# 8. THE REVENUE-MAXIMIZING CORPORATE INCOME TAX RATE FOR TURKEY

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## Abstract

*This paper empirically explores the revenue-maximizing corporate income tax rate for Turkey by using annual time-series data for the period from 1980 to 2019. Overall, we identify two key findings. First, corporate income tax rates are nonlinearly associated with revenues from corporate taxation, confirming the existence of an inverted U-shaped relationship between the two variables. Second, the estimated revenue-maximizing corporate income tax rate is found to be 23.5%, slightly above Turkey's current statutory corporate income tax rate of 22%. These findings indicate that the current rate is only 1.5 percentage points lower than its revenue-maximizing value and thus there is little room for Turkish authorities for reaching a revenue-maximizing peak through tax rate hikes. The most striking result that emerges from our empirical analysis is that raising revenues from corporate taxation further through statutory corporate income tax rate hikes is not an appropriate tax policy option for Turkey. Instead, it may be a more plausible policy option to go corporate income tax cuts that have positive implications for economic growth and employment and by implication for government taxation in the long run. If the Turkish policymakers insist on revenue-raising through corporate taxation, they should focus exclusively on macroeconomic and non-macroeconomic factors that would increase the size and profitability of the corporate sector.*

**Key Words:** Corporate income tax, optimal corporate income tax rate, Laffer curve, tax policy, Turkey.
**JEL Codes:** E62, H21, H25, C32

## 1. Introduction and Some Theoretical Issues

There is no question that one of the main challenging arguments of supply-side economics that emerged in the late 1970s was the Khaldûn–Laffer curve (hereafter the K–L curve).[3]

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[3] *As articulated by Laffer (2004) himself, the philosophical idea behind the K–L curve traces back to Ibn Khaldûn, a muslim philosopher of the 14th century. That is why we label the curve as the K-L curve. Hence, throughout this study, we use Laffer curve and the K–L curve interchangeably.*

The curve establishes a hump-shaped relationship between tax rates and tax revenues, stating that the level of tax revenues is essentially determined by the variations in tax rates.[4] Accordingly, as tax rates rise, tax revenues also increase up to a certain point[5] but beyond which tax revenues tend to decrease as tax rates continue to increase. More specifically, the K–L curve starts with a rate of 0% generating zero tax revenue, rises to its optimal rate generating maximum revenue, and then reaches the top tax rate (the rate of 100%) generating again zero revenue. A certain point of the curve corresponds to the revenue-maximizing (or optimal) tax rate at which the government can collect its maximum tax revenues. The area under the curve is divided into two regions as the normal range (positively sloped side of the curve) and the prohibitive range (negatively sloped side of the curve). A rational tax policy targets to keep tax rates in the normal range. Being in the normal range alludes to a possibility for a government to raise tax revenues by increasing the tax rate without distorting the economy. In this area, the income effect of taxation is dominant, whereas, in the prohibitive area, the substitution effect is effective. Meanwhile, as argued by Ballard et al. (1985), it would be worth noting that the position of the K–L curve may change, depending on several factors, such as supply and demand elasticities, consumption and production parameters, and other circumstances in the economy.

The implicit perception behind the curve is that the more taxes on economic activity, the less tax revenue collected or vice versa. The curve describes how variations in tax rates affect tax revenues generated by the government. Accordingly, variations in tax rates create an “arithmetic effect” in the short run whereas it gives rise to an “economic effect” in the longer run (see Laffer, 2004 for further details). The arithmetic effect, which is a static effect that always operates in opposite direction with what is called economic effect, comes out in the case that if tax rates are altered, then tax revenues, say, per Turkish liras of the taxable base —or revenues and earnings available for taxation—will change correspondingly since tax revenue is equal to tax rate multiplied by the taxable base. On the other hand, the economic effect, or incentive effect, refers to the incentive effects of cuts in tax rates on willingness to work, output, and employment. This effect assumes that tax rates influence the taxable base and then increases in tax rates restrain taxpayers from engaging with such activities. Any tax rates above the revenue-maximizing rate would induce a reduction in tax revenues generated. In particular, at the extreme rate, the government would not, on the theoretical ground at least, collect any tax revenue since taxpayers will re-shape their behavior in response to the tax rate. For instance, they will either lose their incentive to work, or they will look for ways of getting rid of the objective and subjective tax burdens, such as tax avoidance or tax evasion. Now then, from the perspective of the K–L curve, an extreme tax rate corresponds to non-zero tax revenue. In this case, the ideal one is to estimate an optimal tax rate that maximizes tax revenues that falls into a range between the rates of 0% and 100%. Briefly, there are two rates of taxation at which no tax revenue will be generated by the government: 0% and 100%.

With the expression of Wanniski (1978) who introduced Arthur B. Laffer’s idea for the first time and thus named the concept as the “Laffer curve” on the behalf of Arthur B. Laffer, “there are always two rates that yield the same revenue” (p. 3). In the former case, a hike in

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*[4] It is worth noting here that in Arthur B. Laffer’s jargon, tax rates typically refer to marginal tax rates. Owing to the fact that corporate tax is a flat tax, at least in the case of Turkey, there is no difference between marginal and average tax rates, denoting the same things.*

*[5] This point refers to the peak point of the K–L curve that is also named in the literature as the Laffer hill, Laffer peak or Laffer point.*

tax rates increases tax revenues collected by the government. In the latter case, however, a drop in tax rates results in an increase in tax revenues generated. These are based on a K–L curve's simple argument that as tax rates hike the tax base of related tax narrow or vice versa under the assumption that individuals wish to work rather than preferring leisure time and to invest more, and shelter less from their income from taxes as long as tax rates are lower. All these explanations, at least theoretically, refers to the existence of an inverted U-shaped or hump-shaped, nonlinear relationship between tax rates and tax revenues.

Despite the above positive challenges, the K–L curve, as a whole, has received heavy criticism from academics as well as other circles like politicians and policymakers, especially at the following points. The curve does not consider: (i) the size of tax loopholes; (ii) the size of informal economy and the degree of simplicity of switching from the formal economy to informal one; (iii) tax avoidance and evasion; (iv) growing pattern of the economy, v) the country-specific features of the economy and the development level of the country, i.e. whether it is developed or developing; and (vi) the sorts of reductions in tax rates, i.e. transitory or permanent. These criticisms on the K–L curve are frequently put into words by several prominent researchers, including Blinder (1981), Henderson (1981), Dalamagas (1988), Tanzi (2014).

