European Research Studies Journal
Volume XXI, Issue 1, 2018

pp. 144 - 152

VAT Rates and their Impact on Business and Tax Revenue

Petr Mach[1]

Abstract:

Tax rates have impact on business activity and on the volume of the tax revenue. This relation is generally known as the Laffer curve.

In this article data on VAT rates and revenues in the Czech Republic between 2006—2015 are used to estimate the Laffer curve and to find the revenue maximising tax rates.

It is shown that the standard rate of VAT in the Czech Republic is behind the revenue maximising rate and that decreasing the rate would help the taxpayer as well as the state budget.

Keywords: *Tax, Tax Revenue, Value Added Tax, Laffer Curve*.

JEL Code: *H2, H21, H26.*

[1]*University of Finance and Administration (VSFS, www.vsfs.cz), e-mail: petrmach1975@gmail.com*

1. Introduction

Tax rates have impact on business activity and on the volume of the tax revenue. After all the Value Added Tax (VAT) seizes part of the business income. The size and the complexity of indirect taxes influences significantly the situation of businesses and specifically of small and medium sized enterprises (SMEs). It falls specifically on SMEs because tax compliance cost is relatively higher for the SMEs in comparison with big corporations. Also SMEs are direct competitors to very small firms operating below the turnover threshold for VAT registration and thus paying no VAT at all (Thalassinos and Dafnos, 2015; Thalassinos *et al.*, 2015; Rupeika-Apoga and Solovjova, 2017; Thalassinos and Pociovalisteanu, 2009).

The higher are the rates the bigger is the incentive to avoid or evade taxes or even to close the business at all. We ca therefore state that there is the law of diminishing marginal tax revenues: with increasing tax rates the revenue grows less and less. This property of the relation between the rates and the revenue is generally known as the Laffer curve. This relation is described in any standard modern textbook of economics, see for example (Parkin, 2000; Wawrosz *et al.*, 2012). In this article data on VAT rates and revenues in the Czech Republic between 2006-2015 are used to estimate the Laffer curve and to find the revenue-maximising tax rate.

2. Literature review

Arthur Laffer is famous for sketching the curve on a napkin at a dinner with an aide to a US President. He was not however the first economist who observed this property of taxation. As Adam Smith put it in his Wealth of Nations as early as 1776 (Smith, 1924): "*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. When the diminution of revenue is the effect of the diminution of consumption there can be but one remedy, and that is the lowering of the tax.*" A modern estimate of the Laffer curve for VAT in the European Union was provided by Matthews (Matthews, 2003) who studied tax data of 14 EU countries. He found the revenue-maximising rate at 18-19.3 %.

In order to estimate the Laffer curve for the Czech Republic we were interested in the data on declared tax bases by years by individual tax rates groups. We found such data for the years 2011-2013 (Dušek and Janský, 2012) provided by the Ministry of Finance. We therefore asked the Ministry for the data for the whole decade 2006-2015.

3. Material and Methods

We have chosen the period 2006-2015 because in this decade the Czech Republic had experienced frequent changes in the VAT rates and it had thus become an

economic laboratory to study the impact of the tax rates on the business activity. We asked the Department of Taxation Policy Strategy at the Ministry of Finance in the Czech Republic for the data on declared tax bases by VAT rates groups. We have gathered data on the GDP in order to adjust the data for inflation and economic growth. We will therefore analyse the relation between the tax rates on the one hand and the tax base and the tax revenue as percentages of the GDP on the other hand.

We assume a negative relation between the tax rate and the declared tax base. The higher is the rate the less revenue will firms be willing to declare. We will use the linear trend to estimate the trend line (using the trend line feature in MS Excel which is based on the statistical method of the least squares which minimises the sum of the squares of the residuals from the trend). Thus we will be able to find parameters of an equation:

$$B = a - b \cdot t \tag{1}$$

where B is the tax base and t is the tax rate.

