Estimating Optimal Level of Taxation for Growth Maximization in MOROCCO

Rachid BAHLOULA

Département des Sciences Economiques, Université Mohammed V, Faculté des Sciences Juridiques et Economiques, Souissi, Morocco

Abstract:

What is the optimal tax burden rate that maximizes economic growth in Morocco? To tackle this matter, this article aims to model the optimal tax rate in Morocco during the period 2000-2019, by using Scully's model. The results of the estimation show that tax revenue around 23.4 percent of GDP maximizes the growth rate. It is very lower than the actual applied rate (27%). This situation reveals that Morocco is situated in the prohibitive side of Barro's curve and the taxation is "unnecessary" and even degrading for growth and competitiveness.

Keywords: tax burden rate, Economic growth, Laffer curve, SCULLY model, Threshold effect.

1- Introduction

Tax policy is a crucial economic tool for all states seeking to raise the funds they need to improve the citizen well-being. This policy is used to provide public goods and services in sectors such as education, health, social security, infrastructure etc. However, if this public spending is covered by a very high tax burden rate, the effects of taxation will become harmful and create negative externalities as well as it drives taxpayer behaviorism towards tax avoidance and evasion.

Recent economic literature states that, the taxation remains an economic measure by which economic growth could be promoted. The junction between taxes and economic growth makes the Barro's Curve. Its principle reveals that if taxation is burdensome in a very important way at the level of an economy, it will lead to distortions on the two main macroeconomic variables namely final household consumption, the level of business investment and generally harm the performance of economic growth. Consequently, the two economic agents (consumer and producer) can also generate a loss of income for the State by giving rise to behaviorism of tax fraud and evasion. However, a decrease in the tendency of the tax burden makes the hypothesis of an under exploitation of the revenue potential.

To this question, we can ask, what is the optimal tax burden rate that could maximize economic growth in Morocco without compromising the citizen well-being?

The objective of this study is to estimate the optimal tax burden rate that maximizes economic growth and analyze its impact on the evolution of GDP.

2- Literature Review

The question of the relationship between the taxation and the level of economic growth is an issue that has been the subject of several theoretical and applied studies. These studies were mostly inspired by the Solow's model which explains global production by technical progress and demographic growth. Indeed, the steady increase in population and exogenous technological progress contribute to the establishment of a stable growth system. In this system, the rates of increase of capital and production converge. The model thus establishes relationships between the volumes of factors and the volume of production and does not explain the distribution of the national product and the taxation.

The endogenous growth theory, developed by Romer (1986), Lucas (1988) and Barro (1990), seeks to fill this gap by emphasizing that investments in human and physical capital have effects on the rate of growth and that the junction between taxation and growth could have a non-linear rhythm in the form of an inverse U-curve. Thus, Barro showed that an increase in the tax rate provides resources to finance public expenditure needs, but at the same time induces a negative wealth effect by reducing the level of income, savings and consumption. Therefore, in the long term, there is a threshold effect between the tax burden rate and the level of economic growth.

To explain this relationship, Barro developed the following production function:

$$Y_t = AK_t^{(1-a)}G_t^{\alpha}$$

Containing two inputs:

Kt: Private capital

Gt: public capital

With public expenditure financed by a tax proportional to income:

$$G_t = rY_t$$

Barro has demonstrated that increase in the level of taxation provides public administrations with tax revenues, allowing them to finance productive public spending, which contributes to improving the productivity of the private sector and therefore broadening the tax base, this provides the State with fiscal resources making accumulation possible up to a point where the coefficient of public expenditure on income is equal to the tax rate. So, the weight of taxation that maximizes economic growth must be equal to the elasticity of the production of public capital.

$$r^* = \alpha = G/Y$$

If the tax burden rate $r*$ is lower than α, any increase in the tax burden will make the private sector more productive. However, an excessive taxation will have a negative impact on the productivity of this sector, which will negatively affect the level of economic growth.

These findings can be illustrated in a curve called the Scully curve that relates the level of economic growth and the size of the public sector in a given country. The abscissa axis of the curve represents government spending[1] and the ordinate axis represents the level of economic growth.

The U-curve indicates the existence of a threshold effect between economic growth and the size of the public sector.