Although the K–L curve has a long history and the above criticisms, it still relies on an important concept for designing efficient tax policy for countries. At least, a government that is in a need of generating more tax revenue should look for its optimal rate. It is well aware of all that corporate income tax (henceforth CIT) is very important for all countries that seek to boost domestic and foreign investments to stimulate economic growth. Since the tax is levied on the incomes of corporations, it is very likely to adversely affect the investment decisions of resident and non-resident corporations by diminishing their after-tax profits. It is also very likely for corporates to direct their investments from high-tax to low-tax countries. As witnessed in the last couple of decades, countries have embarked upon competition of reducing corporate tax rates to attract more foreign investment. In particular, for developing countries like Turkey, which are in desperate need of foreign direct capital, providing a trade-off between collecting more tax revenue by imposing higher rates and incentivizing corporations with relatively low rates become a crucial point. But not limited to these, studying the K–L curve with different tax forms has significant implications for countries like Turkey that is in persistent need of raising tax revenues to cover fast-growing government spending but cannot use fiscal space effectively. This is because the K–L curve is also a useful instrument to get the maximum benefit from fiscal space. On the other hand, there have been just a couple of studies that examine the K–L curve in the context of CIT in the literature. Also rates on personal and corporate incomes. In addition to these few studies, to the best of our knowledge, there is no other study that points out an optimal CIT rate for Turkey. With this main contribution, the aim is to clarify and give an idea to the authorities at empirical level on their corporate tax policy for Turkey which significantly relies on corporate tax income for the government expenses. Beyond all these, if tax policy decisions are also supported with quantified data that has appropriate accuracy, it would help improve the quality of tax policy further. Exploring the revenue-maximizing corporate income tax rate is one of them that we focus on in this paper.

In short, the present study seeks to investigate the revenue-maximizing CIT rate for Turkey. That is why the studies focusing on other taxes rather than the CIT are beyond the purpose of this study. So, in the following, we only consider the studies that focus on CIT in the context of the K–L curve. However, the existing literature on the K–L curve that exclusively focuses on CIT contains is highly scant. To the best of our knowledge, there have been so far just few empirical studies: Clausing (2007), Brill and Hassett (2007), Stinespring (2009), and Gomeh and Strawczynski (2020). So, the present study is devoted to contributing to the scant literature by considering a case of an emerging economy, Turkey, with a long-run perspective.

The outline of the study is as follows. Section 2 explains recent developments in CIT in Turkey. Section 3 reviews the related literature with a special focus on the K–L curve in the context of CIT, whereas Section 4 describes data and variables together with an econometric model specification to the study. Section 5 provides empirical analysis and estimation results. Section 6 performs a robustness check for the study. The last section, Section 7, provides final remarks.

## 2. Recent Developments in Corporate Income Tax in Turkey

CIT is a typical income tax that is widely applied by many countries around the world under different names, such as corporate tax, company tax, corporation tax, and capital tax. Although its implementation method may change from one country to another, broadly speaking, CIT is levied on the net taxable income of some sort of legal entities. The CIT is mostly implemented as a flat tax with a single rate. As of 2019, among the present 34 OECD member countries, the statutory rates of CIT lie in a range of 8.5-35%. At present, the highest statutory CIT rate is in the USA, whereas the lowest one is in Switzerland. There are also some countries, but the majority of them are either city-state and/or oil-rich countries, such as Bahamas, Bahrain, Bermuda, Cayman Islands, UAE, and the Marshall Islands, where the tax rate on corporate profits is 0%.

For Turkey, the rules of the CIT practice were first introduced in 1949 under the Corporation Tax Law. According to the aforementioned law, the income and earning of corporations and corporate bodies are subject to the CIT over net profits they made. The law assigns the following corporations and corporate bodies as the taxpayers of the CIT: (i) capital companies and similar foreign companies; (ii) cooperatives; (iii) public enterprises; (iv) enterprises owned by foundations, societies, and associations, and (v) joint ventures.

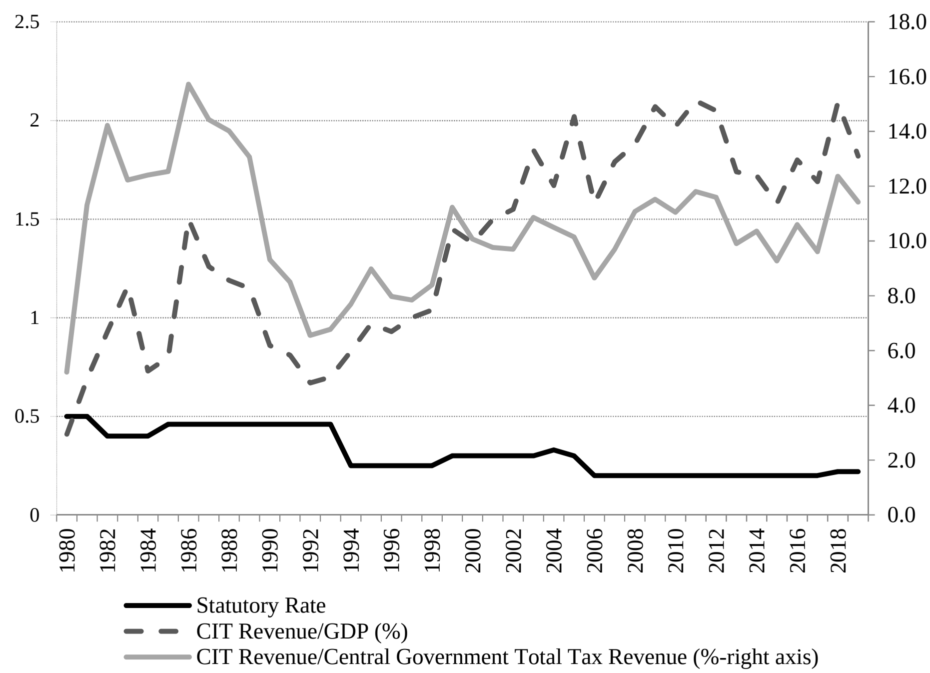
On the other hand, the law specifies two sorts of tax liabilities for the CIT. One is a full liability and the other is limited liability. Those companies whose legal centers and/or their main business offices —as the place in which the business activities are concentrated and supervised—are in Turkey are taxed on the basis of their worldwide net taxable income and their profits subject to full liability. However, those companies that only obtain income and earnings within the territory of Turkey, but their legal centers and the main business offices are not in Turkey are subject to limited liability.