Because the tax revenue (R) is the product of the tax base (B) and the tax rate (t)

$$R = B \cdot t \tag{2}$$

we can conclude that the Laffer curve can be estimated as

$$R = a * t - b * t^2 \tag{3}$$

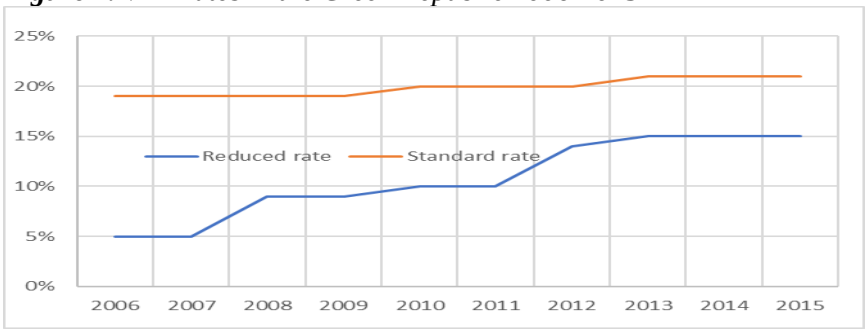
Such a quadratic equation whose curve is a parabola meets the basic criteria set for a Laffer curve – it is concave and it goes through the origin (if the tax rate equals zero the tax revenue equals zero too). After obtaining the parameters of the Laffer curve we will be able to find the maximum of the function by calculating the derivative and setting it equal zero.

Thus we will find the revenue maximising tax rate. We will make this analysis separately for each of the basic tax rate groups (the standard rate and the reduced rate).

3.1 VAT in the Czech Republic

The Value added tax is one of the most important taxes for the state budget. It brings more than CZK 300 billon (7% of the GDP) to the state budget. Most goods and services are taxed at the standard rate of 21% while foodstuffs except beer, wine, and alcohol as well as some services like public transportation, garbage collection, accommodation and culture are taxed at the reduced rate of 15%. In 2015 the third super reduced rate of 10% had been introduced on books, medicines, and some baby food. Since VAT rates had been changed frequently during the past decade we have data on tax revenues at various tax rates to estimate the Laffer curve.

Figure 1. *VAT rates in the Czech Republic 2006-2015*



Source: *Ministry of Finance of the Czech Republic.*

3.2 Laffer curve at the reduced rate

We will use the data on declared tax base separately for each tax rate group, and we will therefore estimate two separate Laffer curves – one for foodstuffs etc. taxed at the reduced rate and one for other goods taxed at the standard rate. Table 1 shows the actual VAT rates, the declared tax base, the tax revenue and the GDP for studied years.

Table 1. *VAT rates, bases, and revenues at the reduced rate group (nominal terms)*

Year	Tax rate	Tax Base (bn. CZK)	Tax Revenue (bn. CZK)	GDP at market prices (bn. CZK)
2006	5%	646,7	32,3	3507
2007	5%	791,1	39,6	3832
2008	9%	701,9	63,2	4015
2009	9%	713,3	64,2	3922
2010	10%	680,5	68,1	3954
2011	10%	679,7	68	4023
2012	14%	635,1	88,9	4042
2013	15%	544,1	81,6	4077
2014	15%	637,2	95,6	4261

Source: *Ministry of Finance of the Czech Republic, GDP Czech Statistical Office.*

The year 2015 is excluded from our analysis because that year a new super reduced rate of 10 % was introduced and some goods from the reduced rate group were moved there, including medicines. Due to the change in the composition of the tax base we would not get correct results.

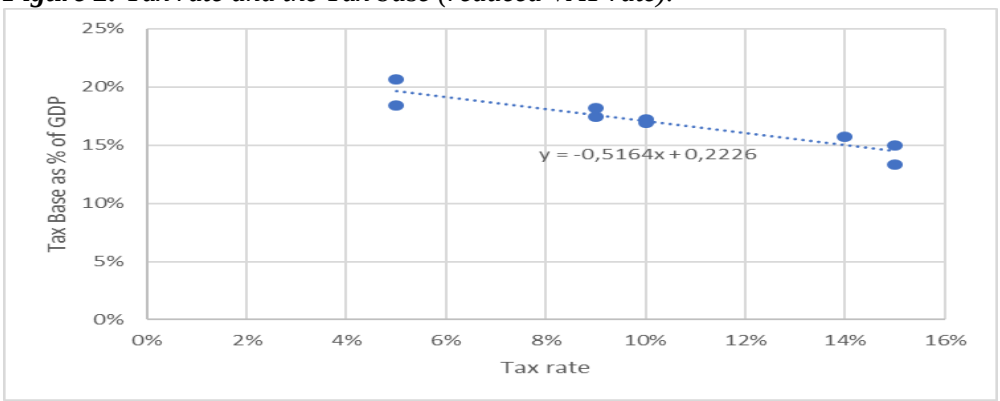
In order to estimate the Laffer curve we should adjust the above raw data for inflation and economic growth. For this purpose we express the tax base and the tax revenue as percentages of the GDP in Table 2 and Figure 2.

Table 2. *VAT rates, bases, and revenues at the reduced rate group (% of GDP).*

Year	Tax rate	Tax base (% of GDP)	Tax revenue (% of GDP)
2006	5%	18,44%	0,92%
2007	5%	20,64%	1,03%
2008	9%	17,48%	1,57%
2009	9%	18,19%	1,64%
2010	10%	17,21%	1,72%
2011	10%	16,90%	1,69%
2012	14%	15,71%	2,20%
2013	15%	13,35%	2,00%
2014	15%	14,95%	2,24%

Source: *Author's own calculation based on data from Table 1.*

Figure 2: *Tax rate and the Tax base (reduced VAT rate).*



Source: *Author's own calculation based on data from Table 2.*

The assumed trend – that higher rates lead to a lower declared tax base is clearly apparent from the graph. The higher is the tax rate the fewer sales are declared to the taxman. The linear trend shows the approximate relation:

$$B = 22.3\,\% - 0.52 \cdot t \tag{4}$$

This equation says that the maximum tax base would be 22.3 % of GDP if the tax rate is close to zero. With each percentage increase in the tax rate the tax base decreases by more than half a percentage of the GDP. Because the tax revenue is the product of the tax rate and the tax base the Laffer curve for the reduced rate can be estimated as the equation (4) multiplied by t:

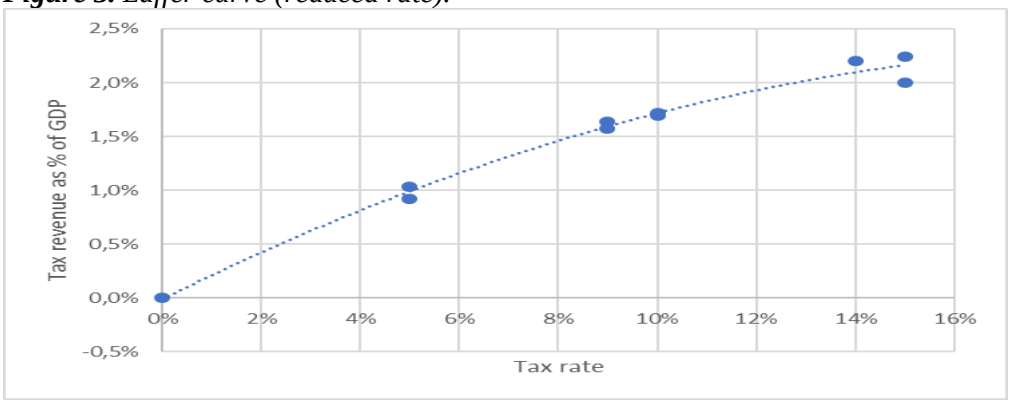
$$R = 22.3\,\% * t - 0.52 * t^2 \tag{5}$$

Revenue maximum of the Laffer curve can be found by setting its first derivative equal to zero:

$$\frac{\partial R}{\partial t} = 22.3\% - 1.04 \cdot t = 0 \tag{6}$$

$$t = 21.4\%$$

Figure 3. *Laffer curve (reduced rate).*



Source: *Author's own calculation based on data from Table 2.*

Tax revenue from the goods in the reduced rate would be maximised at 21.4 %. By replacing this rate for t in equation (5) we get that at this rate the government would collect 2.2% GDP.

It is important to understand that the maximum is far from the optimum. An optimum would have to take into account besides the government benefit the welfare implications for the taxpayers and it would be always below the revenue maximising rate. As Matthews (2012) notes, "the socially optimal rate of VAT will always be lower than the revenue maximising rate".

3.3 Laffer curve at the standard rate

Now we will use the data on declared tax base at the standard rate group (most goods and services) to find the Laffer curve for the goods taxed at the standard rate. Table 3 shows the actual VAT rates, the declared tax base, the tax revenue and the GDP for the studied years.