Figure 1: The Scully's Curve
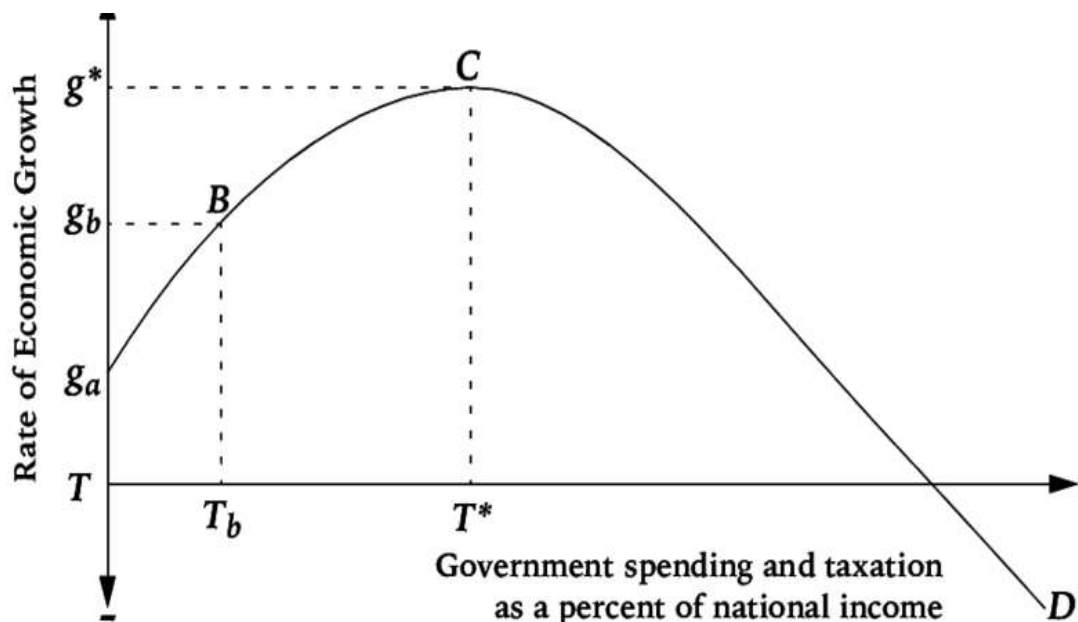
Source : Chao, J., & Grubel, H. (1998)

---

[1] as a percentage of GDP

The weakness of economic growth at the level (ga) of public expenditure is largely explained by the lack of goods and services financed by the government, which pushes economic agents to operate without the provision of public goods and services (Security, justice….).

Then and after public intervention through public spending (Tb) financed by tax revenue, improving the productivity of economic agents increases the level of economic growth. This growth is the result of the positive impact of public goods and services on overall economic efficiency in the private sector. Thus, at this low level of taxation corresponding to expenditure, the dissuasive effects of taxation on work, savings and investment and on risk taking are negligible.

Finally, consider the government's spending and taxation level T *, which corresponds to the highest economic growth rate g *. However, the shape of the slope of the Scully curve between point B and C is such that the proportional increase in spending and taxation is less than that in economic growth. This property of the curve assumes that government spending is subject to diminishing marginal returns. However, all economic activity is characterized by diminishing marginal returns. In this case, government spending financing individual projects a priori meets the most urgent needs and exploits appropriate opportunities for the substitution of inefficient private activities. Therefore, as public spending grows, other government-funded projects gain less and less in productivity. At one level, the marginal productivities of increased public spending cancel each other out. This point corresponds to T * in Figure 1 where government spending maximizes the rate of economic growth. Any further increases in government spending beyond the T * point have negative effects on economic growth: the Scully curve decreases. Thus, Figure 1 shows that at a maximum level of government spending (Tm), there is a zero growth rate, and beyond that, the growth rate becomes negative.

The optimal level of taxation has been the subject of several empirical tests, in particular by Scully who developed an econometric model to estimate the level of Taxation that maximizes economic growth

3-Presentation of the Scully model

The American economist Gerald W. Scully developed an economic model showing how to estimate the optimal taxation able to maximize the economic growth. He divided the economy into two principal sectors .the public sector provided public goods and services financed by revenue tax. The untaxed part of the national income is used by the private sector to produce private goods. Public and private goods are used for global national production. The production function has the following Cobb-Douglas form:

$$Y_{it} = \beta_0 (G_{it-1})^{\beta_1} [(1-\tau)Y_{it-1}]^{\beta_2} \tag{1}$$

Where Y is the output, G is the government spending for public good, τ is the lump sup tax rate for the corresponding period and t is the time period.

We assume that the government budget is balanced. Hence, the government budget constraint is:

$$G_{it} = \tau Y_{it} \tag{2}$$

where τ is the tax-GDP ratio. Here we simply say tax rate.

From 1 and 2, we can write:

$$Y_{it} = \beta_0 (\tau Y_{it-1})^{\beta_1} [(1-\tau)Y_{it-1}]^{\beta_2}$$

Growth rate is defined by: $\qquad Y_{it}/Y_{it-1} = 1 + g$

Hence, dividing both sides by Y_{it-1},

$$Y_{it}/Y_{it-1} = \beta_0 (\tau)^{\beta_1} (1-\tau)^{\beta_2} [Y_{it-1}]^{\beta_1+\beta_2-1}$$

or

$$1 + g = \beta_0 (\tau)^{\beta_1} (1-\tau)^{\beta_2} [Y_{it-1}]^{\beta_1+\beta_2-1} \tag{3}$$

Growth-maximizing tax rate τ^* is obtained by differentiating equation (3) with respect to τ and setting to zero. i.e.

$$\frac{\partial g}{\partial \tau} = \beta_0 [Y_{it-1}]^{\beta_1+\beta_2-1} [\beta_1(\tau)^{\beta_1-1}(1-\tau)^{\beta_2} - \beta_2(\tau)^{\beta_1}(1-\tau)^{\beta_2-1}] = 0$$

$$\Rightarrow \beta_1(\tau)^{\beta_1-1}(1-\tau)^{\beta_2} = \beta_2(\tau)^{\beta_1}(1-\tau)^{\beta_2-1}$$

$$\Rightarrow \frac{\beta_1}{\tau} = \frac{\beta_2}{1-\tau}$$

Hence, optimal tax rate is:

$$\tau^* = \frac{\beta_1}{\beta_1+\beta_2} \qquad (4)$$

We assume constant returns to scale on production function, which allows us to write $\beta_1 + \beta_2 = 1$. Hence, from equation (4), $\tau^* = \beta_1$ gives the optimal rate of taxation. To estimate the parameters, we simplify equation (3):

$$1 + g = \beta_0(\tau)^{\beta_1}(1-\tau)^{\beta_2}$$
$$\{\text{since } \beta_1 + \beta_2 = 1\},$$
$$\Rightarrow 1 + g = \beta_0(\tau)^{\beta_1}(1-\tau)^{1-\beta_1}$$
$$\Rightarrow \frac{1+g}{1-\tau} = \beta_0 \left(\frac{\tau}{1-\tau}\right)^{\beta_1}$$

Taking log to both sides, we get: $\ln[\frac{1+g}{1-\tau}] = ln\beta_0 + \beta_1 ln[\frac{\tau}{1-\tau}]$ (5)

In the end, we are going to enter this last equation into EViews Software in order to find the optimal tax rate that maximizes economic growth. The economic variables that we will use in this estimation are presented as follows:

Table1. The economic variables description

	$g= \frac{(pib_t - pib_{t-1})}{pib_{t-1}}$	τ=tax revenue / PIB	$1+g$	$1-\tau$	$\frac{1+g/1}{\tau}$
2000	0,019	0,235	1,019	0,765	1,333
2001	0,073	0,234	1,073	0,766	1,401
2002	0,031	0,231	1,031	0,769	1,340
2003	0,060	0,228	1,060	0,772	1,372
2004	0,048	0,231	1,048	0,769	1,362
2005	0,033	0,247	1,033	0,753	1,372
2006	0,076	0,254	1,076	0,746	1,441

2007	0,035	0,277	1,035	0,723	1,432
2008	0,059	0,302	1,059	0,698	1,517
2009	0,042	0,269	1,042	0,731	1,427
2010	0,038	0,277	1,038	0,723	1,435
2011	0,052	0,285	1,052	0,715	1,472
2012	0,030	0,295	1,030	0,705	1,461
2013	0,045	0,277	1,045	0,723	1,446
2014	0,027	0,283	1,027	0,717	1,432
2015	0,045	0,264	1,045	0,736	1,421
2016	0,011	0,272	1,011	0,728	1,389
2017	0,042	0,276	1,042	0,724	1,440
2018	0,031	0,278	1,031	0,722	1,429
2019	0,025	0,270	1,025	0,730	1,404

Author based on BM and OECD data

4. Results and discussion

The data used in this study come from the World Bank and the
OECD (Organization for Economic Co-operation and Development).
We extracted panel data for the period 2000-2019 on the Gross
Domestic Product and tax revenue. These variables allow us to
calculate the tax burden rate and the economic growth rate.

Table 1: Results for Optimal taxation in Morocco

Estimation of optimal taxation including social security contributions

Dependent Variable: **Log (1+c/1-t)**
Method: Least Squares
Date: 05/07/21   Time: 00:41
Sample: 2000 2019
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Log(t/1-t)	0.2341877	0.032122	7.27071622	0.0000
C	0.495846	0.033291	5.1635	0.0000
R-squared	0.74	Mean dependent var		7.25

Adjusted R-squared	5990.0731878	S.D. dependent var	53140.032115
S.E. of regression	0.016629	Akaike info criterion	-5.260664
Sum squared resid	0.004978	Schwarz criterion	-5.161091
Log likelihood	54.6066452	Hannan-Quinn criter.	-5.241227
F-statistic	.86	Durbin-Watson stat	2.634

	3	2
	3	5
	1	0
	0	
	.	
	0	
	0	
	0	
Prob(F-statistic)	0	
	0	
	1	

Estimation of optimal taxation excluding social contributions

Dependent   Variable:

Log(1+c/1-t)

Method: Least Squares

Date: 05/07/21   Time: 00:46

Sample: 2000 2019

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
	0	0	6	
	.	.	.	
	2	0	1	0
	1	3	3	.
	6	5	3	0
	5	3	2	0
Log(t/1	2	0	2	0
-t)	7	4	1	0
C	7	0	1	0

24

	.471632	.045353	64.74332	.0000

R-squared	0.676354	Mean dependent var	7.194473
Adjusted R-squared	0.658374	S.D. dependent var	0.029431
S.E. of regression	0.017202	Akaike info criterion	-5.192905
Sum squared resid	0.005327	Schwarz criterion	-5.093332
Log likeliho	53	Hannan-Quinn	-5

od	.	criter.	.
	9		1
	2		7
	9		3
	0		4
	5		6
			7
	3		2
	7		.
	.		5
	6		4
	1		8
	6	Durbin-	6
F-statistic	4	Watson	2
	0	stat	7
	0		
	.		
	0		
	0		
	0		
Prob(F-statistic)	0		
	0		
	9		

Table 2 shows the estimation of the Scully's model (equation 5).the coefficient of independent variable found to be 0.234.This result means that the optimal tax burden rate which maximize the economic growth is 23.4%.it is very lower than the real effective rate(27%). Examining the evolution of the tax burden rate between 2000-2019 shows heavy level of taxation than the optimal. This situation reveals that Morocco is situated in the prohibitive side of Barro's curve and the taxation is unnecessary and even degrading for growth and competitiveness.

Figure 2: Evolution of optimal and observed tax burden rate
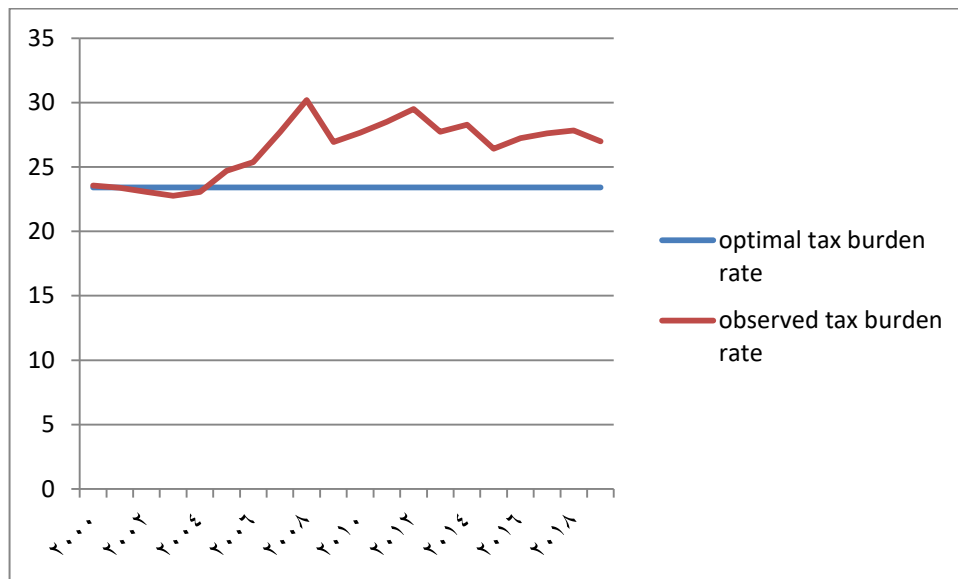
Author based on BM and OECD data

The actual tax burden rate is around 26.5% and the annual average of growth rate corresponding to this level of taxation is 4.1%.the cost of current taxation policy can be measured by the rate of GDP and the evolution of the difference between optimal and observed GDP. The figure 2 presents the evolution of this tow aggregates (in logarithmic scale).

