Revue Française d'Economie et de Gestion
ISSN : 2728- 0128
Volume 2 : Numéro 11

Optimal Taxation and Economic Growth in Côte d'Ivoire: Empirical Evidence in Time Series

Taxation Optimale et Croissance Economique en Côte d'Ivoire : une Evidence Empirique en Séries Temporelles

OYIBO Paul Vivien
Doctorant
Faculté des Sciences Economiques et Développement
Université Alassane Ouattara de Bouaké
Laboratoire d'Analyse et de Modélisation des Politiques Economiques (LAMPE)
oyibovivien@gmail.com

Date de soumission : 07/10/2021

Date d'acceptation : 10/11/2021

Pour citer cet article :

OYIBO.P.V. (2021) «Optimal Taxation and Economic Growth in Côte d'Ivoire:Empirical Evidence in Time Series», Revue Française d'Economie et de Gestion, « Volume 2 : Numéro 11» pp : 86-108

ABSTRACT:

This article aims to analyze the optimal level of taxation in Ivory Coast through an augmented Scully model. This model highlights a U-shaped curve and confirms that the effects exerted by the level of taxation on economic activity in Côte d'Ivoire are non-linear. The results of the estimates, covering the period from 1975 to 2019, argue that the optimal rate of taxation in Côte d'Ivoire would be 34.9% of GDP. However, an increase in public investment would allow the economy to move towards this threshold in the short and long term. In addition, the decade of socio-political instability has negatively and significantly affected the mobilization of tax revenue. These results imply that the level of fiscal pressure still reached by the Ivorian economy remains below its optimal value. From a managerial point of view, knowledge of the tax optimum will allow the tax administration to implement effective tax reforms in order to maximize state revenues.

Keywords: Optimal taxation; tax revenue; public expenditure; economic growth; Côte d'Ivoire.

RESUME :

Cet article a pour objectif d'analyse le niveau optimal de taxation en Côte d'Ivoire à travers un modèle de Scully augmenté. Ce modèle met en évidence une courbe en U et confirment que les effets exercés par le niveau de taxation sur la l'activité économique en Côte d'Ivoire sont non linéaires. Les résultats issus des estimations, couvrant la période de 1975 à 2019, soutiennent que le taux optimal de taxation en Côte d'Ivoire se situerait à 34,9% du PIB. Cependant, une hausse de l'investissement public permettrait à l'économie de tendre vers ce seuil à court et à long terme. En outre, la décennie d'instabilité sociopolitique a affecté négativement et significativement la mobilisation des recettes fiscale. Ces résultats impliquent que le niveau de pression fiscale toujours atteint par l'économie ivoirienne, demeure en deçà de sa valeur optimale. D'un point de vue managérial, la connaissance de l'optimum fiscal permettra à l'administration fiscale de mettre en place des reformes fiscales efficaces afin de maximiser les recettes de l'Etat.

Mots clés : Taxation optimale ; recettes fiscales ; dépenses publiques ; croissance économique ; Côte d'Ivoire.

Introduction

The national economy since the day after the decade of politico-military crisis, has made undeniable progress. However, it seems to suffer from serious shortcomings in the area of its financing. If the increased mobilization of own resources becomes the surest source of financing the expenditure of the economy, it seems necessary to refer to the theory of Laffer (1984) which states that "too much tax kills tax". Thus Laffer[1] states that there is a tax threshold that minimizes welfare losses for the taxpayer while maximizing collected revenue. In other words, there would be a level of taxation that would discourage economic growth. Therefore, the question of optimal taxation arises. This theme is the subject of debate in the economic literature. If for some researchers, the existence of a maximum for tax revenue is possible, others refute this thesis and support the idea according to which the Laffer curve can present several maxima (Novales and Ruiz, 2002). Other thinkers like Fullerton (1982) formally believe that the Laffer curve may not be continuous or may not have a maximum.

Finally, the most recent studies attempt to rehabilitate the bell shape of the Laffer curve through transition variables that would support the concavity of this curve. Thus, the Laffer growth curve maintains its concavity through the fiscal deficit (Minea and Villieu, 2009; Bidzo, 2016). As a result, several empirical studies have looked at estimating the tax rate that maximizes tax revenue. According to Keho (2010), this tax rate for Côte d'Ivoire is estimated at 21.1% of GDP. His data cover the period 1960 to 2004. For him, Côte d'Ivoire would be located to the left of the maximum, unlike the developed countries which would be positioned to its right. Thus, one can easily explain the tax rate lower than the optimal rate by the idea that the shape of the Laffer curve depends on the use[2] of the revenue mobilized. Consequently, the difficulties of identifying public expenditure can generate an estimation bias of the Laffer curve and uncertainty as to the positioning in relation to the optimal tax rate.