The assessment of CIT is subject to the declaration of taxpayers with a return. Tax returns are annually filled by corporations and submitted to the related tax office. To create a favorable home country tax environment for tax competition and thus to attract foreign firms many countries around the globe have steadily lowered their CIT rates. Due to almost similar concerns, over past decades, the statutory CIT rates in Turkey have been gradually reduced from, for instance, 46% in 1990 to 33 in 2004 to 30 in 2005, and then with a radical reduction, it was lowered to 20% in 2006 (see Figure 1). But the current statutory CIT rate was raised to 22% from 20% as of the last quarter of 2017. As of December 2020, corporations in Turkey are liable to the CIT at a statutory rate of 22%, putting Turkey somewhat below the average of the current 34 OECD member countries; that is, 22.4%. Over the past three-four decades, among the OECD member countries, there has also been a tendency towards imposing lower levels of the statutory CIT rate, but the average rate remains always higher than Turkey's current rate.

Figure 1 plots the striking evolution of the statutory CIT rate against CIT revenues, expressed as a share of the total central government tax revenues and GDP, separately, since 1980. As exhibited in the figure, the left-hand side of the vertical axis measures the statutory CIT rates and CIT revenues as a percentage of GDP whereas the right-hand side of the axis measures the CIT revenues as a percentage of central government total tax revenue. Adhering to the figure, roughly speaking, it is the case that the lower statutory rates are associated with higher CIT revenue.

**Figure 1**

**Evolution of the statutory CIT rate versus CIT revenues in Turkey, 1980 to 2019**




*Source: Turkish Ministry of Treasury and Finance and World Bank Database*

According to the official figures released by the Turkish Revenue Administration Authority (very often abbreviated in Turkish as just "GİB"), the number of taxpayers, as the average of the past decade, well exceeds 600 thousand. Despite the presence of such a considerable number of corporate taxpayers, the contribution of the large majority of corporations to corporate tax revenues is very little. By and large, there are 100 top corporations that come to the first in accounting for CIT revenues, a great large portion of which are state-owned ones. Another highlighting observation is that despite the high tax rates in the 1980s, real variation in annual tax revenues was negative. In other words, the real value of corporate tax revenue was decreasing. Following an array of statutory CIT rate cuts towards today's rate by the government, real variation in CIT revenues increases when the economic crisis years are not excluded.

On average, the share of revenues from corporate taxation in total central government tax revenues is nearly 9%, whereas the same ratio was well-above 10% in general except for major economic and financial crisis times. With these figures, the CIT has been stationed in fourth place within the Turkish Tax System after the special consumption tax, the VAT, and the personal income tax in terms of revenue generation.

## 3. Related Literature

A glance at the existing literature reveals that the discussions about not only the theoretical but also empirical aspects of the K–L curve have received remarkable attention among academics and policymakers since the early 1980s. Some studies, such as Henderson (1981), Malcomson (1986), Gahvari (1988), Sanyal et al. (2000), Agell and Persson (2001), and Novales and Ruiz (2002), concentrate on the theoretical aspects of the curve, while others, like Feige and McGee (1983), van Ravestein and Vijlbrief (1988), Hsing (1996), Matthews (2003), Heijman and van Ophem (2005), Clausing (2007), Trabandt and Uhlig (2011, 2012), Karas (2012), Akgun *et al.* (2017), Şen *et al.* (2019), and Steinmüller *et al.* (2019), focus on the empirical analysis of the K–L curve in the context of various taxes.

It is worth to underline that most of the studies mentioned above first develop a theoretical model and then calibrate it to a country and/or country groups. Moreover, some of these studies critically assess the K–L curve on the ground ranging from its logic to validity as well.

An early contribution that investigates the revenue-maximizing CIT rate belongs to Clausing (2007). The author examines the presence of the Laffer curve in the context of the CIT for 29 OECD member countries[6]. Based on the central government data over the period 1979-2002, the author reports that there is a quadratic relationship between tax rates and CIT revenues for the sample countries and she estimates the revenue-maximizing CIT rate to be 33% for the countries under consideration. But the author draws attention to the fact that "… *while this is an estimate for the sample of countries and years studied in this analysis, it need not imply the revenue-maximizing tax rate for any particular country at any particular time, which is likely to depend on that country's individual circumstances. Country circumstances include the size and openness of the country in question"* (Clausing, 2007: p. 130-131). Based on her findings, she concludes that "… *smaller, more open economies will have lower revenue-maximizing tax rates than do larger or more closed economies. This is compatible with the theoretical expectation that such countries should face a more elastic capital supply*" (p. 131).

In a follow-up study, Brill and Hassett (2007) replicate as well as extend the results of Clausing (2007) by using slightly different data, covering data on all levels of government, instead of using only central government data. The authors find robust evidence, showing

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[6] *These countries are Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the UK, and the USA.*

the existence of the K–L curve for the CIT throughout most of their sample period. Apart from this, the authors' other empirical findings may be itemized as follows:(i) the revenue-maximizing CIT rate was about 34% as of the late 1980s. But it has decreased steadily over time, dropping to almost 26% for the most recent period; (ii) the shape of the curve has changed over time, and then become steeper, which suggests that the penalty for being above the peak of the Laffer curve has increased. This is an observation that is consistent with increased capital mobility in the sample countries; and (iii) the gap between the top rate of the Laffer curve and the average tax rate among the OECD member countries has narrowed in the period analyzed.

Vogel (2012) extends the QUEST III model[7] by home production to analyze fiscal limits in an economy with tax avoidance. The author analyzes the revenue functions of labor income, corporate, and consumption taxes in the QUEST III model for an average EU member state. The author finds the revenue-maximizing CIT rate as being 72%, which is well over the EU-average actual implicit tax rate of 32%. Contrary to monopolistic competition in goods and labor markets where the CIT applies to the sum of profit and capital income in the QUEST model, Trabandt and Uhlig (2011, 2012) use Solow-Swan's growth model[8] with perfect competition in which returns on capital is taxed through corporate income taxation. They estimate the revenue-maximizing CIT rate to be 46%, which corresponds to a lower value than that of Vogel's (2012) finding.

In an attempt to investigate the presence of the K–L curve for three major taxes (Labor, capital, and consumption taxes) for Japan for the period 1980 to 2009, Nutahara (2015) used Trabandt and Uhlig' (2011, 2012) method and found that the capital tax rate is very close to the peak rate, or higher than that of the curve. Based on the empirical findings, the author suggests that to maximize total tax revenues, the Japanese government should lower the capital tax rate from the current level.

Adopting a dynamic general equilibrium model in which tax evasion and underground activities are explicitly incorporated, Busato and Chiarini (2013) analyze the K–L curve for corporate and personal income taxes. According to the authors' findings, the curve peaks at 66% for the CIT. In addition to this, the authors' findings show that the underground economy considerably flattens the curves as well as lowers the maximum collectible tax revenue, reflecting the impact of the underground economy on the curves which stem from the high elasticity of substitution between formal and informal activity.

An OECD study by Akgun et al. (2017) looks at how government tax revenue responds to tax rates by using a panel of 34 OECD countries from1978 to 2014. In the context of corporate income tax, the authors' estimation shows that the response of revenue to rates weakens as rates become higher, confirming the existence of a hump-shaped relationship between tax revenues and rates for corporate income taxation. The authors' study shows further that the estimated responses of government tax revenues to tax rates vary, in some cases very strongly from an economic perspective, depending on country-specific policies and framework conditions. Concerning corporate income tax, the authors conclude that: (i) the revenue-generation potential of hiking the effective tax rates shrinks much more quickly in more open economies relative to more closed ones; and (ii) tax revenue is more responsive to tax increases in countries where the tax authorities have more resources.

[7] *An estimated DSGE model of the Euro Area with fiscal and monetary policy.*

[8] *See Solow (1956), Swan (1956).*

A similar, but most recent study by Gábriel and Kabza (2019) examines the Laffer curve of the labor tax rate for the Hungarian economy by using a general equilibrium model and finds that the budget revenue-maximizing tax rate in the medium term is 55%. When the accumulation of human capital and capturing the longer-term effects of a tax cut is considered, however, it drops to 40%. Based on these findings, the authors conclude that following the Hungarian tax reform after 2010, the maximum marginal tax rate shifted to the left of the Laffer hill, where the slope is positive, considerably improving the efficiency of the tax regime. An overlapping study by Lin and Jia (2019) on China also uses a similar model and shows that the Chinese data verify the validity of the Laffer curve with a threshold level of approximately 40%. However, the same ratio would be 35% when the direct tax on labor is considered. Overall, the authors conclude that the government tax peak is always 5-10% earlier than the apex of the Laffer curve.

A fresh study by Ferreira-Lopes et al. (2020) estimate individual Laffer curves for three direct and indirect taxes (value-added, corporate income, and labor taxes) that contribute the most to the government revenue for a panel of 18 eurozone member countries[9] for the period spanning from 1995 to 2011. Adopting the Seemingly Unrelated Regression models specification, among others, the authors arrive at the following results: (i) the estimated parameters are significant and have expected sign according to the Laffer curve hypothesis for the majority of the sample countries; (ii) the estimated significant parameters are especially the case for Greece, Portugal, and Slovakia for the direct taxes (corporate income tax and labor income tax); and (iii) especially for corporate income tax, there is a strong divide between the values of the optimal tax rates for Eastern European countries and Western European economies and that the economic and financial conditions of each country also affect the value of these tax rates. Specifically, by ranking the optimal taxes across countries, the smaller occur amongst Eastern European countries, like Estonia (15%), Latvia (15%), and Slovenia (14%), while the larger is in Western European economies, such as Italy (31%), the Netherlands (30 vs. 50%), and France (26 vs. 30%).

Another fresh paper by Gomeh and Strawczynski (2020) uses a micro dataset of Israel for the time span between 2006 and 2015 and estimates the tax rate at the Laffer curve's peak. The authors' estimation reveals that the aggregate tax rates at the peak of the curve are within the range of 26-38%. Based on their findings, the authors argue that the figures they found fall into almost the range obtained using the macro dataset.

To conclude, the literature on the K–L curve hypothesis that is examined solely in the context of the CIT is rather sparse. As reviewed above, available studies in the literature in this regard analyze the validity of the curve and by implication the revenue-maximizing rate in a multiple-tax context. Additionally, though the vast majority of the available literature verifies the validity of the curve for various taxes, including corporate income tax, the studies offer rather diverse tax rates at which government tax revenue is maximized. Furthermore, estimation methodology-related factors, including model specification, time span, and the proxy variables employed for the tax rate along country-specific factors induce different results among studies.

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[9] *The countries are: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxemburg, Malta, the Netherlands, Portugal, Slovak Republic, Slovenia, and Spain.*

# 4. Data and Econometric Specification

The primary objective of the present study is twofold. The first one is to examine the validity of the K–L curve for corporate taxation for Turkey. The second one is to estimate numerically the “Laffer hill” that provides concrete knowledge concerning the intersection of optimal tax rate and its correspondence tax revenue over the curve if there is a nonlinearity between tax rates and tax revenues as proposed by Arthur B. Laffer. As discussed above, the existing literature about corporate taxation largely focuses on the determinants of corporate taxation rather than its revenue-maximizing rate. But in-country groups, the levels of tax rate change in a range of between 8% and 35% among OECD member countries. So, finding an optimal level for a country group may be hard to interpret. For instance, Clausing (2007) finds the revenue-maximizing CIT rate at 33% for OECD member countries. However, among these countries, the statutory CIT rate is 8.5% for Switzerland whereas it is 35% for the US. Due to not only this high differentiation but also economic structure differences among the sample countries may make it hard to make a policy recommendation for corporate taxation. Thereby, instead of a set of countries, we prefer to focus on an individual country; —that is, Turkey—, to assess the current situation and make some tax policy recommendations relating to corporate taxation.

## *4.1. Data and Variables*

The empirical analysis of the present study is based on Turkey’s annual time-series data over the period 1980-2019. The period under scrutiny is dictated by data availability. Except for the data on taxes and firm-specific values that come from the Ministry of Treasury and Finance Database, data on all other variables are collected from the World Bank Database. The variables that we used and their description together with summary statistics are reported in Table 1.

**Table 1**

**Description of variables and summary statistics**

| Variable | Description/Measurement | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Tax revenue | The share of CIT revenues in GDP (%) | 1.37 | 0.49 | 0.41 | 2.1 |
| Tax rate | Statutory CIT rate (%) | 0.31 | 0.11 | 0.2 | 0.5 |
| Trade share | The share of the sum of exports and imports in GDP (%) | 43.55 | 11.54 | 17.09 | 61.39 |
| Unemployment rate | The ratio of the number of people who are registered unemployed over the number of people in the labor force (%) | 8.69 | 1.75 | 5.99 | 13.49 |
| Output per person | Total output divided by population ($) | 5572.1 | 3918.4 | 1246.8 | 12519.4 |
| Net number of firms | The difference between the number of newly established and closed firms liable to CIT | 34083.5 | 18580.4 | 6042 | 72715 |
| Agriculture share | The share of agriculture sector in GDP (%) | 12.82 | 5.72 | 5.82 | 26.15 |
| Inflation rate | Annual percentage change in consumer price index (CPI) (%) | 40.47 | 31.27 | 6.25 | 110.17 |

*Note: The correlation matrix of the variables is checked to prevent the multicollinearity problem.*
*Source: Authors’ calculations*

The justification of the variables is given in the subsequent section. What we see from Table 1 is that some variables such as inflation rate and output per person have a high variation through time which shows the fluctuating structure of the Turkish economy. The other possible deduction from this table is the range of the tax rate which is between 20% and 50%. Considering the current statutory rate (22%), it seems that the previous tax rates were much higher than the current one. On the other hand, regarding the standard deviation of the unemployment rate, it is somewhat less volatile.

## *4.2. Econometric Specification*

In this section, economic theory for the selected variables is explained with the econometric methodology applied to test the validity of the K–L curve for corporate taxation. Since the K–L curve hypothesis tests the possible existence of a threshold for tax rate, some empirical studies present the tax rate and the square of the tax rate as the only independent variables. However, tax revenues might be affected by other economic variables that have to be tested during an empirical analysis due to preventing “omitted variable bias”. Excluding a relevant variable makes the estimated coefficients as biased because of the violation of the zero conditional mean assumption (Woolridge, 2012). To overcome this problem, some control variables that have the potential in explaining CIT revenues are incorporated into our empirical analysis. These variables are: (i) output per person; (ii) unemployment rate; (iii) trade share; (iv) inflation rate; (v) agriculture share; and (vi) firm related variables.

The purpose of including independent variables other than the CIT rate and the square of the CIT rate is not only to avoid the underspecified econometric model but also to observe the pure effect of the CIT rate on CIT revenues. The CIT rate we considered throughout this paper is the statutory CIT rate set by the central government. It is noteworthy to state at this point that in this study, we use statutory tax rates rather than effective ones. Although we are fully aware of the fact that statutory tax rates represent only official rates. So, strictly speaking, they mostly do not take into account (at least in the case of Turkey; that is, the sample country) tax expenditures, such as loopholes, deductions, exemptions or credits and preferential rates, which may also affect tax collection, unavailability of the related data forces us to use statutory tax rates. Furthermore, as highlighted in several empirical studies (see, notably, Mendoza et al.,1997), obtaining and/or choosing an appropriate tax rate for the proxy measure of tax shocks is a problematic issue for empirical studies. Having claimed average marginal tax rates are the most accurate proxy measure for tax shocks, a good deal of studies suggest using marginal tax rates (see, for example, Padovano and Gali, 2002; Poulson and Kaplan, 2008; Arin et al., 2013; Steinmüller et al., 2019 for a review). However, time-series data for the components of this variable is unavailable for a great majority of countries, including Turkey. Hence, some empirical studies employ either average or statutory rates as rough approximations to the average marginal tax rate. As a result, in this paper, the statutory tax rate is used due to not only the availability of the data but also Turkish CIT is practiced as the flat tax where there is no considerable difference between the marginal tax rates and average ones.

In general terms, output per person reflects the performance of the economy. In the context of CIT, output per person gives a perspective regarding the revenue-generating capacity of the state (Clausing, 2007). So, a positive relationship is expected between CIT revenues and output per person, also considering the arguments of Wagner and Weber (1977). What is more, Clausing (2007) suggests that richer countries have a relatively higher portion of the corporate sector in the economy so that output per person should be assigned as a structural factor variable among CIT revenues determinants and hence can be assumed to be a proxy for the size of the corporate sector.

The link between inflation and CIT revenue is unambiguous since high inflation hints at rises in the corporate profits in nominal terms. However, this rise boosts the real tax burden of firm owners, which is called “taxflation” in the literature. On the other hand, the real value of tax revenue decreases as inflation rises, which is known as the “Tanzi effect” or “Olivera–Tanzi effect”.[10] Because of these two opposite effects of inflation on tax revenues, there is no credible consensus over the sign of the relationship between these two variables, implying the existence of an ambiguous relationship. The percentage variation in the CPI index over the previous year measures the annual inflation rate in this study. Another control variable that we use is the unemployment rate. Cluasing (2007) defines the unemployment rate as a cyclical variable that affects corporate profitability, while Fullerton (1982) explains the relationship between unemployment and CIT revenues from the microeconomic effect of demands for goods and services, which influence corporate sales. Because of this, we posit that the expected sign of the unemployment rate is negative. The other control variable is agriculture share which is measured as the ratio of the agriculture sector over GDP. It is widely used to represent the informal sector capacity in a country because of difficulty in taxing and detecting. As also underlined in several studies, such as Burgess and Stern (1993), Stotsky and WoldeMariam (1997), Bird, Martinez-Velasquez and Torgler (2004), and Mahdavi (2007), rises in the share of agriculture in the national economy reduce tax revenues because of many factors associated with this sector, such as low literacy, difficulties in income measurement, large fluctuations in income, and poor accounting. Hence we posit a negative sign for this variable.

Trade share is widely used as a proxy variable for the measurement of the openness degree of an economy to international trade, referring to, at the same time, the “globalization ratio”. It is traditionally expressed as the ratio of the sum of imports and exports over GDP. The degree of openness to international trade can affect tax revenues through corporate profitability or/or tax competition. Many studies, including Piancastelli (2001), Mahdavi (2008), and Profeta and Scabrosetti (2010), regard openness degree as one of the key drivers of tax revenues. They also demonstrate the existence of a positive relationship between the openness degree of the economy and tax revenues since the openness degree provides a higher demand for goods, which induces production increases, so does corporate profitability. On the other hand, some studies, such as Rodrik (1997), Grubert (2001), Slemrod (2004), Loretz (2008), provide evidence on the relationship between international trade and tax competition, suggesting that tax competition-induced reductions in tax rates adversely correlated with revenues from taxation. For this reason, we recognize that there is no an agreed consensus about the sign of this variable.

Firm-related data is the net number of firms, the difference between newly established and closed firms for that specific year, liable to the CIT. This variable is used to represent the corporate share of the economy. The total number of the firms liable to the CIT is also included in the analyses but then excluded, because it is found highly insignificant for this study so that the flow variable, the difference between newly established and closed firms, is used and it is called net firms throughout this study. The net number of firms has a direct effect on CIT revenues since the net number of firms, which pay the CIT, changes, revenues will change. Also, this variable is included to eliminate the firm-related effects from CIT

[10] *See Tanzi (1977, 1978) for further discussion of this concept.*

revenues and diagnose the clear effect of the CIT rate on CIT revenues. The expected sign for this variable is negative because the newly established firms will probably have lower revenue than the closed firms which may be already giving their tax for a while. So, as the number of newly-established firms exceeding the number of closed ones increases, i.e. the net number of firms increases, in that year, the total tax revenues will decrease. After controlling for the variables above, we seek to estimate the threshold level of the CIT rate when the behavior of tax revenue changes. To do this, we adopt a standard quadratic relationship between the CIT rate and tax revenue raised by corporate income taxation. The appropriate quadratic equation that mathematically represents the relationship between tax rates and tax revenues illustrated by the K–L curve for econometric estimation can be written as:

$$T_t = \beta_0 + \beta_1 tax_t + \beta_2 tax_t^2 + \beta_3 F_t + \beta_4 X_t + \varepsilon_t$$

where the subscript t denotes the time period. Similarly, T is revenues from corporate taxation and tax stands for tax rate, whereas X and F stand for control variables described before, and firm-related control variable respectively that $\beta_0, \beta_1, \beta_2$ and $\beta_3$ are scalars and $\beta_4$ is a parameter vector. If the squared coefficient on tax is negative and significant and the coefficient on tax is positive and significant at the same time, it indicates that tax revenues generated by the government initially increases and eventually decrease with the rise in the tax rate. Theoretically, the aforementioned optimal rate is a tax rate at which the K–L curve makes a peak, representing the revenue-maximizing point; that is, the Laffer hill.

On balance, having the above equation, the revenue-maximizing tax rate can be formulated as follows:[11]

$$tax^* = \frac{-\beta_1}{2\beta_2}$$

## 5. Empirical Analysis and Results

Our empirical analysis is based on annual time series data and the sample period runs from 1980 to 2019. The data frequency and the sample period are entirely dictated by data availability. Notably, the unavailability of firm related data constrains the span of the data. For our time series analysis, as a first step, we test the variables for stationarity, since in the existence of unit root, the regression results will be spurious, which is first introduced to the literature by Granger and Newbold (1974). The null hypothesis of the Augmented Dickey-Fuller (ADF) unit root test is that the variable follows a unit root process, against the alternative hypothesis; the variable does not follow a unit root process.

According to the ADF unit root results, presented in Table 2, all variables are in the form of non-stationary and integrated of order one (I(1)).That is, the null hypothesis cannot be rejected for the level data. However, it is rejected for the first differences of the data. Given these results, Granger and Newbold (1974) state the results of non-stationary regressions

[11] *Since our objective is to estimate the revenue-maximizing rate for CIT, if such a rate exists, we are taking the first order derivative of tax revenues with respect to the tax rate and equalizing it to zero. The optimal tax rate for a certain tax that maximizes tax revenues generated and corresponding tax revenue (tax*, T*) can be found as follows:*

$$T = \beta_1 tax + \beta_2 tax^2 + C \;\rightarrow \frac{\partial T}{\partial tax} = \beta_1 + 2\beta_2 tax = 0 \;\rightarrow\; tax^* = \frac{-\beta_1}{2\beta_2}$$

as unreliable since R-square and t-statistics no longer follow the usual distributions and can be likely to diverge from the real solutions.

**Table 2**

**ADF test results**

| Variable | DF test statistic[a] | Change (Δ) in related variable[b] | DF test statistic[c] |
|---|---|---|---|
| CIT revenues | -2.118 | Δ CIT revenues | -8.234 |
| CIT rate | -1.664 | Δ CIT rate | -8.194 |
| Trade share | -1.970 | Δ Trade share | -6.047 |
| Agriculture share | -2.786 | Δ Agriculture share | -5.648 |
| Unemployment rate | 0,898 | Δ Unemployment rate | -4.791 |
| Output per person | -0.725 | Δ Output per person | -5.515 |
| Net firms | -1.085 | Δ Net firms | -5.359 |
| Inflation rate | -2.441 | Δ Inflation rate | -8.503 |

*[a] 1% level of critical value is -3.675*
*[b] The Greek letter Δ(delta) stands for the variation in the related variable.*
*[c] 1% level of critical value is -3.682*
*Source: Authors' calculations*

Johansen (1988) and Johansen and Juselis (1990) construct an unrestricted VAR model:

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \ldots + \Pi_k X_{t-k} + u_t$$

where $X_t$ is a vector of I(1) variables, $\Pi_i$ is a matrix of unknown parameters, $k$ is the number of lags and $u_t$ is the vector of error terms. Error correction of this model is:

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + u_t$$

Johansen's approach is deriving maximum likelihood estimators of cointegrating vectors for an autoregressive process where $\Pi$ can be decomposed into cointegrating vectors $(\alpha)$ and weights of these vectors $(\beta)$: $\Pi = \beta\alpha'$. So, Johansen (1988) uses a maximum likelihood approach to find out the number of cointegrating relations by using the above error correction model.[12]

One of the advantages of non-stationary variables is to be able to test for the presence of a long-run relationship between the given variables. Since all the variables have the same integration order (I(1)) as stated before, we can apply the Johansen Cointegration test. As seen in Table 3, there is a strong long-run relationship among the variables of our model. Also, the Lagrange multiplier test for auto-correlation and Jarque-Bera normality tests are applied and no undesired results are observed. Table 3 provides three different Johansen Trace test results, in which control variables are different. In short all the results point to the presence of a cointegrating relationship between the variables.

[12] *In this study, we do not give the details of vector error correction model since we are only focusing on the 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.*

One of the main purposes of this study is to test the existence of the K–L curve for the CIT of Turkey and if it exists, to find out the current position of Turkey on the curve. Previous studies (see, e.g. Hsing, 1996; Brill and Hassett, 2007; Karas, 2012) on the K–L curve mostly omit the inclusion of control variables in which case the pure effect of tax rate onto tax revenues may not be observed.

**Table 3**

**Johansen rank test for cointegration**

| Maximum rank | Trace statistic (1) | 5% critical value | Trace statistic (2) | 5% critical value | Trace statistic (3) | 5% critical value |
|---|---|---|---|---|---|---|
| 0 | 230.89 | 208.97 | 162.49 | 141.20 | 43.98 | 42.44 |
| 1 | 146.59* | 170.80 | 116.94* | 119.80 | 22.15* | 25.32 |
| 2 | 102.47 | 136.61 | 74.22 | 82.49 | 5.40 | 12.25 |
| 3 | 71.07 | 104.94 | 44.92 | 59.46 | | |

*Note: * There is one cointegrating relationship at the 95% confidence level.*
*Source: Authors' calculations*

From Table 4, the last column is applied to see the difference between including the control variables and removing them.

**Table 4**

**Long-run estimates for the K–L curve for corporate income tax, 1980 to 2019[a]**

***Dependent variable: CIT revenues over GDP***

| Variable | (1) | (2) | (3) |
|---|---|---|---|
| Net number | $-1.43 \times 10^{-5}$*** <br> ($4.47 \times 10^{-6}$) | $-6.05 \times 10^{-7}$* <br> ($3.89 \times 10^{-7}$) | |
| Output per person | $8.97 \times 10^{-5}$ * <br> ($5.10 \times 10^{-5}$) | $4.71 \times 10^{-5}$ ** <br> ($2.24 \times 10^{-5}$) | |
| Trade share | -0.0758*** <br> (0.0093) | -0.0728*** <br> (0.0093) | |
| Agriculture share | -0.0210*** <br> (0.0302) | -0.0210* <br> (0.0111) | |
| Unemployment rate | -0.0596 <br> (0.0416) | | |
| Inflation rate | 0.0178*** <br> (0.0026) | 0.0095*** <br> (0.0022) | |
| CIT rate | 16.9954*** <br> (6.3040) | 11.2286*** <br> (2.8363) | 1422.02*** <br> (534.0103) |
| CIT rate square | -29.6262*** <br> (8.5794) | -23.8370*** <br> (4.8380) | -2377.23*** <br> (746.5104) |
| Trend | 0.0499 | | -0.9240 |
| Constant | -7.3920 | | -153.8781 |
| Optimal CIT rate[b] | 28.67 | 23.55 | 29.91 |
| Number of observations | 38 | 38 | 38 |

*Note: a Two lags are imposed in the vector error correction model by AIC and SBIC criteria.*
**** Statistically significant at the 1% level; ** Statistically significant at the 5% level; * Statistically significant at the 10% level*
*Source: Authors' calculations*

Comparing the last column of Table 4 with the other columns demonstrate that regressing of tax revenues on the only tax rate and its square overestimate the optimal tax rate for Turkey, which is nearly 30%. In the first column, the net number of firms, output per person, the unemployment rate, trade share, agriculture share, and inflation rate are inserted into the model as control variables. In the second column, the unemployment rate is excluded due to its high insignificancy and all other control variables are the same. In both cases, the estimatedrevenue-maximizing CIT rate is higher than 22%; that is, the current statutory CIT rate. This implies that Turkey's current statutory CIT rate fall into the normal range of the K–L curve, representing an upward-sloping portion of the curve that corresponds to a point just below the peak point of the curve (Laffer hill). Technically speaking, ∂CIT Revenue/∂CIT Rate $> 0$.

Taken together, these findings sugest that there is little room for the Turkish tax authorities to raise CIT revenues via further statutory rate hikes from 22% to the rate that we estimated, 23.5%. All in all, our estimation results suggest that if the Turkish tax policymakers hike the statutory CIT rate by 1%, CIT revenues, measured as a share of GDP, would increase by 0.7%, given the current statutory rate standing at 22%.[13]

## 6. Robustness Check

Applying the Ordinary Least Squares (OLS) method to non-stationary data will yield misleading results since the error term does not satisfy Gauss-Markov assumptions. But taking the first differences of the variables into account makes them stationary. So, we apply the OLS method to the first differences of the variables, which make them stationary, with White's heteroscedasticity consistent standard errors. Besides, there are some critiques to the K–L curve suggestions, one of which depends on the unclear time period whether the K–L curve is valid in the short- and/or long run. So, the other reason behind OLS estimation is to test the K–L curve hypothesis for the short run.

According to the results of OLS estimates reported in Table 5, most of the variables are insignificant, which is expected, because differencing them may lead to losing a significant amount of information about the variables. The same table also shows that there are three different regression results in which control variables differentiate. Consistent with the previous tables, in the first column, the unemployment rate is included, whereas, in the second column, it is excluded. In the last column, no control variables, only the CIT rate and its square are taken into consideration. All of the OLS estimations provide supportive evidence for the validity of the K–L curve hypothesis. Now then, we can proceed to estimate the revenue-maximizing, or optimal, CIT rate. In the light of the calculations presented above, we estimated the revenue-maximizing CIT rate for Turkey for the time span between 1980 and 2019. According to the estimation results, Turkey's current statutory CIT rate falls into the normal range of the K–L curve. This suggests that the existence of a room that allows the Turkish authorities for generating extra CIT revenues through further increases in the current CIT rate.

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*[13] Woolridge (2012, p.194) focuses on models with quadratic independent variables and shows that the coefficient of an independent variable, which has a quadratic form in the same regression form, cannot be directly interpreted as the effect on the dependent variable, but approximates the effect as follows: $\Delta y \approx (\beta_1 + 2\beta_2 x)\Delta x$ when the regression is $y = \beta_0 + \beta_1 x + \beta_2 x^2$ under the assumption "ceteris paribus".*

Table 5

**OLS estimates for the K–L curve for corporate income tax, 1980 to 2019**

***Dependent variable: Change in CIT revenues over GDP***

| Variables[a] | (1)[b] | (2)[b] | (3)[b] |
| --- | --- | --- | --- |
| Net number of firms | $-2.08 \times 10^{-6}$ ($5.23 \times 10^{-6}$) | $-2.00 \times 10^{-6}$ ($5.12 \times 10^{-6}$) | |
| Output per person | $6.02 \times 10^{-5}$ ($9.43 \times 10^{-3}$) | $5.48 \times 10^{-5}$ ($5.06 \times 10^{-5}$) | |
| Unemployment rate | -0.008 (-0.048) | | |
| Agriculture share | -0.026 (0.042) | -0.027 (0.041) | |
| Trade share | -0.009 (0.009) | -0.009 (0.009) | |
| Inflation rate | -0.005* (0.004) | -0.005* (0.004) | |
| CIT rate | 6.433* (5.530) | 6.451* (5.442) | 8.477* (5.265) |
| CIT rate square | -9.230* (7.573) | -9.284* (7.446) | -10.454* (7.197) |
| Constant | 0.040 (0.053) | 0.037 (0.047) | 0.039 (0.038) |
| Optimal CIT rate[c] | 34.83 | 34.74 | 40.54 |
| Adjusted R-squared | 0.0123 | 0.0434 | 0.0510 |
| Number of observations | 39 | 39 | 39 |

*[a] All the variables are in the form of differences to make them stationary*
*[b] White's heteroscedasticity consistent standard errors*
*[c] Optimal tax rate level corresponds to the peak point of the K–L curve.*
** Statistically significant at the 10% level.*
*Source: Authors' calculations*

The OLS estimations presented in Table 5 confirm the validity of the K–L curve hypothesis for CIT for Turkey. Accordingly, Turkey's current statutory CIT rate is slightly below its estimated revenue-maximizing rate, falling into the area that is named as "normal range region"; that is, an area that allows the tax authorities to obtain more tax revenue through increases in tax rates. From a tax policy viewpoint, this implies that the Turkish tax authorities can raise the statutory CIT rate from its current rate of 22% if they wish to generate further revenue from corporate income taxation without giving rise to the substitution effect.

# 7. Final Remarks

In this study, we examined the possible existence of a hump-shaped non-linear relationship, which describes the K–L curve, between the statutory corporate income tax rates and corporate income tax revenues for Turkey by using annual time-series data for the period 1980-2019.

Our empirical findings, overall, support the validity of the K–L curve hypothesis for corporate income taxation. To put it more explicitly, the Turkish data verify that there exists an inverted–shaped nonlinear relationship between tax rates and tax revenues in the context of corporate income taxation. More precisely, increases in the statutory corporate income tax rate enhance corporate tax revenues only up to a certain level; beyond which, however, further increases in corporate income tax rate tend to lower corporate income tax revenues. This is because of the higher tax rates, the less corporate activity but the much more efforts to avoid from higher tax burden through various ways like tax avoidance, tax evasion, moving to tax competitive places, and so on. Our findings are also broadly consistent with especially the findings of the following two major empirical studies on corporate income taxation available in the literature conducted by Clausing, (2007) and Brill and Hassett (2007), suggesting that there is an inverted U-shaped nonlinear relationship between corporate income tax rates and tax revenue raised through corporate income taxation.

However, whatever the findings are, it is important to recognize that the empirical estimation of the revenue-maximizing tax rates and by implication the K–L curve is a highly complex issue. First and foremost, the tax rates used in empirical estimation of the K–L curve are not monotype among countries, varying from one to another. Second, speaking in general terms, the value of the estimated revenue-maximizing tax rate is significantly affected by the control variables that are incorporated into the estimation considered in the model. Lastly, the selection of an appropriate tax rate indicator is a problematic issue.

To sum up, the empirical findings we reached stand out two important conclusions. First, Turkish data supports the view that there is an inverted U-shaped nonlinear relationship between statutory corporate income tax rate and revenues from corporate income taxation, confirming the validity of the K–L curve. Then, the estimated revenue-maximizing corporate income tax rate for Turkey is approximately 23.5% against the present statutory corporate income tax rate of 22%. This finding is clear evidence that Turkey’s current statutory corporate income tax rate is on the efficient side of the K–L curve, which offers little room for maneuver to the Turkish authorities to be able to generate additional corporate income tax revenues through tax rate hakes. This is because the current statutory corporate income tax rate is highly close to its optimal level of 23.5%. Recognizing this, it can be argued that attempting to raise corporate income tax revenues through further statutory corporate income tax rate hikes appears not a rational tax policy option for Turkey. Instead, the Turkish policymakers may concentrate on cuts in the statutory corporate income tax rate that has economic growth- and employment-enhancing potentials. Such a policy option would likely broaden the corporate income tax base, resulting in more corporate income tax revenues. More importantly, the revenue-raising objective should not be the primary purpose of corporate income taxation but should be a secondary objective that emerges as a result of increases in the size and profitability of the corporate sector. In this regard, focusing on the other drivers of revenues from corporate income taxation rather than statutory tax rate hikes could be beneficial. These include a range of macroeconomic and non-macroeconomic factors, such as inflation, unemployment rate, the economic performance of the government, the size and profitability of the corporate sector, ease of doing business, size of FDI inflows, and globalization degree of the host country. The statutory corporate income tax rate should also be seen as a part of international tax competition to raise the attractiveness of foreign capital inflows that would boost the host country's growth and employment. In addition to this, when they determine the statutory corporate income tax rate, the authorities should take into account a number of factors, such as the paradox of tax rate-informal economy, the degree of tax competition, ease of doing business, and so forth. Higher tax rates may not always guarantee higher government revenues raised through taxation. As Arthur Laffer himself rightly and repeatedly said: “when you tax something you get less of it, and when you tax something less, you get more of it", implicitly drawing our attention to the validity of diminishing returns in the nexus between tax rates and tax-revenue generation. Apart from this, it is widely believed, as is also evident by voluminous empirical studies, that higher tax rates, notably corporate income tax rates, impede growth. However, if tax revenues generated by the government are used to fund productive spending, such as those infrastructures, education, health care, R&D, the negative impact of higher tax rates on growth can be, at least partially, offset.

It needs to be stressed, nevertheless, that the K–L curve draws our attention to the role of tax rates in raising tax revenues for governments and underlines the fact that tax hikes do not always generate more revenue. Rather, high tax rates are much likely to reduce the potential tax revenues collected by the government. In addition to this, the K–L curve can allow us to assess that to what extent fiscal space—that is, the amount of budgetary room created via either additional revenue or via reductions in unproductive government spending or via extra borrowing that would create only transitorily effect on the government budget balance without giving damage to fiscal sustainability—is effectively used from the standpoint of tax policy. All in all, the empirical analysis of the K–L curve helps improve the quality of tax policy decision-making by quantifying it.

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