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THE KHALDÛN−LAFFER CURVE REVISITED: A PERSONAL INCOME TAX−BASED ANALYSIS FOR TURKEY*

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Abstract

This paper focuses on an old but still discussed postulate, the Khaldûn-Laffer curve, and empirically applies it to personal income tax by using annual time-series data of Turkey for the period 1970-2015. From our analysis, two fundamental findings emerge: first, Turkish data provides evidence in favor of the Khaldûn-Laffer curve, suggesting that there is a non-linearity between tax rates and tax revenue. Second, the optimal tax rate that maximizes revenue from personal income tax is 15.03% against the current rate we estimate at 15.37%. These findings imply that Turkey's current personal income tax rate falls slightly into the prohibitive range of the curve.

Overall, it is safe to argue that the current personal income tax rate should be lowered to its optimal value to maximize the revenue from personal income taxation. If done so, the Turkish fiscal authorities would be able to generate more revenue with a relatively lower tax rate.

Keywords: Turkey, tax policy, personal income tax, optimal tax rate, Laffer curve.

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1. Introduction

One of the most important and well-known arguments of supply-siders is the notion of the Khaldûn-Laffer curve (henceforth the K-L curve)[1]; based on persistent high tax rates in the US, supply-siders have claimed that lower tax rates would mean higher tax revenue and that consequently higher rates would result in lower tax revenue. Hence, reducing current tax rates would be a good tax policy because it will not only maximize tax revenue but also motivate economic activity. This argument of supply-siders made the K-L curve popular in the early 1980s. The K-L curve is the graphical representation of the aforementioned postulate. It depicts a classic bell-shaped relationship[2] between tax rates and tax revenue: as the tax rate increases the tax revenue increases till it reaches an optimal point of maximum tax revenue; any further increase in the tax rate decreases the revenue due to the disincentive effects created by higher taxes. Laffer (1981, 2004) argues that higher tax rates will discourage work and production by removing incentives, triggering sluggish growth, and thereby lowering tax revenue collected by the government.

As with many other developing countries, maximizing revenue is important for Turkey in order to realize its fiscal targets. Considering the undesired consequences of the alternative ways to finance budget deficits (especially, borrowing and printing money), the significance of having an ideal tax system in which tax rates generate maximum tax revenue for the government without inducing a dampening effect on the economy has been well understood.

Turning to the case of Turkey, this paper proposes to revisit the K-L curve. In this context, the paper first endeavors to examine the validity the K-L curve empirically and then attempts to find the optimal tax rate at which the maximum amount of tax revenue can be collected. The paper also aims to: (i) investigate whether present tax rates are lower or higher than the revenue-maximizing tax rates; (ii) determine the income and substitution effects of tax rates and thereby design ideal tax rates for fiscal policy purposes; (iii) avoid the undesired consequences of taxation incurred from high tax rates (i.e. tax avoidance, tax evasion, preferring leisure to work, changing the scope and/or structure of economic activity, etc.) which result not only in a reduction of tax revenue but also negatively affect economic activity and thus growth, and (iv) contribute to the limited empirical literature related to the K-L curve for developing countries like Turkey.

Since the curve theoretically establishes a non-linear link between tax rates and tax revenue, we have chosen the personal income tax (hereafter, the PIT) as the case for testing the validity of it. The reasons for doing so, first and foremost, is that the

1 Throughout the paper, we use 'the K-L curve' and 'the Laffer curve' interchangeably.

2 In the literature, the relationship between tax rates and tax revenue in the context of the K-L curve is presented as 'classic bell-shaped curve', 'inverted U-shaped curve', 'hump-shaped curve'; see Fullerton (1982), Hsing (1996), Slemrod (1996), Sanyal, Gang and Goswani (2000), Tanzi (2014) for different descriptions.

PIT is a tax that is levied on individuals' taxable income. Second, this tax accounts for the largest share of the central government's tax revenue after VAT and the special consumption tax. Thirdly, the PIT is a tax instrument that is well-suited to examining the K-L curve.

The PIT is one of four important taxes that generate the highest tax revenue in the Turkish tax system. The other taxes are the corporate income tax, the value-added tax, and the special consumption tax. These four taxes account for an average of more than 80% of total central government tax revenue. Although two indirect taxes (the value-added tax and special consumption tax) dominate the tax system and constitute nearly 65-70% of the central government's tax revenue on average, the PIT also has a significant place in the tax system, accounting for almost 20% of it. Moreover, it is the sole progressive tax (if wealth tax, which constitutes a minor portion of total tax revenue, is ignored). At present, the PIT contains four brackets with rates of 15, 20, 27 and 35%, respectively. As a rule, these rates are not frequently changed. The latest alteration was made in 2006 when the number of tax brackets was reduced from 6 to 4. However, at the end of the year, before starting the new fiscal year, tax brackets are re-adjusted for subsequent fiscal years in line with developments in inflation of the current year.

The remainder of the paper is organized as follows. Section 2 outlines the theoretical background and related literature. Section 3 describes the data and econometric methodology, while Section 4 presents the estimation strategy and results of the paper alongside their interpretation; the final section concludes.

2. Theoretical background and related literature

2.1. Theoretical background

While Laffer was discussing the US President's proposal for tax increases in a dinner meeting in 1974, he charted a classic bell-shaped curve on a cocktail napkin, illustrating the trade-off between tax rates and tax revenue (see Laffer, 1981, 2004; Wanniski, 1978, 2005). Soon after, Wanniski (1978) named this trade-off as 'the Laffer curve'; however, Laffer (1981, 2004) notes that the idea behind the curve belongs to Ibn Khaldûn, a 14th-century Muslim philosopher. Giving a special reference to the opus of Khaldûn, the Muqaddimah, Laffer draws attention to the background of the curve with the words of Khaldûn himself: 'it should be known that at the beginning of the dynasty, taxation yields a large revenue from small assessments. At the end of the dynasty, taxation yields a small revenue from large assessments' (Khaldûn, 1980 [1377], p. 80).

However, contrary to the arguments above, some authors, such as Fullerton (1982), van Ravestein and Vijlbrief (1988), and Hsing (1996), attribute the roots of the curve to Adam Smith, an 18th-century Scottish economist, referencing his words: 'high taxes, sometimes by diminishing the consumption of the taxed commodities, and sometimes by encouraging smuggling, frequently afford a smaller revenue to government than what might be drawn from more moderate taxes' (Smith, 2008 [1776], p. 835).

Despite these counter-arguments, we prefer to label the curve as the K-L curve to give credit to both Khaldûn and Laffer.

The curve exhibits a one-way causality from tax rates to tax revenue, illustrating a hump-shaped relationship between tax rates and tax revenue. The upward-sloping side of the K-L curve displays the normal range, whereas the downward-sloping side shows the prohibitive range (Wanniski, 1978; Laffer, 1981, 2004). This implies that a given tax revenue can be collected with two different tax rates, one falls into the normal range of the curve, and the other one falls into the prohibitive range; the rational fiscal policy option would be choosing the lower rate, which falls into the normal range because the income/incentive effect dominates the substitution/disincentive effect of taxation.

The K-L curve is still being discussed, although more than three decades have passed since its postulation by Arthur Laffer. The focal point of discussion is whether the K-L curve is true or false, or only an approximation. The discussions are centered specifically on whether there is such a relation between tax rates and tax revenue, as emphatically argued by Laffer (1981, 2004). If so, what is the revenue-maximizing tax rate, i.e. the optimal tax rate?

The K-L curve received a great attention especially in the early 1980s with the arguments of the prominent supply-siders such as Paul Evans, Michael Boskin and Martin Feldstein, asserting that 'lower tax rates would mean higher revenue because existing rates were too high to maximize tax revenue, – that is, tax rates were so high that fewer taxed goods were being produced and the overall effect was lower tax revenue' (Becsi, 2000, p. 53). Even today, the curve still receives remarkable attention in tax-related discussions, especially in the United Stated of America, where a conservative political movement within the Republican Party that is called 'Tea Party' keeps the topic always on the agenda and makes the reduction of taxes one of its primary objectives (Tanzi, 2014).

Despite these facts, the curve encounters severe criticism in the literature, such as: (i) the K-L curve, in the words of Tanzi (2014), is a wonderful propaganda device for conservatives; (ii) the idea that the Laffer curve has disincentive effects on high tax rates is not precise, and (iii) there are suspicions about the existence of a relationship between tax rate and tax revenue. More specifically, the curve that establishes a classic bell-shaped relationship between tax rates and tax revenue obtained by the government may not reflect the reality. Depending on a number of factors, such as taxpayers' reaction to the taxes, the openness degree of the economy, efforts of the tax administration, structure of labor market, and etc., the curve may take different shapes, rather than proposed by Arthur Laffer[3].

In the literature, we see at first glance that there have been many studies on the K-L curve, a large majority of which have focused on the theoretical aspects of the

3 See, inter alia, Tanzi (2014) for a critical review.

curve, rather than empirically exploring it. There are also numerous counter-studies such as Henderson (1981), Sanyal, Gang and Goswani (2000), Busato and Chiarini (2013), which critically assess the curve in terms of different aspects, ranging from its assumptions to its validity.

This paper contributes to the literature not only by focusing on the PIT of Turkey in the context of the K-L curve in the long run, but also by including control variables other than tax rate and its square as determinants of tax revenue in order to prevent omitted variable bias that may produce misleading results.

2.2. Related literature

An early study by Stuart (1981) calibrates the Laffer curve for Sweden for the 1970s and then concludes that the Swedish tax rate on labor income is higher than the revenue-maximizing tax rate. He estimates the revenue-maximizing marginal tax rate between 69-73%, while the actual tax rate is around 80%. These findings confirm that the Swedish tax system was in the prohibitive range of the K-L curve in the 1970s. On the other hand, Feige and McGee (1983) find that the marginal tax rate was about 0.83, whereas the revenue-maximizing rate was 0.58 for Sweden for 1979. Both studies show that the optimal tax rate is lower than the actual one for Sweden. This implies the importance of cutting tax rates for this country for obtaining a revenue-maximizing rate as well as reducing the substitution effects of taxation arising from high tax rates. Van Ravestein and Vijlbrief (1988) employ a similar model to Stuart (1981) and then estimate the actual tax rate and the peak level of the Laffer curve for the Netherlands; they found that all the actual tax rates are lower than the revenue-maximizing rate, reflecting the availability of room for hiking the marginal tax rates for this country.

Another study by Hsing (1996) investigates the Laffer curve for the US by employing a single-factor model, considering tax revenue as a function of only tax rate and its square; the author finds evidence that the revenue-maximizing tax rate changes for the PIT between 32.67% and 35.21% for this country for the period 1959-1991. On the other hand, the average tax rate is 19.58% based on tax liability and 20.18% based on tax payment in 1991. Based on these results, Hsing (1996) argues that there is a room for increasing the average tax rate to collect more tax revenue. Similarly, Karas (2012) examines the revenue-maximizing PIT rate for the Czech Republic. Karas (2012) confirms the existence of an inverted U-shape relationship between the tax rates and tax revenue; the revenue-maximizing PIT rate for the Czech Republic is 33.13%.

Walewski (1999) explores the existence of the K-L curve by considering the case of three European transition economies (the Czech Republic, Poland, and Hungary) and observes that the curve for the selected countries can be classic bell-shaped. Based on the findings, both the Czech Republic and Poland are still on the upward sloping side of the curve, whereas Hungary swings around the Laffer hill: that refers to the revenue-maximizing point of the curve.

The existing literature contains also some other prominent studies that focus on country groups. For instance, Dalamagas (1998) examines the Laffer curve for 13 industrialized OECD countries and finds that the curve has the familiar inverted U-shape; his findings also document that a permanent reduction in tax rates has a potential of generating more tax revenue in the long run for the highly taxed countries alone. However, he argues that a permanent reduction in average tax rates may result in increases in the long-run of government budget deficits in economies with crowding-out characteristics, thus providing a strong refutation of the dynamic Laffer curve proposition.

Two follow-up studies by Trabandt and Uhlig (2011, 2013) investigate quantitatively the shape of the Laffer curves for labor taxation and capital income taxation for a group of countries covering the US, EU-14 and some other non-EU countries. The aforementioned authors document that the Laffer curve exists for labor taxes as well as capital taxes. According to Trabandt and Uhlig (2011, 2013), both the US and EU-14 are located on the left side of the curve, but the EU-14 countries are much closer to the slippery slopes than the US. More specifically, they suggest that increasing tax revenue by 30% in the US requires raising labor taxes but only 6% by raising capital income taxes. However, the same requirement for the EU-14 is 8% and 1%, respectively. Another interesting finding of their study is that in the US, 32% of a labor tax cut and 51% of a capital tax cut are self-financing in the steady state, whereas in the EU-14 countries, 54% of a labor tax cut and 79% of a capital tax cut are self-financing.

Likewise, Nutahara (2015) explores Laffer curves for labor, capital and consumption taxes for Japan and his findings confirm that the Laffer curves for labor and capital taxes have single peaks, whereas consumption tax revenue increases monotonically with respect to the tax rate. Furthermore, according to the findings of the author, while the labor tax rate is smaller than that at the peak of the curve, the capital tax rate is either very close to, or bigger than, that at the peak of it.

In sum, a large number of empirical studies on the K-L curve concentrate on either an industrialized country or on country groups, while studies that focus on the K-L curve for other countries, i.e. developing, emerging, and transitional, are highly limited, including Turkey. To the best of our knowledge, there are few empirical works that examine the Laffer curve for Turkey. However, in contrast to the present paper, all the available studies without exception, do not take the issue on a specific tax as we did and employ mostly univariate models.

As stated above, with few exceptions, virtually in all studies different models have been used and this makes it difficult to make comparison among countries, unless the same models are used for different country groups. On the other hand, most of the assumptions of the models employed in the empirical studies are highly far from the reality. In other words, they do not match with the actual economy and taxation system.

Contrary to many other studies, in this paper, we specifically examine the K-L curve in the context of the PIT. Secondly, as opposed to a large strand of studies that only consider tax rate and its square as independent variables for tax revenue we employ a long-run estimation analysis with multiple variables (the share of trade, agriculture, external debt in GDP, inflation rate and GDP per capita) to avoid misspecification problem. One more merit of our paper is that we work with relatively longer time span with 45 annual observations.

3. Data and econometric methodology

3.1. Data

The data used in this paper spans the 1970-2015 period[4]; the availability of the data is the main reason for choosing the study period. The definitions and the sources of the variables used in our model are presented in Table 1. Increasing the precision of the econometric methodology highly depends on the number of observations, so we try to keep the time horizon as large as possible to increase the reliability of our econometric model.

Table 1: Definition of variables and data sources

Variable	Definition	Source
Tax Revenue	Real PIT Revenue (TL)	Ministry of Treasury and Finance
Tax Rate	$\dfrac{\text{Tax Revenue} / \text{Number of Employed People}}{\text{GDP Per Capita}}$ (%)	Ministry of Treasury and Finance
Trade Share	(Import + Export) / GDP (%)	World Bank
Agriculture Share	Agriculture / GDP (%)	World Bank
GDP per capita	GDP per capita (TL)	World Bank
External Debt Share	External debt / GDP (%)	World Bank
Inflation Rate	Change in Consumer Price Index (%)	World Bank

Note: 'TL' denotes Turkish currency, Turkish Lira

Source: The authors

4 In the literature, there is no consensus over the ideal number of sample size in time series analysis. Large sample size leads to increased precision in estimates of population. So, 'more is better' phrase suits well. In addition, forecasting by using time series analysis requires higher sample size. However, in this paper we do not focus on forecasting. Rather, concentrating on finding out an optimal tax rate. For many developing countries, lack of data is observed excessively due to several reasons, such as making reforms more frequently, changing the calculation methods in data collection or collecting data for different time lines. As a result, analysing for a developing country case is challenging. In our analysis, the number of observations and degrees of freedom are larger than 30. We believe that statistically all these are fair enough for interpreting the coefficients.

3.2. Econometric methodology

In this section, besides the econometric methodology for our model, we also briefly provide the theoretical framework for the variables we chose. As noted earlier, there are several theoretical formulations for the K-L curve in the literature, each of which is based on different assumptions. Existing empirical studies on the curve typically employ a single factor model[5]. However, omitting a relevant variable causes specification error, the so-called 'omitted variable bias'. Underspecifying the model by excluding a relevant variable violates one of the Gauss-Markov assumptions: zero conditional means of the error term (Woolridge, 2012). This violation harms the unbiasedness of estimated coefficients. Hence, if the expected values of estimated coefficients are not equal to population parameters, it will be meaningless to interpret them; in order to avoid this misspecification problem, some control variables are included in our analysis.

In the present paper, we depict the K-L curve by controlling other determinants of PIT revenue different from its tax rate. These control variables are as follows: (i) GDP per capita; (ii) share of agriculture; (iii) share of trade; (iv) share of external debt; and (v) the inflation rate. With the exception of GDP per capita and the inflation rate, all other control variables are expressed as a fraction of GDP.

Since GDP per capita is simply the overall production per person, it can be used as a proxy for the whole economy (Gupta, 2007). Then, we include inflation rate in our analysis to capture the price effects in the economy; for this purpose, we define the inflation rate as the annual percentage change in the consumer price index over the previous year. Yet another control variable is the share of agriculture in GDP, which represents the informal sector that cannot be taxed properly from personal income, owing to lack of well-functioning bookkeeping system and market economy, dominance of small-sized enterprises, and existence of subsistence farming make difficult to tax the agriculture sector for a large number of developing countries. Furthermore, in parallel with the extant literature, the share of trade in GDP is used as a proxy of openness of the economy to the international trade. The last control variable, external debt share, indicates the government's revenue generating performance (Gupta, 2007).

The challenging point in this paper is to define the tax rate since the Turkish PIT has a progressive tax structure; depending on the level of the taxpayers' current income, the tax rates are set at 15, 20, 27 and 35%. Since it is practically almost impossible to access the number of taxpayers who fall in which tax bracket during the fiscal year, we choose using the PIT revenue for each employed – to – GDP per capita ratio which can be considered as the individual's income-tax burden. This kind of calculation methodology is frequently applied in the literature, especially in the absence of

5 See, for instance, Hsing (1996) and Karas (2012).

a specific flat tax rate as in the case of Turkey. The calculated value can be called the marginal tax rate. We use PIT revenue as the dependent variable and to eliminate the price effect, we converted the nominal level of tax revenue into the real one.

We aim to find the threshold level for the tax rate when the behavior of tax revenue changes by controlling the following variables. The appropriate econometric model for this purpose can be designed as follows:

$$T_t = \beta_0 + \beta_1 tax_t + \beta_2 tax_t^2 + \beta_3 X_t + \varepsilon_t \qquad (1),$$

where T and tax denote PIT revenue and rate respectively, whereas X denotes control variables which are listed before so that β_0, β_1, β_2 are scalars and β_3 is a parameter vector. Proving the possible existence of the curve for Turkey, the expected sign of the coefficient on PIT rate (β_1) should be positive while the coefficient on PIT rate square (β_2) should be negative. Then, the optimal tax rate will be:

$$\mathrm{T} = \beta_1 \mathrm{tax} + \beta_2 \mathrm{tax}^2 + \mathrm{C} \;\Rightarrow \frac{\partial \mathrm{T}}{\partial \mathrm{tax}} = \beta_1 + 2\beta_2 \mathrm{tax} = 0 \;\Rightarrow\; \mathrm{tax}^* = \frac{-\beta_1}{2\beta_2} \qquad (2)$$

4. Estimation strategy and results

The problem of spurious regression may arise when time series data is applied to the non-stationary form; in such a case, one possible solution is to make the series stationary by taking first-differences. However, it is important to keep in mind that the differencing of the series would hinder long-run analysis (Davidson *et al.*, 1978). To avoid such a problem, there are several methods. For instance, Davidson *et al.* (1978) propose an error correction mechanism by using first differences of the short-run and undifferenced values for the long-run dynamics. However, Engle and Granger (1987) prove the necessity of cointegration relations in order to be able to implement this method. The Johansen Cointegration test is preferred to realize the long-run relationship between variables. To do so, the first step is to test the variables in terms of stationarity.

4.1. Unit root analysis

The null hypothesis of the Dickey-Fuller (DF) unit root test states that the data needs differencing to be stationary, whereas the alternative hypothesis argues the opposite; in other words, data may not require differencing to be stationary. According to the results of the ADF unit root test, we cannot reject the null hypothesis that implies all variables are non-stationary. To see the integration order, ADF unit root test is applied to the first differences; Table 2 reports the results of this test indicating that all the differenced variables are stationary. Since all the variables are I(1), it is suitable to further apply cointegration analysis.

Table 2: ADF test results

Variable	DF Test Statistic[a]	Change in Related Variable	DF Test Statistic[b]
Agriculture Share	-2.75	ΔAgriculture Share	-5.84
Trade Share	-1.04	ΔTrade Share	-6.12
External Debt Share	-1.48	ΔExternal Debt Share	-6.19
Inflation Rate	-2.05	ΔInflation Rate	-7.91
GDP Per Capita	-0.18	ΔGDP Per Capita	-6.28
Tax Rate	-2.69	ΔTax Rate	-6.80
Tax Rate Square	-2.51	ΔTax Rate Square	-6.85
Tax Revenue	2.54	ΔTax Revenue	-11.06

Note: [a] 1% critical value is -3.614; [b] 1% critical value is -3.621

Source: Authors' calculations

4.2. Cointegration tests and results

The cointegration test is based on the idea that if a linear combination of non-stationary (I(1)) variables leads to stationarity (I(0)), then the variables are cointegrated. Cointegration relation between these variables implies the existence of a long-run equilibrium relationship between them. Johansen (1988), and Johansen and Juselis (1990) construct an unrestricted VAR model by deriving maximum likelihood estimators of cointegrating vectors for an autoregressive process in order to find the number of cointegrating relations by using error correction model[6].