In a context of scarcity of own resources for financing the economy, it is appropriate for a government like that of Côte d'Ivoire to determine the optimal level of taxation. From the above,

[1] Arthur Laffer of the University of Chicago, although the curve was popularized under his name by Wanniski (1978), was not its designer. Indeed, the existence of this curve illustrating a bell-shaped relationship between tax rate and tax revenue has existed since the 14th century. According to Say (1803), an exaggerated tax destroys the basis on which it relates.

[2] Public consumption expenditure or public investment expenditure.

the main question of this study is: what is the level of taxation that best suits Côte d'Ivoire to maximize its growth?

The main objective of this study is to analyze the fiscal optimum in Côte d'Ivoire. Specifically, it: (i) identifies the determinants of the tax rate in Côte d'Ivoire in 1985- 2019; and (ii) analyzes the relationship between taxation and economic growth.

These objectives induce the following hypotheses: (H1) public investments positively influence economic growth in Côte d'Ivoire between 1985-2019; moreover, (H2) the relationship between taxation and economic growth of Côte d'Ivoire over the period 1985-2019 is non-linear.

Following the introduction, this study presents a review of the literature (1), followed by a methodological approach (2), results and discussion (3).

1. Literature review

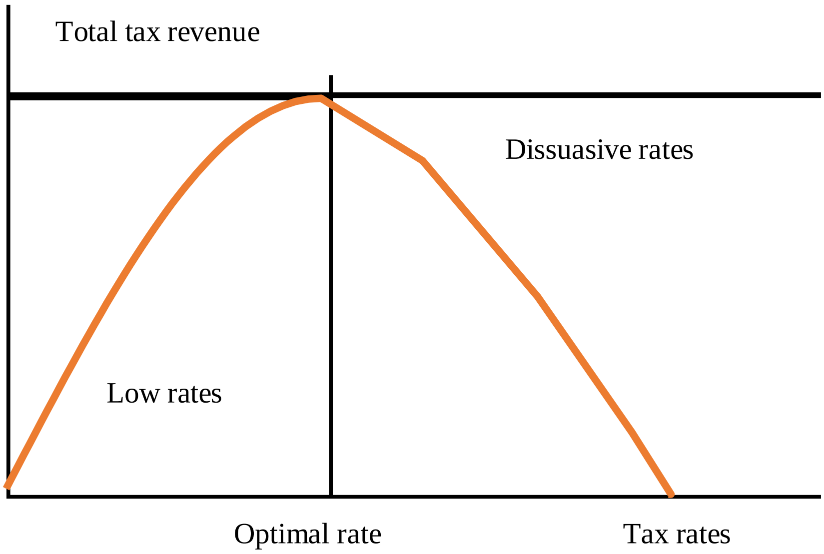
This section will present the theoretical and empirical debates on the relationship between tax rate and economic growth.

Theoretical review

The theory of optimal taxation represents the search for a system of taxation which minimizes the loss of collective well-being, and allowing to respect an exogenous budgetary constraint of the State. When a tax is introduced into a market. The "first theorem of the theory of well-being" indeed shows that any competitive equilibrium is efficient in the sense of Pareto. If the state cannot perfectly observe all the characteristics of individuals, its intervention in a market will create a distortion which will shift the economic equilibrium towards a suboptimal state in the sense of Pareto. In other words, recourse to a "flat-rate" tax is a priori impossible, the fiscal instruments and the desired balance are "second-rate". One will then speak of "criterion of effectiveness" or "of incidence" when one seeks to minimize this dead weight.

Tax rate has been much debated by thinkers so much so that Ramsey (1927) calls for a structure which is based on the evolution of the tax rate. Therefore, the problem of optimal taxation has become a major object for the success of an effective tax policy. Following Ramsey, Laffer, for his part, emphasizes stimulating the supply of goods and services by the state by subsidizing businesses and reducing their tax burdens for them and those of workers. which he called "fiscal allergy". Indeed, a tax rate that is too high has negative repercussions on the collection of tax resources, in other words, when the state increases the tax rate, the supposedly rational taxpayer realizes that the tax paid is not proportional. for the benefit of its tax contribution, hence, it will have a tax avoidance behavior also called " loss of tax morale ". This concept is explained by the quote "too much tax kills tax". He developed his work by a curve which later bore his name " Laffer's curve ". This curve reflects the fact that it is not profitable to set a levy rate above 50% to 80% of GDP.

Figure 1 : Laffer's curve



Source : LAFFER (1981)

This curve reflects a bell or inverted U relationship between tax rate and economic growth. Fullerton (1995) found limits to this curve. For him, it fails to accurately present the optimal tax rate. But all the same, there is still agreement that there is a relationship between taxation and economic growth. This relationship can have a double-edged sword. Thus, a good tax policy through taxation is a tool for economic growth in the context where it encourages companies to invest in innovation and human capital. Consequently, this promotes job creation and by extension a broadening of the tax base (Romer, 1986). Also, an excessively severe tax policy would encourage the development of tax evasion.

1.1. Empirical review

The relationship between taxation and economic growth has been the subject of several studies, particularly in advanced economies as well as in developing economies, so that the determination of the tax threshold has therefore become an indicator of the system's performance. tax. Indeed, reaching the fiscal potential of an economy can sometimes be harmful to economic activity. Some economists believe a non-linear relationship between economic activity and taxation.

The empirical results of Barro (1990), based on a sample of poor and rich countries, showed that a high level of taxation has negative impacts on growth. Engen and Skinner (1992) showed that a 2.5 percentage point increase in tax pressure would likely reduce long-term growth rates by 0.18 percentage point based on data from a sample of 107 countries over the period 1970-1985. Myles (2000) confirms these results, highlighting a negative effect of taxation on the growth rate per capita in 22 OECD countries during the period 1960-1980. For Leibfritz et al. (1997), a 10 point increase in the tax rate would decrease the growth rate by 0.5 percentage point in OECD economies.

Among the works relating to the determination of the optimal fiscal pressure, one could refer to the numerous works carried out by Scully. The latter even built a model which bears his name for this purpose, and which is most often used for time series studies. Regarding panel data studies, Scully (1991) uses a quadratic model with a panel of 103 countries. As a result, the optimal tax pressure is 19.3%, which would allow the studied economies to maximize growth. He then conducted another study with a panel of 7 countries including the USA, Denmark, the United Kingdom, Italy, Sweden, Finland and New Zealand using a Scully model. As a result, he obtains that these economies are characterized by excessively high taxes, where the observed tax rates are higher than the optimal tax rates, hence lower tax revenues. In other words, the economies studied would be located to the right of the Laffer curve.

Minea and Villieu (2009) meanwhile worked on a panel of 23 OECD countries using a Panel Smooth Threshold Regression (PSTR) model. These results support the conclusion that the Laffer curve does exist in all the economies analyzed. Indeed, the relationship between economic growth and taxation is characterized by a transition variable which is the budget deficit. Consequently, an increased indebtedness would hamper the relationship between the aforementioned economic magnitudes.

Saibu (2015) analyzed the relationship between the tax rate and economic growth in two economies (Nigeria and South Africa) over the period 1964 to 2012 for the case of the Nigerian economy and 1970 to 2012 for the case of the South African economy. His study is conducted using a Scully model. At the end of his study, it is clear that the highest taxes are negatively correlated with low economic growth. Thus, the optimal tax rates for Nigeria and South Africa are respectively 30% and 15% of GDP. As a result, the Nigerian economy's tax rate is sub-optimal while that of the South African economy is over-optimal.

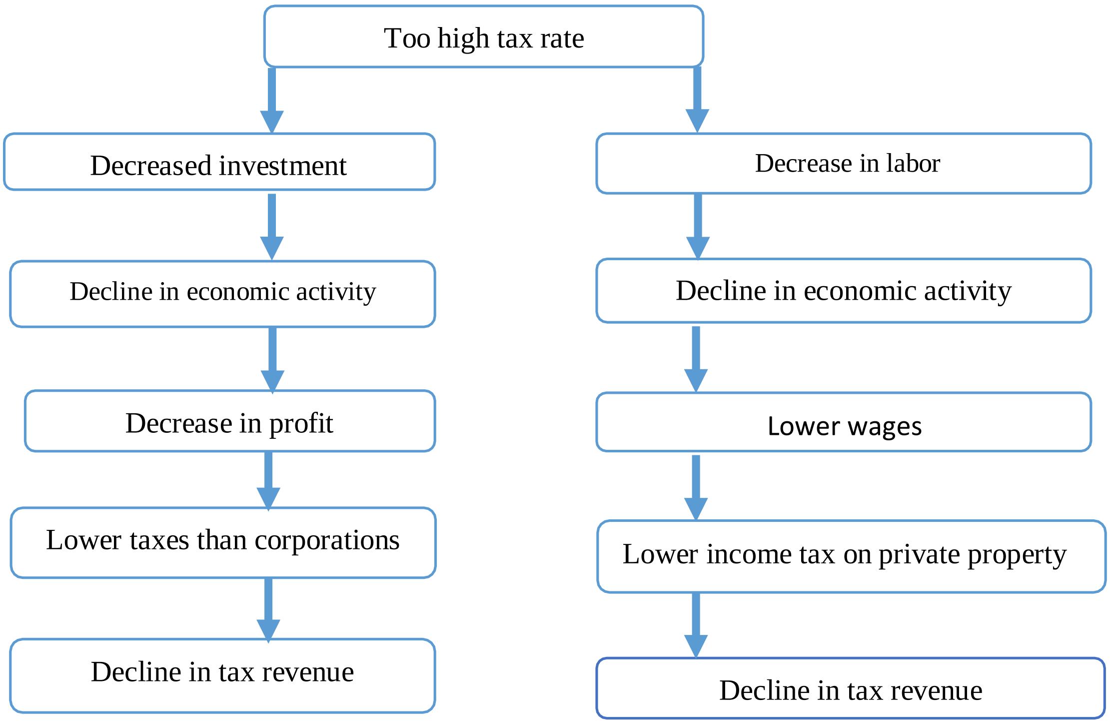
Regarding the case of Côte d'Ivoire in particular, Keho (2010) analyzed the effects of tax levies on economic activity, using Co-integration and a causal link. His results were able to reveal the existence of a non-linear relationship between these two variables and a long-term relationship between fiscal variables and GDP, consumption and investment. According to him, taxation does not slow down long-term growth and tax revenues are positively linked to GDP and its components. In the short term, however, he finds that certain types of taxes reduce economic growth. These results suggest that there is a space for tax revenue not yet collected.

As proof, this work on the optimal tax pressure rate reveals that Côte d'Ivoire still has around 6% uncollected tax pressure rate (Keho, 2010). This last work was able to show by means of the Scully and quadratic models that the optimal rate of fiscal pressure of Côte d'Ivoire is established at 21.1% of the GDP, which is largely higher than the effective fiscal pressure. He believes that the state should improve the rate of tax collection and seek to broaden the tax base while ensuring their efficient use in the economy. This can certainly mean removing the many tax exemptions the government grants each year. Also, according to the author, the recovery rate could be due to corruption or the low tax base. It is therefore necessary to extend this base to a larger number of taxable persons by removing exemptions.

Apart from the Ivorian economy, studies on the optimal tax rate have been carried out in several West African economies like Togo by Yawovi and Amedanou (2018). Using annual data over the period 1960 to 2016, their research leads to the result that, the optimal fiscal pressure of the Togolese economy is 22.6% of GDP. These results are obtained using the augmented and quadratic augmented Scully models because the authors state that the nonlinear relationship between taxation and economic activity can be influenced by other control variables such as private investment, deficit primary and gross domestic product per capita. However, it is important to delay the last control variable to avoid exogeneity between the latter and the dependent variable[3]. Still according to our authors, African economies are characterized by their left positions on the Laffer curve.

By mockery, an earlier study was carried out by Saibu (2015) in the context of determining the tax rate for the case of Nigeria and South Africa through a Scully model. The time series data used for the case of Nigeria cover the period 1970 to 2012 and those of the case of South Africa from 1964 to 2012. The results obtained by the author support the conclusion that the tax rate of the economy Nigerian is sub optimal while that of the South African economy is over optimal. In both cases, the two economies encounter difficulties in mobilizing more internal resources for their financing.

Figure 2: Transmission channels of Laffer's theory



Source : Author

[3] In the case of the fiscal optimum model, the dependent variable is the growth rate of GDP.

2. Methodology

This paper aims to assess the fiscal optimum while highlighting taxation and economic growth. This work will be carried out using the augmented Scully model.

Analysis model

This model was first developed by Scully in 1996. The object is to estimate the tax rate that maximizes economic growth. Scully, bases his model on the principle of budgetary balance $G = \mathrm{T}Y$, with G: the level of public expenditure, Y: the gross domestic product (GDP) and T: the tax rate. This model considers that the economy has two sectors: the public sector and the private sector. Concerning the public sector, according to this model, the intervention of the State is more than necessary insofar as the State carries out public expenditure (G) which is financed by tax revenue which constitutes almost all of the revenue of the state. This situation results in :

$$G = \tau Y$$

With Y the GDP and r: the rate.

The private sector, for its part, produces private goods and services that it makes available to the economy. Being in an economy with state, this sector bears the weight of taxes (T) collected by the state. The value of its goods and services produced is $(1 - T)Y$. These two sectors generate a product represented by a function of the Cobb-Douglass type which is as follows:

$$Y_t = a(G_{t-1})^b \left[(1-\tau)Y_{t-1}\right]^c \quad (1)$$

Suppose the economy is in equilibrium (balanced budget), therefore tax revenue is equal to public expenditure:

$$G = \tau Y \quad (2)$$

By replacing (1.2) in (1.1), we get:

$$Y_t = a(\tau Y_{t-1})^b \left[(1-\tau)Y_{t-1}\right]^c$$

$$Y_t = a\tau^b Y^b_{t-1} (1-\tau)^c Y^c_{t-1}$$

$$Y_t = a\tau^b (1-\tau)^c Y^{b+c}_{t-1} \quad (3)$$

However, in an economy, the economic growth rate is:

$$g_t = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

$$g_t = \frac{Y_t}{Y_{t-1}} - \frac{Y_{t-1}}{Y_{t-1}}$$

$$g_t = \frac{Y_t}{Y_t} - 1$$

$$1 + g_t = \frac{Y_t}{Y_{t-1}} \quad (4)$$

By replacing (2.16) in (2.17), we obtain:

$$1 + g_t = \frac{a\tau^b (1-\tau)^c Y^{b+c}}{Y_{t-1}}$$

$$1 + g_t = a\tau^b (1-\tau)^c Y (Y_{t-1})^{-1} \quad (5)$$

By introducing the logarithmic form, we get the following

$$\log(1+g_t) = \log(a) + b\log(\tau) + c\log(1-\tau) + \log(Y) - \log(Y_{t-1}) \quad (6)$$

By maximizing (6) with respect to:

$$\frac{\partial \log(1+g_t)}{\partial \tau} = 0 \Leftrightarrow b * \frac{1}{\tau} + \left(c * \frac{-1}{1-\tau} \right) = 0$$

$$\frac{b}{\tau} - \frac{c}{1-\tau} = 0$$

The optimal tax rate that maximizes economic growth is:

$$\tau^* = \frac{b}{c+b} \quad (7)$$

The empirical estimator of the optimal tax pressure rate will be based on the following econometric model:

$$\log(Y_t) = a + b\log(\tau_{t-1}Y_{t-1}) + c\log\left[(1-\tau_{t-1})Y_{t-1}\right] + \varepsilon_t \quad (8)$$

Or, $b < 1 and\ c < 1$.

With, Y_t : The gross domestic product (GDP); τ : The tax rate and $(1-\tau)$: Private revenues.

Commentary on equation (8)

In sum, *equation (8)* represents a model in which GDP is explained by tax revenues and private revenues after deduction of taxes.

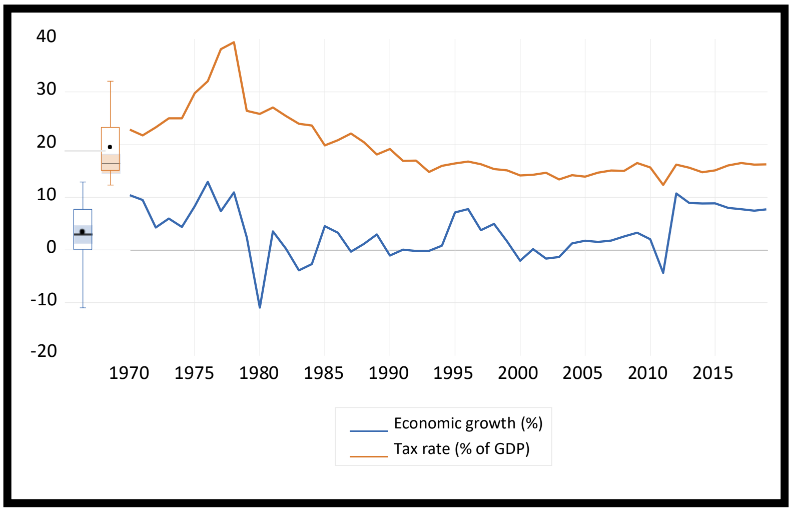
Study variables

All the data used in this part comes from the World Bank database (WDI 2019) and covers the period 1985 to 2019.

In our model, we use real GDP as an explanatory variable. As indicated in the literature, we have chosen explanatory variables, namely the information relating to nominal GDP and tax revenues come from the EDEN database of the Central Bank of West African States (BCEAO), with which we obtain the rate of fiscal pressure (PF) which represents the total tax revenue as a percentage of nominal GDP. Other data such as real GDP (GDP), GDP per capita (Constant 2010 US $) (GDPC), the investment rate represented by the growth rate of gross fixed capital formation (GFCF)

In fact, GDPC, which is equal to per capita income, can have a great influence on growth and makes it possible to verify the conditional convergence hypothesis. Equally important is the investment rate, which represents the ratio between gross fixed capital formation (GFCF) and GDP. This variable indicates the share of total investment in GDP. As for the consumer price index, it will be used as a proxy for inflation. These variables are one of the key determinants of growth.

Figure 2: Comparative evolution between fiscal pressure and GDP growth rate



Source: Our calculations on Eviews12

The graph clearly shows that from the devaluation of the local currency (CFA Francs) in 1994, the rate of fiscal pressure has the same trend as the growth rate. Indeed, this devaluation stimulated national production and allowed the state to mobilize further tax revenue. The period 2002 to 2011, marked by the greatest political instability in the country, caused a slowdown in economic activity. This justifie the view that political instability hinders not only the rate of GDP growth but also the collection of internal resources. The decreasing trend in the rate of fiscal pressure makes the hypothesis of an underexploitation of the potential of internal resources credible. In other words, there would be an untapped public resource space probably due to low taxation or low level of collection.

Table 1: Description of the variables used in the Scully model

Variables	Définition	Source des données
Y_t	The gross domestic product (GDP)	BCEAO
$(\tau_{t-1}Y_{t-1})$	Delayed tax rate delayed gross domestic product	BCEAO
$(1 - r_{t-1})Y_{t-1}$	One minus the delayed tax burden delayed gross domestic product	BCEAO
GFCF	The growth rate of gross fixed capital formation (GFCF) to approcimatethe investment rate represented.	BCEAO
GDPC	GDP per capita (Constant 2010 US $) (GDP)	BCEAO

3. Results

At first glance, it is worth checking the shape of the bell in taxation and the rate of economic growth. Consequently, a test of nonlinearity is necessary.

***Table 2**: Linearity test*

Null Hypothesis	F-statistic	d.f.	Probabilité
H04 : b1=b2=b3=b4=0	9.2995***	(3, 37)	0.0001
H03 : b1=b2=b3=0	9.2995***	(3, 37)	0.0001
H02 : b1=b2=0	9.2995***	(3, 37)	0.0001
H01 : b1=0	9.2995***	(3, 37)	0.0001

The H0i test uses the i-th order Taylor expansion (bj=0 for all j>i).

*Note: *****: P-value<0,01; **: P-value<0,05; *: P-value<0,1**. The values in parentheses are the p-values.*

Source: Our calculations on Eviews12

The linearity test with fiscal pressure as a transition variable, states that there is an effect of non-linearity between taxation and the level of economic activity.

Calculating the optimal tax pressure consists in a first step, to estimate the coefficients of the *equation (8)* follows:

$$\log(Y_t) = a + b\log(\tau_{t-1}Y_{t-1}) + c\log\left[(1-\tau_{t-1})Y_{t-1}\right] + \varepsilon_t$$

But before proceeding to the estimation of the coefficients, it is necessary to carry out preliminary tests then to study the stationarity of the variables which will be integrated in the model.

Table 3: Correlation matrix of the variables of the Scully model

Probabilité	$log(Y_t)$	$log(r_{t-1}Y_{t-1})$	$log[(1-r_{t-1})Y_{t-1}]$	GFCF	GDPC
$log(Y_t)$	1.000				
$log(r_{t-1}Y_{t-1})$	0.376	1.000			
$log[(1-r_{t-1})Y_{t-1}]$	0.951	0.152	1.000		
GFCF	0.075	0.807	-0.181	1.000	
GDPC	-0.343	0.664	-0.559	0.826	1.000

***Source*:** