laffer curve was estimated by Beenstock (1979) for the United Kingdom for the period 1946-1977. In the study, where the ordinary least squares method is used, all taxes are in millions (British Pounds). Tax rates are calculated by dividing tax revenues by GDP. According to the findings, the current tax rate applied in 1979 is 40%; The estimated optimal tax rate was found to be 60% (Beenstock, 1979).

Stuart (1981) examined the effects of these increases on the Swedish economy in terms of taxation, using a simple two-sector general equilibrium model, as the effective marginal tax rates on labor income in Sweden increased to around 50% in 1959 and then to 80%. In the model estimation, Sweden's GDP explains about 75% of the decline in the growth rate. Total tax revenue calculations are also derived from the model. In the findings obtained, it was seen that the optimal tax rate (peak point) was around 70%. Accordingly, it has been determined that the tax rates applied in Sweden are in the downward sloping part (on the right side) of the Laffer curve (Stuart, 1981).

Bender (1984), in his study to test the validity of the Laffer curve in personal income tax for the USA, concluded that a reduction in the personal income tax rate would reduce tax income, given the current tax rates in the USA (Bender, 1984).

Ravestein and Vijlbrief (1988), also examined the effects of an increase in average and marginal tax rates on income taxes and indirect taxes in the Netherlands, using a simple general equilibrium model that largely corresponds to Stuart's model. Taking the year 1970 as the base year, it has been determined that the marginal rate of 66.9% in the Laffer curve maximizes tax revenues. It has also been emphasized that an additional tax rate increase will cause a loss of welfare of 1.24 units on individuals (Ravestein and Vijlbrief, 1988).

Walewski (1999), in his work on the Czech Republic, Poland, and Hungary, proved the existence of the Laffer curve with a simple regression equation. The correlation coefficient between tax rate and tax revenue in Hungary was found to be 0.96, but it was argued that the relationship between tax rates and tax revenues did not play an important role in determining budget revenues in these countries. It has been determined that the Czech Republic and Poland economy is located on the left side of the Laffer curve (normal area), while the Hungarian economy is located around the peak of the Laffer curve (Walewski, 1999).

Matthews (2003), tested the validity of the Laffer curve for VAT in EU-14 countries using time series analysis. Austria (1974-97), Belgium (1971-97), Denmark (1970-95), France (1970-97), Germany (1970-97), Greece (1987-97), Italy (1973-98), Ireland OLS for Luxembourg (1972-96), the Netherlands (1970-97), Portugal (1986-97), Spain (1986-97), Sweden (1980-1998), and the UK (1973-98), and The maximum range for the Laffer Curve calculated by the LAD method was estimated as 18%-19.3%. In addition, the author emphasized that if VAT is increased by the authorities, individuals will reduce their consumption while trying to pay VAT (Matthews, 2003).

Brill and Hassett (2007), estimated income-maximizing corporate tax rates in OECD countries for the period 1980-2005. Using a simple regression model, the income-maximizing corporate tax rate was estimated to be similar in the late 1980s, ranging from about 30% to 34%. For the most recent period of the sample, it was observed that the income maximizing rate dropped sharply to 26% (Brill and Hassett, 2007).

In their study, Papp and Takats (2008) tested how reductions in the personal income tax rate for Russia could increase revenues by improving tax compliance through three models, and concluded that tax rate increases increase tax revenues until they reach 12%. It is stated that the Laffer effect is due to the increase in tax compliance, not the labor supply response. In cases where the tax rate exceeds 12%, the percentage of honest taxpayers has decreased significantly Papp and Takats (2008).

Trandafir and Brezeanu (2011), created the Laffer curve for the Romanian economy over the tax revenues realized in the 2000-2010 period in their study. In the correlation relationship in which tax revenues realized at current prices, GDP at current prices, tax revenue realized with GDP deflator, and real GDP variables are used, the maximum real tax revenue was achieved in 2010 with a rate of 10.96%, in the Romanian tax policy optimality. In 2000, 2001, 2004, 2005, 2006, 2007, 2008, and 2009, the rates applied remained in the forbidden region (to the right of the peak) of the Laffer curve (Trandafir and Brezeanu, 2011).

In another study for the Romanian economy, the Laffer curve was calculated with quarterly data for the 1999-2009 periods by using the linear probit model by Mutascu (2012). In the results of this model, which provides information about the possibility of a change in the total tax revenues when a change occurs in the tax rate, it has been determined that the tax revenues decrease if the state increases the tax rates and the tax evasion decreases when the tax rates decrease (Mutascu, 2012).

In the study by Riihela *et al.* (2014), using the regression model with time series data for the Finnish economy between 1990 and 2010, the highest tax rate in Finland was 62.7% in 1990 while; the highest marginal rate was 44% in 2010. The marginal tax rate at which income tax revenues are the maximum is 66.7%. It has also been emphasized that the highest marginal tax rate is not close to the peak of the Laffer curve (Riihela *et al.*, 2014).

Megersa (2015), in the long-run relationship between public debt and economic growth considers within the scope of the Laffer curve the point where debt contributes to economic growth up to a certain point and then starts to have a negative effect on growth. In the second-order regression-based model, in the study consisting of low-income Sub-Saharan African economies and using panel data analysis, a bell-shaped relationship was determined between economic growth and total public debt, and it is supported by Laffer theorem (Megersa, 2015).

Kbiladze (2015), drew static and dynamic Laffer curves for the period of 1996-2012 of the Georgian economy using the growth rate, corporate tax income, and tax rate variables and the regression model. In the findings obtained, it has been determined that the optimal tax rate in the Georgian economy varies between 13.6% and 17.6% (Kbiladze, 2015).

Varela-Candamio and Morollon (2017), used the least- squares method to test the existence of a parabolic relationship between the tax rate and tax income for different cities in Spanish income tax. In addition, this variability was also found to be significant in the analysis they made according to the size of the province. And also, the maximum tax revenue of the two main cities (Madrid and Barcelona) was estimated to be obtained with a tax rate of 34%, and it was observed that the maximum income levels were reached in all other cities at similar rates (Varela-Candamio and Morollon, 2017).

In a study on the Chinese economy, Lin and Jia (2019) examined the relationship between tax rates and direct tax revenues (over labor income) from the perspective of the Laffer curve. In the findings, it has been determined that the peak of the Laffer curve for China is approximately 40%. The direct tax rate that maximizes tax revenues is 35%. In addition, tax reductions have been strongly recommended by the authors as they have a positive effect on the economy and government revenues (Lin and Jia, 2019).

Latif *et al.* (2019), estimated the Laffer curve on the basis of goods and services taxes for the period 1981-2018 in their study for Pakistan. In the study using time series analysis, the existence of the Laffer curve in the Pakistani economy was confirmed. According to the results, the current tax rates of Pakistan are in the forbidden region of the Laffer curve. As a matter of fact, since the rates on goods and services taxes are very high, it is observed with the graph that tax revenues have decreased over the years (Latif *et al.*, 2019).

Hajek *et al.* (2021), tested the Laffer curve models for the 2000-2012 periods in EU countries. In addition to the graphical expression of certain effects, the results of the cross-sectional panel data regression, which tests the model derived from the theoretical decomposition of the curve, are also included in the study. According to the results of the analysis, a negative correlation was observed between corporate tax income and tax rate, a positive correlation between labor productivity and corporate tax income, and a negative correlation between tax rate and unemployment level. Other effects (silver economy, tax competition, government spending, etc.) have not been proven (Hajek *et al.*, 2021).

Kurt (2017), evaluated the effectiveness of tax policies implemented in Turkey by estimating the Laffer curve for Turkey in the period 2004:Q1-2015:Q2 using the ordinary least squares method. In the results obtained, respectively the tax rates applied for total, indirect and direct taxes are 25.4%, 17.4%, and 7.73%, respectively; optimal rates were determined as 25.3%, 16.7%, and 9.06%. In terms of total taxes, while the tax policies in Turkey are seen as successful in catching the optimal tax rates, it has been stated that a small tax reduction in indirect taxes and a tax increase indirect taxes can be made in order to achieve the optimal (Kurt, 2017).

Dökmen (2018), used the nonlinear regression technique with a sample of 26 OECD countries between 2000 and 2015 to test the corporate tax rate-revenue relationship. According to the results of the analysis, it has been determined that the Laffer curve is valid in terms of corporate tax, and the rate that maximizes corporate tax revenues is determined to be at the level of 34% (Dökmen, 2018).

Şen and Bulut (2021), examined the income-maximizing corporate tax rate in Turkey for the period 1980-2019 using time series data. Estimated income maximizing corporate tax rate is 23.5% (current statutory corporate tax rate is 22%[4]). According to these findings, it was stated by the authorities that increasing the tax rate would have little effect on maximizing income and would not be an appropriate tax policy option for Turkey (Şen and Bulut, 2021).

As can be seen, the relationship between countries' tax revenues and tax rates differs, because the social, economic, technological and cultural structure of each country is different from each other. Situation in Turkey;

H1: There is a difference between tax revenues and tax rates.

H2: Effective on unemployment and real wage tax revenues.

H3: The difference between current rates and optimal rates in Turkey is high.

3. Methodology, Data, and Findings

According to Laffer Theorem, which developed within the scope of supply-side economics, which sees taxes as a critical policy tool, the tax rate that maximizes tax revenues is optimal. Considering that the primary sources for the Laffer theorem, which is an important issue in the finance literature, are not used sufficiently (Yüksel, 2016), the validity of the Laffer analysis for total tax revenues in Turkey within the scope of optimal taxation in the research has been tried to be revealed with the help of econometric models.

In order to estimate the Laffer curve, a quadratic function was used, taking into account the geometric assumptions regarding the curve. In this context, there is a squared term in the relevant function. In fact, constructing a quadratic function with a squared term can be seen as pre-confirming the validity of Laffer Theorem's. Namely, in the function $y = a + bx + cx^2$, it can be thought that the dependent variable will be conical in shape with respect to the independent variable. However, for a curve similar to an inverted U-shaped Laffer curve, a value must be zero, b value must be positive and c value must be negative (Yüksel, 2016). As a matter of fact, in this part of the study, the validity of Laffer Theorem's will be analyzed based on the sign of the coefficients.

The implementation for Turkey covers the period 1980-2019. Annual data were used in the study. GDP and total tax revenue variables are calculated with the 2010 base year CPI series. GDP and tax revenues are in million TL.

[4] It is applied at a rate of 25% for annual-temporary corporate tax returns that must be submitted as of July 1, 2021. The said rate has been determined as 23% for the year 2022.

The tax rate (TR) is taken as the ratio of total tax revenues (TI) to GDP. Ministry of Treasury and Finance Revenue Administration for tax data; IMF for unemployment rate data; The World Bank database was used for real wage growth and GDP data. Due to the quadratic nature of the Laffer curve, the square of tax rates (TRS) is used in the models. Tax revenues are dependent variables; other variables are independent variables. The originality of the work; It is based on the inclusion of time series analysis of macroeconomic data (such as crisis periods, unemployment rates, real wages) as independent variables in determining the relationship between tax revenues and tax rates.

Using the model applied by Beenstock (1979), the validity of the Laffer curve in Turkey was tested for the period covering 1980-2019. Beenstock's work includes three different models. In the first model, the Laffer curve is a static curve and does not move in time. In the second model, the time variable is added to the model, assuming that the Laffer curve moves in time. In the third model, there is the previous year's GDP variable, assuming that the previous year's performance will be taken into account when making economic decisions in the current year by the tax authorities.

In the established model, it is generally accepted that if the tax rates are zero, the tax revenues will also be zero. The constant term is not included in the equations. The relationship between tax revenues and tax rates is formulated as follows.

$TI = f\,(TR, TR^2)$

1. $TI_t = \beta_1 TR_t - \beta_2 TR_t^2 + u_i$
2. $TI_t = (\beta_1 + \beta_2 TREND)TR_t - \beta_3 TR_i^2 + u_i$
3. $TI_t = (\beta_1 + \beta_2 NI_{t-1})TR_t - \beta_3 TR_t^2 + u_i$

In the first equation, the static Laffer curve is expressed. First- order conditional equation in optimization; ; $\frac{dTI}{dTR} = \beta_1 - 2\beta_2 TR = 0$ and the tax rate that maximizes tax revenue is $TR_{max.} = \frac{\beta_1}{2\beta_2}$. *The second equation* includes the dynamic Laffer curve. The first- order conditional equation for the optimization of this equation is; $\frac{dTI}{dTR} = (\beta_1 + \beta_2 TREND) - 2\beta_3 TR = 0$. The tax rate for maximum tax revenues; $TR_{max.} = \frac{(\beta_1 + \beta_2 TREND)}{2\beta_3}$. *The third equation* is the equation created by adding NI_{t-1} (a lag of Gross Domestic Product) to the model. The first- order conditional equation of this model is; $\frac{dTI}{dTR} = (\beta_1 + \beta_2 NI_{t-1}) - 2\beta_3 TR = 0$ and the optimal tax rate is $TR_{max.} = \frac{(\beta_1 + \beta_2 NI_{t-1})}{2\beta_3}$.

In determining whether the time series for analysis are stationary; Augmented Dickey Fuller (ADF) and Phillps-Perron (PP) tests were used. Table 1 shows the results of the ADF and PP tests.

Table-1. ADF-PP Unit Root Test Results

Series	Augmented Dickey Fuller					
	Level				First differences	
	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None
TI	[0.1400] (0.9649)	[-2.3917] (0.3779)	[2.6058] (0.9971)	[-4.7844] 0.0004	[-4.7245] 0.0027	[-3.9846] (0.0002)
TR	[-1.7149] (0.4161)	[-2.9035] (0.1725)	[-0.2165] (0.6018)	[-5.6390] 0.0000	[-5.4929] 0.0003	[-8.1153] (0.0000)
TRS	[-1.7169] (0.4151)	[-2.8350] (0.1941)	[-0.4410] (0.5170)	[-5.7733] (0.0000)	[-5.6395] (0.0002)	[-7.9753] (0.0000)
Unemployment Rate	[-0.8537] (0.7921)	[-2.1940] (0.4795)	[0.8307] (0.8867)	[-4.8437] (0.0003)	[-4.8698] (0.0018)	[-4.7833] (0.0000)
Real Wage	[0.1030] (0.9620)	[-2.6260] (0.2716)	[1.6640] (0.9746)	[-6.5056] (0.0000)	[-6.6101] (0.0000)	[-5.9637] (0.0000)
Phillps-Perron						
TI	[0.1738] (0.9673)	[-2.3151] (0.4163)	[2.6820] (0.9977)	[-4.7036] (0.0005)	[-4.3303] (0.0076)	[-4.1007] (0.0001)
TR	[-1.5490] 0.4986	[-2.7330] (0.2298)	[-0.1666] (0.6196)	[-8.1532] (0.0000)	[-8.0277] (0.0000)	[-8.2774] (0.0000)
TRS	[-1.5427] (0.5018)	[-2.6515] (0.2612)	[-0.3638] (0.5471)	[-7.8919] (0.0000)	[-7.7764] (0.0000)	[-8.0098] (0.0000
Unemployment Rate	[-0.5954] (0.8601)	[-2.0464] (0.5584)	[2.0379] (0.9887)	[-4.5313] (0.0000)	[-5.9470] (0.0000)	[-4.3811] (0.0000)
Real Wage	[1.2634] (0.9980)	[-2.6799] (0.2500)	[4.3476] (1.0000)	[-7.1722] (0.0000)	[-10.4783] (0.0000)	[-5.9637] (0.0000)

Notes: Values in square brackets are t statistics; those in parentheses indicate the MacKinnon (1996) p-value. Values above 0.05 indicate that the null hypothesis of the existence of a unit root cannot be rejected.

According to the ADF and PP unit root test results, since the series related to total tax revenues are integrated to the same degree (all I (1)), the long-term relationship of the series has been determined by Johansen cointegration analysis. Since the long-term coefficients and t statistics were found to be insignificant in the results obtained from the first equation in the analysis for total tax revenues, respectively the results of the second (time factored/trend) and third equation (a lag of GDP) were included.

3.1. Trend Model Results

In the model, first, the appropriate lag number is determined. The results for the appropriate number of delays according to all information criteria are given in Table 3. According to Table 2, LR, FPE, HQ values are in the same direction. HQ criterion 2, AIC criterion, 3 and SC criterion 1 gave the minimum value for delay. Firstly, 1 lag was chosen in the study, but since the autocorrelation problem was encountered, the appropriate number of lags was determined as 2.

Table-2. Criteria Used in Choosing the Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	101.6265	NA	1.15e-07	-4.628460	-3.931846	-4.382871
1	218.7428	183.5877	4.99e-10	-10.09421	**-8.700979***	-9.603027
2	242.9699	**32.73940***	**3.43e-10***	-10.53892	-8.449077	**-9.802150***
3	260.5501	19.95580	3.65e-10	**-10.62433***	-7.837875	-9.641972

Notes: *Indicates the delay order selected by the criterion.
LR: Consecutive Modified LR Test Statistic (each test at 5% level)
FPE: Last Prediction Error
AIC: Akaike Knowledge Criteria
SC: Schwarz Knowledge Criterion
HQ: stands for Hannan-Quinn Knowledge Criterion.

After determining the appropriate delay for the Johansen cointegration test, the results of the Johansen cointegration test, which tests the existence of the relationship between the series, are as in Table 3.

Table-3. Johansen Cointegration Test Results

Null Hypothesis	Eigenvalue	Trace Statistic	Critical Value for .05	Prob.**
No cointegration*	0.669575	62.17357	40.17493	0.0001
There is at most 1 cointegration	0.317624	21.20062	24.27596	0.1163
There are at most 2 cointegrating	0.171298	7.060177	12.32090	0.3191
There are at most 3 cointegrating	0.002916	0.108057	4.129906	0.7868
Null Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**Critical Value for .05**	**Prob.****
No cointegration*	0.669575	40.97295	24.15921	0.0001
There is at most 1 cointegration	0.317624	14.14044	17.79730	0.1633
There are at most 2 cointegrating	0.171298	6.952120	11.22480	0.2537
There are at most 3 cointegrating	0.002916	0.108057	4.129906	0.7868

Notes: The trace statistic shows 1 cointegration equation at the 0.05 level.
* indicates that the hypothesis is rejected at the 0.05 level.
**Mackinnon (1999) probability values.

Trace and eigenvalue test statistics are given in Table 4 in line with the selection of model 1 (without constant and without trend). The first hypothesis; there is no cointegration, second hypothesis; There is at most 1 cointegration, the third hypothesis is that there are at most 2 cointegrations. Since the test statistics are greater than the critical value of 5%, the first hypothesis that there is no cointegration between the series is rejected. Therefore, it has been determined that there is a cointegration relationship between the variables. According to this result, dependent variables and independent variables act together. Spurious regression problems will not be encountered in the long-term analyses to be made with the level values of the variables in question. The cointegration relationship between the series shows that the short-term tendency of the series to deviate from equilibrium can be examined by the vector error correction mechanism (VECM). Error correction mechanism is an estimation technique that adjusts both the short-term changes in the variables and the deviation from the equilibrium. A simple form of VECM for two variables is as follows (Andrei and Andrei, 2015);

$$\Delta Y_t = a_1 + a_2 ECM_{t-1} + a_3 \Delta Y_{t-1} + a_4 \Delta X_t + \epsilon_t$$

The error correction term coefficient (ECM_{t-1}), which measures the equilibrium level adaptation rate, is a very important parameter in the estimation of the VECM dynamic model. Such that, in VECM, it is taken as internal (ΔY) and extrinsic (ΔX) in order to establish a long and short-term relationship between the series in order to determine the common effect (Andrei and Andrei, 2015).

Table-4. Long-Run Vector Error Correction Model Estimation Results

Cointegrating Eq:	**CointEq1**
TI(-1)	1.000000
TR(-1)	-9459.209
	(2487.45)
	[-3.80278]
TRENDTR(-1)	-634.3925
	(51.6155)
	[-12.2907]
TRS(-1)	105260.0
	(16954.0)
	[6.20855]

According to the estimation results in Table 4, the long-term estimation can be written as follows;

$TI = 9459,209TR + 634,3925TRENDTR - 105260TRS + \epsilon_t$

Std. Error (24887,45) (51,6155) (16954)

t statistic [-3.80278] [-12.2907] [6.20855]

According to the equation above, the effect of a one-period change in tax rates on tax revenues, in the long, run is positive. A change in the TRS, on the other hand, affects tax revenues negatively. The obtained findings support Laffer Theorem's.

Table-5. Short-Run Vector Error Correction Model Estimation Results

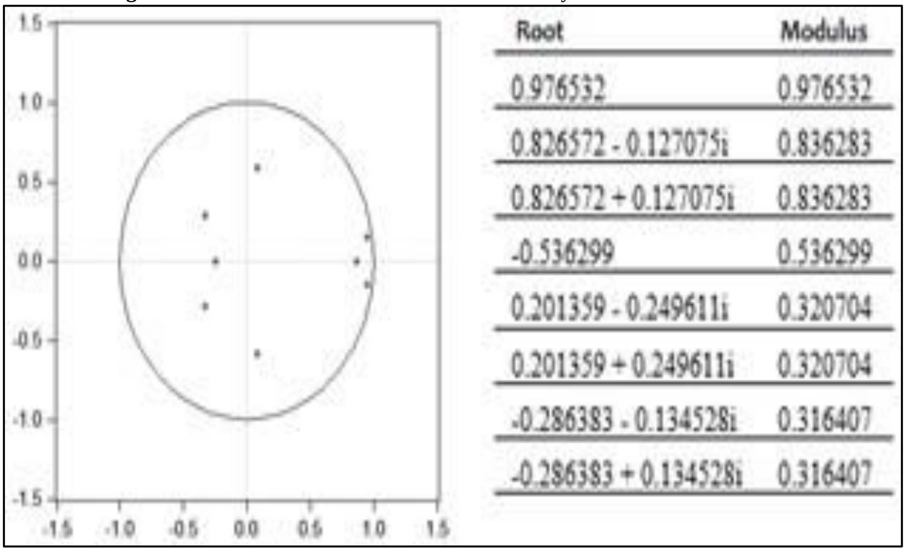
Error Correction Equation	**D(TI)**	**D(TR)**	**D(TRENDTR)**	**D(TRS)**
cointEq1	-0.487871	-6.27E-05	-0.001313	-1.83E-05
	(0.13971)	(9.8E-06)	(0.00022)	(3.0E-06)
	[-3.49210]	[-6.36763]	[-5.84825]	[-6.20558]
D(TI(-1))	-0.026894	2.64E-05	0.000523	6.13E-06
	(0.27384)	(1.9E-05)	(0.00044)	(5.8E-06)
	[-0.09821]	[1.36616]	[1.18826]	[1.05946]
D(TI(-2))	-0.011688	-5.13E-06	-7.19E-05	-2.52E-06
	(0.26483)	(1.9E-05)	(0.00043)	(5.6E-06)
	[-0.04413]	[-0.27480]	[-0.16900]	[-0.44964]
D(TR(-1))	39664.12	5.744442	118.8468	1.728751
	(19358.6)	(1.36377)	(31.1147)	(0.40935)
	[2.04891]	[4.21216]	[3.81964]	[4.22318]
D(TR(-2))	45801.70	2.864705	145.6805	1.123750
	(22756.3)	(1.60313)	(36.5756)	(0.48119)
	[2.01271]	[1.78694]	[3.98300]	[2.33534]
D(TRENDTR(-1))	1264.990	0.126603	2.645138	0.037226
	(296.555)	(0.02089)	(0.47665)	(0.00627)
	[4.26562]	[6.05997]	[5.54948]	[5.93642]
D(TRENDTR(-2))	1137.375	0.060404	2.869465	0.022067
	(400.635)	(0.02822)	(0.64393)	(0.00847)
	[2.83893]	[2.14018]	[4.45617]	[2.60485]
D(TRS(-1))	-203253.9	-27.81535	-580.1298	-8.317835
	(78276.3)	(5.51440)	(125.812)	(1.65519)
	[-2.59662]	[-5.04413]	[-4.61110]	[-5.02529]
D(TRS(-2))	-221374.2	-13.82636	-675.4642	-5.268836
	(97224.3)	(6.84925)	(156.266)	(2.05586)
	[-2.27694]	[-2.01867]	[-4.32252]	[-2.56284]
UNEMPLOYMENT RATE	-22.38366	-0.000891	-0.030036	-0.000331
	(10.3690)	(0.00073)	(0.01667)	(0.00022)
	[-2.15871]	[-1.21933]	[-1.80226]	[-1.51004]
CRISIS	-84.90038	0.001551	0.067875	0.000497
	(50.8066)	(0.00358)	(0.08166)	(0.00107)
	[-1.67105]	[0.43333]	[0.83118]	[0.46296]
REAL WAGE	97.37959	-0.009300	-0.243152	-0.002526
	(111.291)	(0.00784)	(0.17888)	(0.00235)
	[0.87500]	[-1.18623]	[-1.35933]	[-1.07331]
R-squared	0.488502	0.774167	0.717873	0.765405
Adjusted R-squared	0.263444	0.674801	0.593737	0.662183
Sum squared Resid	261724.3	0.001299	0.676122	0.000117
S.E. equation	102.3180	0.007208	0.164453	0.002164
F-statistic	2.170554	7.791039	5.782955	7.415154

Note: Values in parentheses are standard error; The values in square brackets are the t statistic.

In Table 5, the short-term results are given. The significance of error terms is determined by the absolute value of the coefficients. Because the t statistics for the error terms should be higher than '1.96' according to the absolute value of 5% confidence level, according to the literature, the fact that only one model is significant in the series alone can make the model meaningful in general. When the findings in Table 6 are examined, besides the TI series, the t statistics of the TR, TRENDTR, and TRS series are also significant at the 5% confidence level. This result indicates that VECM is working. In addition, the coefficients of the error terms of the series are negative. In this direction, it can be said that when a shock occurs in a period, the long-term equilibrium will be approached with a 48% recovery for TI in the next period.

After this stage, diagnostic tests are included. It was determined that there was no autocorrelation (F-statistic: 1.651965; p: 0.0854) and variable variance problem (Chi-square: 242.3946; p: 0.2747), and the error terms were normally distributed (Jarque-Bera: 15.00429; p: 0.0591).

Figure-2. Inverse Roots of the AR Characteristic Polynomial and the Unit Circle



In addition, as seen in Figure 2, all modulus values are within the reference value (less than 1) range. This result shows the stability (stability) of the VAR model. All AR points (roots) lie within the unit circle. Therefore, the established model is dynamically stationary.

3.2. Results for a Lagged Model of GDP

In the model, first, the appropriate lag number is determined. The results for the appropriate number of delays according to all information criteria are given in Table 6.

Table-6. Criteria Used in Choosing the Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-636.5701	NA	2.46e+10	35.27406	35.97067	35.51965
1	-560.3473	119.4843	9.72e+08	32.01878	**33.41200***	32.50995
2	-537.3102	**31.13131***	**7.12e+08***	**31.63839***	33.72823	**32.37515***
3	-521.5764	17.85995	8.37e+08	31.65278	34.43923	32.63513

Notes: *Indicates the delay order selected by the criterion.
LR: Consecutive Modified LR Test Statistic (each test at 5% level)
FPE: Last Prediction Error
AIC: Akaike Knowledge Criteria
SC: Schwarz Knowledge Criterion
HQ: stands for Hannan-Quinn Knowledge Criterion.

According to Table 6, LR, FPE, AIC, and HQ values are in the same direction. For 2 delays, HQ and AIC criteria gave the minimum value. The SC criterion, on the other hand, gave a minimum value for 1 delay. In the study, the appropriate lag number for the Johansen cointegration test was determined as 1. After determining the appropriate lag, the results of the Johansen cointegration test, which tests the relationship between the series, are as in Table 7.

Table-7. Johansen Cointegration Test Results

Null Hypothesis	Eigenvalue	Trace Statistic	Critical Value for .05	Prob.**
No cointegration*	0.579561	50.50098	40.17493	0.0034
There is at most 1 cointegration	0.341582	17.57562	24.27596	0.2759
There are at most 2 cointegrating	0.043398	1.694829	12.32090	0.9708
There are at most 3 cointegrating	0.000233	0.008850	4.129906	0.9388
Null Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**Critical Value for .05**	**Prob.****
No cointegration*	0.579561	32.92536	24.15921	0.0025
There is at most 1 cointegration	0.341582	15.88079	17.79730	0.0949
There are at most 2 cointegrating	0.043398	1.685979	11.22480	0.9534
There are at most 3 cointegrating	0.000233	0.008850	4.129906	0.9388

Notes: The trace statistic shows 1 cointegration equation at the 0.05 level.
* indicates that the hypothesis is rejected at the 0.05 level.
**Mackinnon (1999) probability values.

The SC information criterion was used in model selection for the Johansen cointegration test. According to Model 1, trace and eigenvalue test statistics are given in Table 7. The first hypothesis; there is no cointegration, second hypothesis; There is at most 1 cointegration, the third hypothesis is that there are at most 2 cointegrations. Since the test statistics are greater than the critical value of 5%, the first hypothesis that there is no cointegration between the series is rejected. Therefore, it has been determined that there is a cointegration relationship between the variables. According to this result, dependent variables and independent variables act together. Spurious regression problems will not be encountered in the long-term analyses to be made with the level values of the variables in question. The cointegration relationship between the studied series shows that the short-term tendency of the series to deviate from equilibrium can be examined with VECM.

Table-8. Long-Run Vector Error Correction Model Estimation Results

Cointegrating Eq:	CointEq1
TI(-1)	1.000000
TR(-1)	-12280.88
	(2735.02)
	[-4.49024]
NI_1TR(-1)	-1.06E-06
	(1.0E-07)
	[-10.1857]
TRS(-1)	25957.26
	(14771.0)
	[1.75731]

According to the estimation results in Table 8, the long-term estimation can be written as follows;

$$TI = 12280,88TR + 1,06E\text{-}06\ NI\_1TR(-1) - 25957,26TRS + \epsilon_t$$

SD. (2735,02) (1,0E-07) (14771,0)
t statistic. [-4,49024] [-10,1857] [1,75731]

In the equation above, the effect of a one-period change in tax rates on tax revenues in the long run according to a lagged model of GDP is positive. A change in the TRS, on the other hand, affects tax revenues negatively. The obtained findings support Laffer Theorem's.

Table-9. Short-Run Vector Error Correction Model Estimation Results

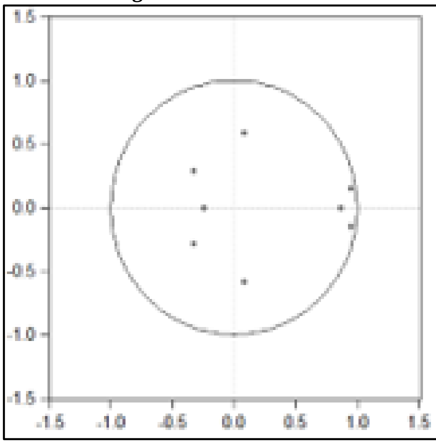
Error Correction Equation	D(TI)	D(TR)	D(NI_1TR)	D(TRS)
cointEq1	-0.446106	3.99E-06	-44122.87	-3.15E-08
	(0.13122)	(1.7E-05)	(119063.)	(4.9E-06)
	[-3.39965]	[0.23805]	[-0.37059]	[-0.00640]
D(TI(-1))	-0.155956	-1.24E-05	622991.5	-4.75E-06
	(0.24667)	(3.2E-05)	(223813.)	(9.3E-06)
	[-0.63225]	[-0.39275]	[2.78353]	[-0.51326]
D(TR(-1))	-2236.927	0.350349	6.23E+09	0.173164
	(12724.4)	(1.62558)	(1.2E+10)	(0.47733)
	[-0.17580]	[0.21552]	[0.53929]	[0.36278]
D(NI_1TR(-1))	-7.83E-08	2.99E-11	0.214372	7.13E-12
	(2.7E-07)	(3.5E-11)	(0.24668)	(1.0E-11)
	[-0.28804]	[0.86115]	[0.86904]	[0.69880]
D(TRS(-1))	7905.888	-2.434603	-4.27E+10	-0.911243
	(44818.5)	(5.72567)	(4.1E+10)	(1.68127)
	[0.17640]	[-0.42521]	[-1.04960]	[-0.54200]
UNEMPLOYMENT RATE	-47.33474	0.000665	-2799654.	6.91E-05

	(16.1756)	(0.00207)	(1.5E+07)	(0.00061)
	[-2.92630]	[0.32201]	[-0.19075]	[0.11386]
CRISIS	-65.09364	-0.002263	35078154	-0.000592
	(47.5187)	(0.00607)	(4.3E+07)	(0.00178)
	[-1.36985]	[-0.37277]	[0.81358]	[-0.33196]
REAL WAGE	133.7086	-0.006392	-65922872	-0.001697
	(101.667)	(0.01299)	(9.2E+07)	(0.00381)
	[1.31516]	[-0.49213]	[-0.71464]	[-0.44495]
R-squared	0.353047	0.133330	0.316794	0.126153
Adjusted R-squared	0.202092	-0.068893	0.157379	-0.077745
Sum squared Resid	342820.0	0.005595	2.82E+17	0.000482
S.E. equation	106.8987	0.013657	96993874	0.004010
F-statistic	2.338750	0.659323	1.987231	0.618708

Note: Values in parentheses are standard error; The values in square brackets are the t statistic.

According to Table 9, the t-statistic of the TI series is significant at the 5% confidence level. This result indicates that VECM is working. In addition, the coefficient of the error term of the series is negative. In this direction, it can be said that when a shock occurs in a period, the long-term equilibrium will be approached with a 44% improvement in TI in the next period. After this stage, diagnostic tests are included. It is seen that there is no autocorrelation (F-statistic: 0.913095; p: 0.5579) and variable variance problem (Chi-square 157.8851; p: 0.3135), and the error terms are normally distributed (Jarque-Bera: 14.53634; p: 0.0688).

Figure-3. Inverse Roots of the AR Characteristic Polynomial and the Unit Circle



Root	Modulus
0.950311-0.147484i	0.961687
0.950311+0.147484i	0.961687
0.864494	0.864494
0.085588-0.583407i	0.589651
0.085588+0.583407i	0.589651
-0.330047-0.284821i	0.435952
-0.330047+0.284821i	0.435952
-0.243024	0.243024

In addition, as seen in Figure 3, all modulus values are within the reference value (less than 1) range. This result shows the stability of the VAR model. All AR points (roots) lie within the unit circle. Therefore, the established model is dynamically stationary.

3.3. Current and Optimal Rates in Total Taxes

The findings regarding the optimal ratios obtained by using all three equations are given in Table 10. Current rates, on the other hand, are obtained by dividing tax revenues by GDP.