Figure 3: Evolution of observed and optimal GDP
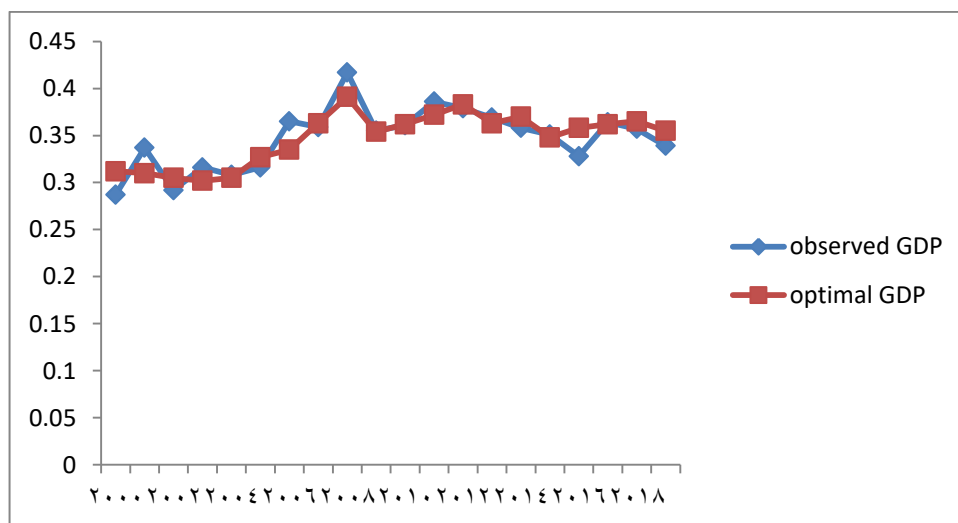
Author based on BM and OECD data

The graphic shows that the difference between the observed and the optimal GDP is neglected. which means that the country had the possibility of achieving the same level of economic growth with less tax burden rate which would improve the consumer purchasing power and the performance of private sector.Likewise, the figure reveals that from 2008, the year in which Morocco achieved the highest tax burden rate; excessive taxation caused a fall in the GDP which accelerated over time.

Table3: Average rate of the tax and economic growth

	AVERAGE RATES BY SUB PERIOD (%)	
	tax burden rate	GDP
period of optimal taxation(2000-2006)	23,6	4,9
period of excessive taxation (2007-2019)	28	3,7
difference	-4,4	1,2

The cost of current taxation policy or the potential gain from optimal taxation can also be assessed in term of tax revenue. If the optimal tax burden rate had been applied over the same period, taxes would have been collected on a much higher tax base thanks to strong economic growth and the competitiveness of the private sector

5-Conclusion

In a nation, it is essential that the government provide its economy with public goods such as infrastructure, health, education and national security. However, these expenditures must be financed on an optimal tax basis, as the distorting effects of heavy taxation on the economy may confirm Laffer's famous phrase "too much tax kills tax".

In our study, we relied on empirical evidence, namely the Scully's model, which allows us to determine the optimal tax burden rate. The results of the estimation show that tax revenue around 23.4 percent of GDP maximizes the growth rate. It is very lower than the applied rate (27%). This situation reveals that Morocco is situated in the prohibitive side of Barro's curve and the taxation is "unnecessary" and even degrading for growth and competitiveness.

7- References

1. KEHO, Y., (2010), « Détermination d'un taux de pression fiscale optimal en côte d'ivoire », in CAPEC, BUPED, n°04/2009.

2. Scully G. (2006). « Optimal taxation, economic growth and inequality in the United States ». Le centre national des analyses politiques.

3. Arthur Laffer, 1980. « Trop d'impôt tue l'impôt », Université de Chicago. L'Amérique.

4. **Eric M. Engen, Jonathan Skinner**, (1996), « Taxation and Economic Growth », NBER Working Paper No. 5826. L'Amérique.

5. BARRO, R.J., (1990), « Government spending in a simple model of endogenous growth », Journal of Political Economy, 98(5), p. 103-125.

6. Gwartney, J, J, Hall, et R, Lawson, (2010), « The impact of economic growth, tax policy and economic freedom on income inequality », The Journal of Private Enterprise, Fall, 74 (3), 230-239.

7. Scully G. (1998). « Measuring the burden of high taxes », Le centre national des analyses politiques.

8. Van Heerden Y, J. Niek Schoeman (2008). « Finding the optimum level of taxes in South Africa: A balanced budget approach ». Université de Pretoria. L'Afrique du Sud.

9. Firmin C. (2007). « La courbe de Laffer ». Revue d'Etude Politique des Assistants de Sénateurs (REPAS).

10. Marcus Davidsson, (2012), « Optimal Growth Taxation », Research in World Economy, Vol. 3, Issue 1, pp. 35-44.