One of the most crucial assumptions of the Johansen Cointegration test, that all variables are in the same integration order, is satisfied (see Table 2). The Johansen Trace test results confirm that there is a strong long-run relationship between the variables in our model (see Table 3)[7]. Table 3 also tabulates three different Johansen Trace test results. In the first one, all independent variables are included, whereas in the second one external debt share is excluded. In the last one, additional to external debt share, the inflation rate is omitted[8].

6 In this paper, we do not give the details of vector error correction model since we are only focusing on long-run dynamics of this model without losing any long-run information, i.e. using level data. However, the error correction model is tested in order to see the stability of the long-run relationship and the error correction term is found significant and negative.

7 In addition, the Lagrange multiplier (LM) test for autocorrelation concludes the rejection of the null hypothesis, which represents the non-existence of autocorrelation problem at 95% confidence level. Furthermore, the Jarque-Bera Normality test shows that residuals are normally distributed.

8 It will be clear why we omit these variables while explaining Table 4.

Table 3: Johansen Rank Test for Cointegration

Maximum Rank	Trace Statistic (Model 1 – All independent variables included)	5% Critical Value	Trace Statistic (Model 2 – External debt excluded)	5% Critical Value	Trace Statistic (Model 3 – External debt and inflation rate excluded)	5% Critical Value
0	182.44	165.58	140.45	131.70	114.44	102.14
1	129.17**	131.70	97.13**	102.14	71.76**	76.07
2	91.31	102.14	68.29	76.07	47.89	53.12
3	67.27	76.07	46.14	53.12	30.21	34.91

Note: ** There is one cointegrating relationship at the 95% confidence level.

Source: Authors' calculations

The findings of our long-run estimates presented in Table 4 are threefold. According to the first regression, the share of agriculture, trade and external debt are insignificant and all other variables are significant at the 95% confidence level (Table 4). In the second regression, the external debt share is omitted since it is statistically insignificant. In the last regression, we exclude the inflation rate with the same concern as in the external debt share.

Table 4: Long-run Estimates of the K-L Curve for the PIT
Dependent variable: PIT Revenue (in thousands TL)

Independent Variables	(Model 1)	(Model 2)	(Model 3)
Agriculture Share	276669 (182515.2)	-134572 (115401.7)	-163644** (83788.5)
Trade Share	197589 (120379)	732340*** (128027)	676825.2*** (121849.2)
External Debt Share	144198.6 (104241)		
Inflation Rate	54239.8** (23815.8)	557 (26636)	
GDP Per Capita	804.8** (351.2)	1621.7*** (367.3)	1628.9*** (238.4)
Tax Rate	3712064** (2104365)	9221823*** (2333558)	7551050*** (2226549)
Tax Rate Square	-131609** (70442.3)	-308133*** (78444.9)	-251211.4*** (74801.9)
Constant	-3.99×10^{7}** (1.83×10^{7})	-6.23×10^{7}*** (1.74×10^{7})	-4.98×10^{7}*** (1.63×10^{7})
Optimal Tax Rate Level[a]	14.10	14.96	15.03
N. of observations: 45[b]			

Note: Robust standard errors are in parentheses. [a] Optimal tax rate level is the revenue-maximizing rate of the K-L curve. [b] The observation period is 1970-2015. However, one lag is imposed in the vector error correction model by AIC and SBIC criteria. Also, standard deviations are in parentheses. *** $p < 0.01$, ** $p < 0.05$.

Source: Authors' calculations

Before turning to discuss the optimal PIT rate, it would be useful to interpret the signs of the control variables included in the models. Wagner and Weber (1977) declare that as an economy progresses, it is also observed that the public sector tends to expand. In the literature, this principle is called Wagner's Law; a positive and significant relationship between PIT revenue and GDP per capita supports the Wagner's law since GDP per capita is used to represent the condition of the overall economy.

On the other hand, the sectorial decomposition of the output is significant for tax revenue because it renders possible to collect further taxes from certain industries (Stotsky and WoldeMariam, 1997; Gupta, 2007). Deficiencies in bookkeeping makes the agriculture sector hard to collect tax properly, especially in developing countries. The significant and negative sign in the last two regressions for agriculture share of GDP points out the adverse relationship between the agricultural sector and PIT, which is consistent with the findings of Stotsky and WoldeMariam (1997) and Gupta (2007). In essence, as the agriculture share of Turkey increases, the Turkish government's revenue performance for personal income taxation declines.

The relationship between the inflation rate and PIT revenue is straightforward since high inflation rates imply rises in the wages in nominal terms. In the view of the progressivity of PIT, inflation drives incomes up and into higher tax brackets, resulting in bracket creep depending on the inflation's speed and the structure of tax progressiveness. Hence, the bracket creep allows the government to generate artificially more PIT revenue by boosting the real tax burden of personal income taxpayers, a phenomenon called 'taxflation' in the literature. On the other hand, it is also very likely that inflation may reduce the real value of tax revenues by eroding tax base, the so-called 'Tanzi effect' or 'the Olivera-Tanzi effect' that emerges in the existence of the following three conditions: (i) high inflation; (ii) lags in tax collection in un-indexed systems, and (iii) inelastic tax structure[9]. Inflation is also likely to erode the tax base by shrinking the formal sector at the expense of the informal sector. Briefly, in theory, inflation may positively or adversely affect PIT revenue depending on the case we explained above. However, our analysis demonstrates that the adverse behaviors of taxflation and the Olivera-Tanzi effect on PIT revenue make the effect of inflation on the revenue statistically insignificant for Turkey.

Gupta (2007) argues that when the government needs further revenue to finance its expenditures and/or to pay its due debt, the government will need more tax revenue, and external debt share shows this relationship. In our analysis, we find that the relationship between the external debt share and PIT revenue is too weak, i.e. insignificant. So, it would not be wrong to say that the Turkish government does not use a significant amount of PIT revenue to pay its external debt.

Lastly, as known, international trade is likely to affect tax revenue through various channels. The significant and positive sign of trade share in GDP shows consistency

9 See Tanzi (1977, 1978) and Şen (2003) for further details.

with these channels for Turkey. Firstly, the positive effect of international trade on economic development is a commonly regarded idea since the time of Adam Smith; accordingly, as a country's income rises, revenue obtained from PIT increases, too. Secondly, compared to domestic activities, taxing international trade is relatively easier since international activities are taking place at specific locations of the country.

Our long-run estimates from the last regression[10] show that the revenue-maximizing PIT rate (the optimal PIT rate) is 15.03%. The actual tax rate, on the other hand, for the year 2015 is estimated at 15.37%. Based on these findings, we can argue that Turkey is on the right side of the K-L curve referring to the prohibitive range of the curve (see Figure 1).

This finding suggests that if the Turkish fiscal authorities should aim to increase the PIT rate further with the purpose of generating more revenue from this tax, this tax policy action will end up with a significant reduction in PIT revenue rather than a rise; in order to avoid this situation, the current PIT rate should instead be lowered to the rate that corresponds to the Laffer hill, which is 15.03%.

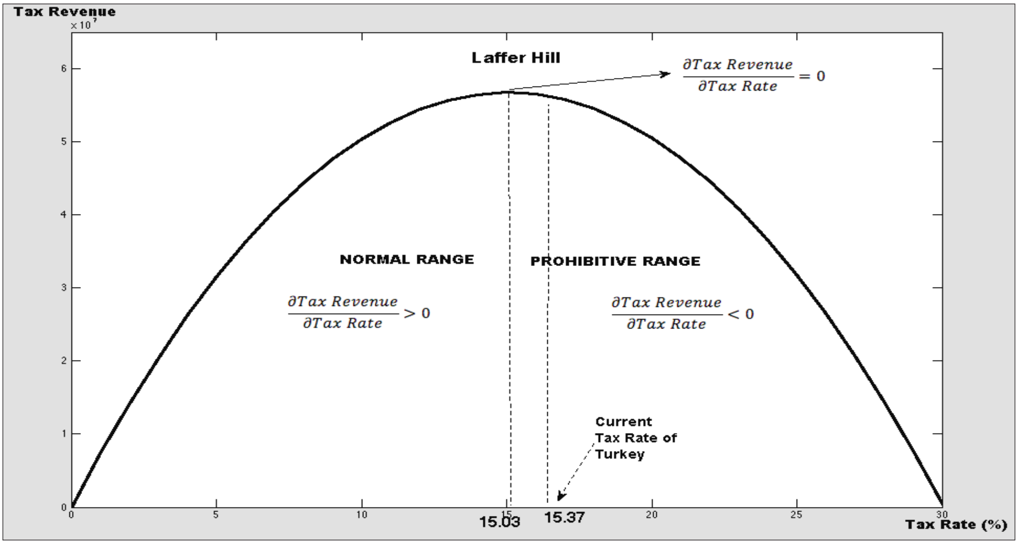

Figure 1: The K-L Curve for the PIT in Turkey[11]

Source: Authors' computation

10 From now on, we consider the results of the last regression since it performs along the lines of our suggested theoretical framework.

11 Based on Table 3, we construct Figure 1 depending on the coefficients coming from long-run estimates, under the assumption of zero control variables since the aim is only to see the classic bell-shaped relationship between tax rate and tax revenue.

5. Conclusion

This paper revisited and then empirically tested the potential existence of the K-L curve for personal income tax (PIT) on the long run by utilizing annual Turkish data over the 1970-2015 period. Our estimation results appear to confirm the validity of the K-L curve in the context of the PIT for Turkey; we found the optimal PIT rate as 15.03% and the present PIT rate as 15.37% for Turkey. Thus, we can argue that the current PIT rate in Turkey is somewhat over its optimal, putting Turkey's current PIT rate into the prohibitive range of the curve. This implies that a reduction in the PIT rate increases PIT revenue that will be collected by the Turkish authorities; in other words, if they reduce the current PIT rate down to its optimal, ceteris paribus, PIT revenue will rise to the corresponding maximum level. If done so, the authorities would have an opportunity of generating further tax revenues with a lower tax rate as higher tax rates create a substitution effect that would discourage working as well as forcing taxpayers to seek out the ways of reducing the tax burden. Our findings presented above are broadly consistent with the findings of similar but scant, empirical studies in this field, such as Hsing (1996) and Karas (2012), which solely focus on the PIT.

Realizing what drives tax revenue is crucially important for not only designing but also implementing a proper tax policy for all countries. A good starting point is the K-L curve that relates tax rates with tax revenue; for the PIT, the curve represents a concave relationship between the revenue obtained from this tax and its rates. From a tax policy perspective, on the basis of our empirical findings, the closeness of the current PIT rate (15.37%) to the lowest level of tax bracket that is 15% as highlighted earlier suggests that the main source of the PIT revenue comes from individuals at the lower income level. As such, individuals with lower income whose taxable incomes fall in the first two brackets of the PIT largely bear the tax burden of the PIT, which may explain the distorted redistributive role of the PIT in Turkey. Besides, the optimal PIT rate also implies that in order to maximize tax revenue, the government should not exceed the lowest level of the income bracket.

Despite the positive explanations in favor of the K-L curve throughout the present paper, as frequently discussed elsewhere in the literature, it is also obvious that the curve has several drawbacks and deficiencies on both theoretical and empirical grounds that should be considered for future studies. First, in Laffer's view, the shape of the curve is solely determined by tax rates. However, the curve may take different shapes and positions depending on various factors, such as the state of business cycle, openness to trade, reaction of taxpayers to the changes in tax rates, how the government spends its tax revenue (investment, consumption, or transfers?), tax consciousness and ethics, and the labor market structure and arrangements, and the size of informal economy. The factors above and their similarities can also make the curve unstable, changing the slope of the curve subject to the time horizon. Second, it is uncertain whether cuts in tax rates produce greater tax revenue while boosting economic activity by incentivizing saving and investment as suggested by Laffer. Third, Laffer does not mention whether tax rate reductions are permanent or transitory. We know that the effects of each measure on the economy are different. Fourth, tax rate cuts would not always encourage the taxpayer to work more as proposed by Laffer. Last, there may be more than one peak of the K-L curve that maximizes tax revenue.

Having considered the aforementioned drawbacks and deficiencies, the Laffer curve is still a critically important concept that draws our attention to the harmful effects of high taxes not just for revenue enhancing, but also for stimulating economic activity by introducing an optimal tax rate. No doubt, further empirical research is essential to identify the drawbacks and deficiencies of the curve for having better tax policies in particular and for designing growth-friendly economic policies in general.

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