Table-10. Findings Regarding Current and Optimal Ratios in Total Tax Revenues

Years	Current Rates	Optimal Rates (Fixed)	Optimal Rates (Trend)	Optimal Rates (NI_1)
1980	0,143	0,137	0,047	0,269
1981	0,150	0,137	0,050	0,281
1982	0,124	0,137	0,053	0,289
1983	0,139	0,137	0,056	0,289
1984	0,107	0,137	0,060	0,284
1985	0,109	0,137	0,063	0,288
1986	0,116	0,137	0,066	0,297
1987	0,121	0,137	0,070	0,300
1988	0,110	0,137	0,072	0,292
1989	0,112	0,137	0,075	0,295
1990	0,115	0,137	0,078	0,301
1991	0,124	0,137	0,081	0,304
1992	0,129	0,137	0,084	0,300
1993	0,133	0,137	0,087	0,303
1994	0,151	0,137	0,090	0,295
1995	0,139	0,137	0,093	0,297
1996	0,151	0,137	0,096	0,303
1997	0,164	0,137	0,099	0,305
1998	0,128	0,137	0,102	0,309

Years	Current Rates	Optimal Rates (Fixed)	Optimal Rates (Trend)	Optimal Rates (NI_1)
1999	0,138	0,137	0,105	0,346
2000	0,155	0,137	0,108	0,342
2001	0,161	0,137	0,111	0,346
2002	0,165	0,137	0,114	0,345
2003	0,180	0,137	0,117	0,367
2004	0,156	0,137	0,120	0,393
2005	0,158	0,137	0,123	0,415
2006	0,174	0,137	0,126	0,427
2007	0,173	0,137	0,129	0,441
2008	0,168	0,137	0,132	0,443
2009	0,172	0,137	0,135	0,457
2010	0,181	0,137	0,138	0,440
2011	0,182	0,137	0,141	0,459
2012	0,177	0,137	0,144	0,482
2013	0,180	0,137	0,147	0,493
2014	0,172	0,137	0,150	0,508
2015	0,174	0,137	0,153	0,522
2016	0,175	0,137	0,156	0,539
2017	0,172	0,137	0,160	0,540
2018	0,166	0,137	0,162	0,548
2019	0,147	0,137	0,165	0,560

Table 10 presents the estimation findings of tax rates maximizing tax revenues and current tax rates for models with fixed, trending, and a lag in national income. The (optimal) tax rates that maximize the total tax revenues for the 1980-2019 period in Turkey are 13.7% in the fixed model; 04.7-16.5% in the trend model; it is estimated between 26.9-56% in a lag of national income. However, the fixed model was found to be statistically insignificant. A lagged coefficient of national income is a small value very close to zero and its effect is very low. For these reasons, the values in the trend factor column of Table 10 were taken into account. In the trend model, only in 2019, the estimated optimal tax rate was higher than the current tax rate. When Table 10 is examined, it is seen that the current tax rates are above the estimated optimal rates until 2019. This situation states that the tax rates applied in the Turkish economy are on the right of the peak of the Laffer curve and means that the tax burden has increased. Therefore, according to Laffer Theorem, continuing to increase tax rates will no longer increase tax revenues. As a matter of fact, at this point, tax revenues can be increased by reducing tax rates and through strict control and deterrent practices.

As a result, optimality could not be achieved in total tax rates for the period of 1980-2019 in Turkey. In other words, it has been observed that the rates applied in the mentioned periods are in the forbidden (to the right) region of the Laffer curve.

Figure-4. The Laffer Curve for Total Taxes in Turkey (2018)

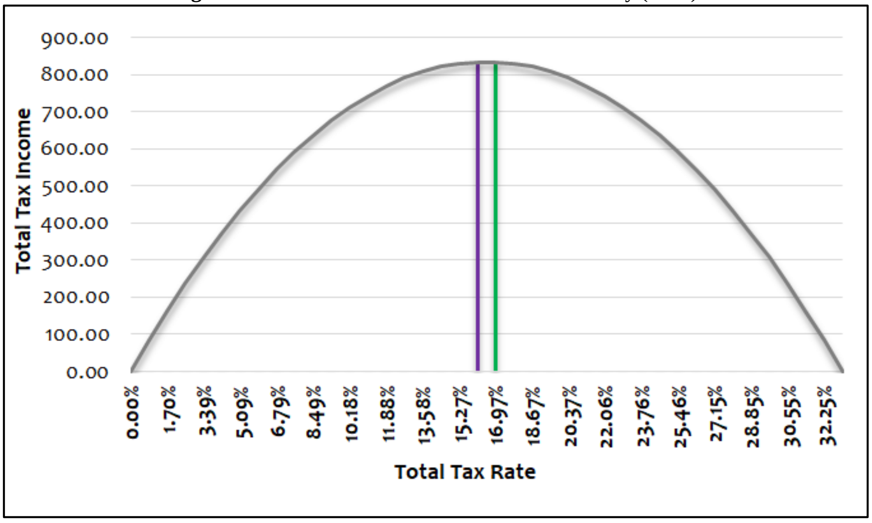
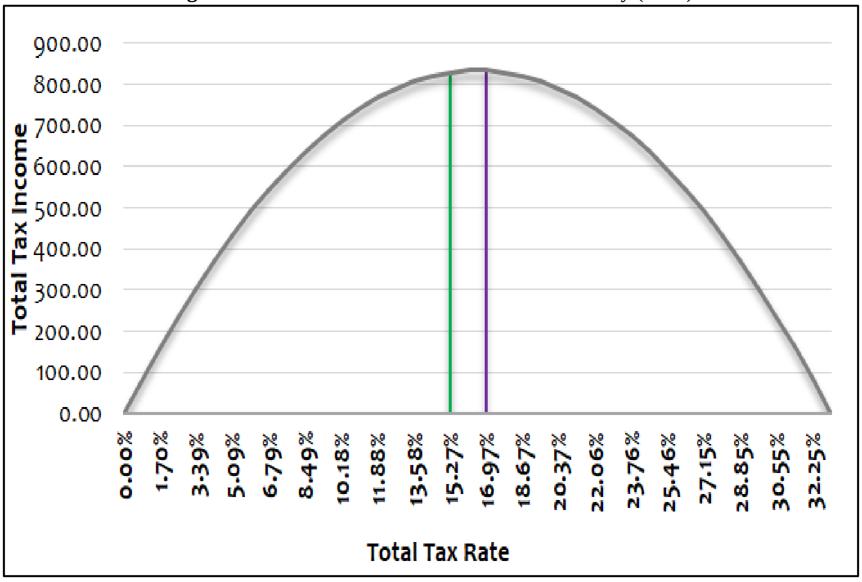


Figure 4 shows Turkey's Laffer curve for 2018. Drawings can also be made according to a fixed and a lagged model of national income. However, the Laffer curve was drawn for the statistically significant trend model in the graph. The value of the coefficients obtained according to the trend model and the tax rates increasing at regular intervals are put into the equation, and the relationship between tax revenues and tax rates is shown geometrically. As seen in Figure 4, the optimal (peak) point of the Laffer curve for 2018 in Turkey is 16.2% and is indicated by the purple line. The green line is the current tax rate in Turkey in 2018 and is located to the right of the purple line. Therefore, it can be said that the total tax rate is above the optimal.

Figure-5. The Laffer Curve for Total Taxes in Turkey (2019)



In Figure 5, Turkey's Laffer curve for 2019 is given. Compared to the Laffer curve of 2018, it is possible to talk about the opposite situation in 2019. As a matter of fact, the optimal tax rate in the relevant year is 16.5%; the actual tax rate is 14.7%. Thus, for the first time in the period between 1980 and 2019, which is the subject of the analysis, the current tax rate was below the optimal tax rate.

The findings obtained for Turkey bear similarities with many studies in the literature. However, most studies have focused on the effect of the tax rate on tax revenues and optimal tax rates.

4. Discussion

According to Laffer curve theory, for a function like $y = a + bx + cx^2$ to have an inverted U-shaped curve, a value must be zero, b must be positive, and c must be negative. The existence of a Laffer curve in an economy can be verified if the available parameters are marked appropriate. In the results given above, both variables are significant and their signs are compatible with the propositions of Ibn Khaldun taxation theory and the Laffer curve, Dökmen (2018), Şen and Bulut (2021), Riihela *et al.* (2014) similar to his work. However, when evaluated in terms of tax rates, tax policies in Turkey are not successful in catching optimal tax rates. This result contrasts with the findings of Kurt (2017). Therefore, it can be said that more studies are needed.

5. Conclusion and Evaluation

It can be said that the tax reforms made after 1980 for optimal taxation are shaped on justice and efficiency. Recently, it is seen that the preference between these two different criteria is efficiency-weighted. In tax systems where efficiency is at the forefront, there is a transition from progressive to flat tariff and from income taxes to expenditure taxes. When evaluated in terms of the Turkish tax system, it can be observed that there has been a radical change in the last half century. In the Turkish tax system, where the generally accepted classification of income, expenditure, and wealth is valid in determining the solvency, the rate of taxes on income (income tax, corporate tax) and wealth such as property tax, motor vehicle tax, and inheritance tax decreases, while the rate of taxes on expenditures decreases. The rate of taxes such as value-added tax and excise tax started to increase gradually in the post-1985 period. Considering the financial purpose of the tax, the income generation power of the mentioned expenditure taxes is higher than other tax groups. The low shares in wealth taxes, on the other hand, show that social purpose is prioritized rather than financial purpose.

One of the issues that the optimal tax theory focuses on is the tax rates that minimize the efficiency loss caused by the tax system where tax liability is increased. According to Arthur Laffer, who argues that low tax rates will increase tax revenue and economic growth, current tax rates are higher than optimal tax rates. The Laffer curve, which deals with tax revenues as well as the justice-efficiency dilemma within the scope of optimal taxation discussions, is an important issue in the field of fiscal theory. In this context, optimal tax theory and the Laffer curve in optimal taxation are discussed in the study. For the analysis, the model applied by Beenstock in 1979 was taken as the basis. There are three different models in the study of Beenstock. The methods used in the analysis were determined according to the results of the unit root tests of the series. As a matter of fact, in the discussions about whether the time series is stationary or not, the determination of the unit root; is important in eliminating the spurious regression problem and in terms of the accuracy and reliability of the findings obtained from the analysis. In this context, the stationarity of time series; was determined by ADF and PP tests. According to the unit test results, it was decided to use the Johansen cointegration analysis for total tax revenues for the period 1980-2019. According to the results of the analysis, the coefficient of the tax rate variable was found to be positive and the coefficient of the variable expressing the square of the tax rate was negative. This shows that the Laffer curve is in question, and as a matter of fact, the created quadratic function paves the way for this result. Therefore, the H1 hypothesis was accepted. In addition, looking at the short and long term VECM results, it is seen that macro data (unemployment rate and real wage) affect tax revenues. Accordingly, the H2 hypothesis was also accepted. Another important issue is the calculation of the optimal tax rates for Turkey and the drawing of the estimated Laffer curve. These curves were drawn for 2018 and 2019.

Based on the existence of Laffer theorem's in Turkey, the optimal tax rates for total tax revenues were calculated, and the current tax rates of each year were compared with the optimal tax rates. In the results obtained, it has been seen that the current tax rates for the 1980-2019 period in Turkey are above the optimal tax rate. At this point, hypothesis H3 was accepted. In other words, it has been determined that the total tax rates in the determined period are located in the forbidden region of the Laffer curve.

This situation shows the high tax burden. On the other hand, Laffer Theorem states that tax revenues can no longer be increased by continuing to increase tax rates. Therefore, tax revenues can be increased by reducing tax rates and through strict control and deterrent practices. In the OECD 2020 report, it is stated that the total tax burden is 23.1% in Turkey and 33.8% in the OECD average. It can be argued that the tax burden, which reaches about 24% compared to the OECD average, is at a reasonable or low level. However, when the aforementioned result is evaluated considering the income level rather than the tax point of view, since the real income level is low in Turkey, the sacrifice for low tax burden is similar to the sacrifice for high tax burden in high-income countries. For this reason, the suggestion that the total tax rates should be increased in the Turkish tax system will not be a rational and real proposal. Because the net income of taxpayers after taxation, when considered on the basis of purchasing power parity, should be sufficient for an acceptable quality of life, in addition, although tax rates are considered to be low, it can be stated that it will not increase purchasing power due to low average wages. Moving tax rates to the left side of the Laffer curve will also positively affect taxation efficiency and fiscal efficiency. In this context, policies to reduce indirect taxes can be updated, tax incentives can be applied more cautiously on the basis of efficiency, and tax flexibility can be increased.

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