Table 3. *VAT rates, bases, and revenues at the standard rate group (nominal terms)*

Year	Tax rate	Tax Base (bn. CZK)	Tax Revenue (bn. CZK)	GDP at market prices (bn. CZK)
2008	19%	1112	211,3	4015
2009	19%	1055	200,5	3922
2010	20%	947	189,4	3954
2011	20%	1067	213,4	4023
2012	20%	927	185,4	4042
2013	21%	959,3	201,5	4077
2014	21%	951,5	199,8	4261
2015	21%	1199,5	251,9	4495

Source: *Ministry of Finance of the Czech Republic, GDP Czech Statistical Office.*

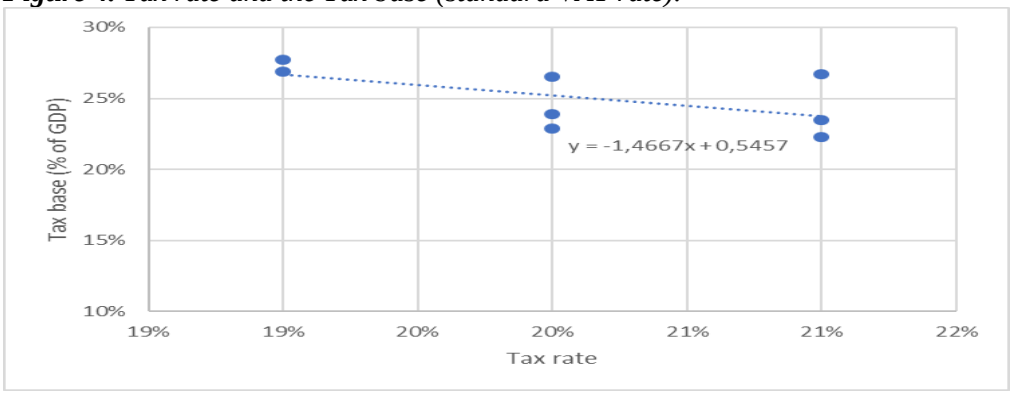
In order to estimate the Laffer curve we should again adjust the above raw data for inflation and economic growth. For this purpose we express the tax base and the tax revenue as percentages of the GDP in Table 4 and Figure 4.

Table 4. *VAT rates, bases, and revenues at the standard rate group (% of GDP).*

Tax rate	Tax base (% of GDP)	Tax revenue (% of GDP)
19%	27,70%	5,30%
19%	26,90%	5,10%
20%	23,90%	4,80%
20%	26,50%	5,30%
20%	22,90%	4,60%
21%	23,50%	4,90%
21%	22,30%	4,70%
21%	26,70%	5,60%

Source: *Author's own calculation based on data from Table 3.*

Figure 4. *Tax rate and the Tax base (standard VAT rate).*



Source: *Author's own calculation based on data from Table 4.*

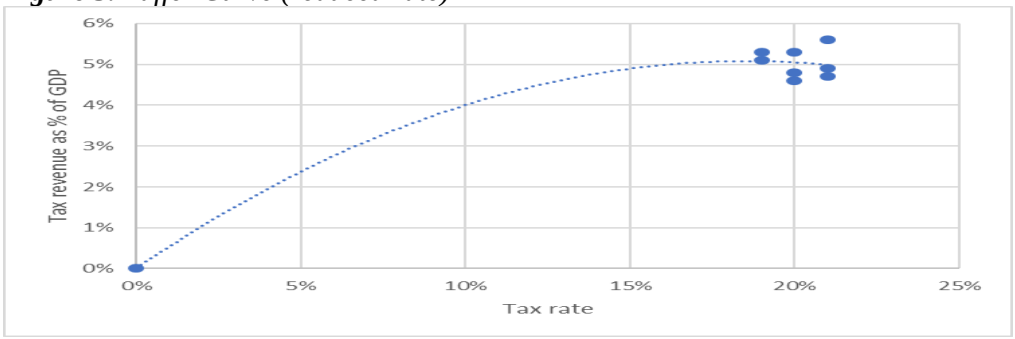
The assumed trend – that higher rates lead to a lower declared tax base is apparent from the graph. The higher is the tax rate the fewer sales are declared to the government. The linear trend shows the approximate relation:

$$B = 54.6\,\% - 1.47 \cdot t \tag{7}$$

This equation says that the maximum tax base would be 54.6 % of GDP if the tax rate is close to zero. With each percentage increase in the rate the tax base decreases by one and half a percentage of the GDP. Because the tax revenue is the product of the tax rate and the tax base the Laffer curve for the reduced rate can be estimated as

$$R = 54.6\,\% * t - 1.47 * t^2 \tag{8}$$

Figure 5. *Laffer Curve (reduced rate)*



The revenue maximum of the Laffer curve can be found by setting its derivative equal to zero:

$$\frac{\partial R}{\partial t} = 54.6\% - 2.94 \cdot t = 0 \qquad (9)$$
$$t = 18.6\%$$

Tax revenue from the goods in the standard rate would be maximised at 18.6 %. Replacing this rate for t in the equation (8) tells us that at this rate the government would collect 5.1% GDP.

This analysis implies that the current standard rate of 21 % in the Czech Republic lies behind the revenue maximising "Laffer point". By reducing the rate to 18.6 % the government would gain some additional revenue and the taxpayers would be better off as well.

4. Results and Discussion

In this analysis we have calculated that at the reduced rate of VAT the actual rate of 15 % is below the revenue maximising rate of 21.4 %. On the other hand at the standard rate the actual rate of 21 % is above the revenue maximising rate of 18.6 % and the taxpayers would be better off if the government reduced the rate while the government could be better off too.

We should understand that the revenue maximising rate is different from an optimal rate, which would take into account not only the benefit for the state budget but also the cost to the taxpayer. It is only clear that everybody would gain if the tax rate is reduced when it actually lies behind the revenue maximising Laffer point.

5. Conclusion

The analysis of the tax rates, the tax base, and the tax revenue supports the assumption that the Laffer curve works. The growth in the tax rate by the factor of 3

(from 5% to 15%) at the reduced rate had increased the tax revenue only by the factor of 2 (from 1 % of GDP to about 2 % of GDP) as is apparent from Figure 3.

It is above the scope of this article to analyse the optimal rate of tax which would take into account the government revenue as well as the taxpayers' cost. We can however say for sure that reducing a tax rate which is higher than the revenue maximising rate would be good for everybody.

Acknowledgment:

The author of this paper is grateful to Mr. Petr Kusý from the Department 25 – Taxation Policy Strategy at the Ministry of Finance of the Czech Republic for providing the raw data on declared tax bases at various rates of VAT during the past decade. Contribution supported by funds institutional support for the long-term conceptual development of the research organization of the University of Finance and Administration.

References:

Dušek, L. and Janský, P. 2012. Expected impacts of changes in VAT rates on regional budgets. Idea, Cerge.

Mathews, K. 2003. VAT Evasion and VAT Avoidance: is there a European Laffer curve for VAT? International Review of applied Economics, 17(1), 105-114.

Smith, A. 1925. An Inquiry into the nature and Causes of the Wealth of Nations. London, G. Bell and Sons. Ltd.

Parkin, M. 2015. Microeconomics. 12th edition, Pearson Series in Economics, ISBN-13: 978-0133872293.

Rupeika-Apoga, R., Solovjova, I. 2017. Access to Finance for Latvian SMEs. European Research Studies Journal, 20(3A), 57-68.

Thalassinos, I.E. and Pociovalisteanu, M.D. 2009. The Structural Funds and the Economic and Social Cohesion Process. Annals-Economy Series 1, 313-330.

Thalassinos, I.E. and Dafnos, G. 2015. EMU and the process of European integration: Southern Europe's economic challenges and the need for revisiting EMU's institutional framework. Chapter book in Societies in Transition: Economic, Political and Security Transformations in Contemporary Europe, 15-37, Springer International Publishing, DOI: 10.1007/978-3-319-13814-5_2.

Thalassinos, I.E., Ugurlu, E. and Muratoglu, Y. 2015. Comparison of Forecasting Volatility in the Czech Republic Stock Market. Applied Economics and Finance, 2(1), 11-18.

Wawrosz, P., Heissler, H., Helísek, M. and Mach, P. 2012. Macroeconomics Basic Course. Prague, University of Finance and Administration, Eupress. ISBN 978-80-7408-059-3.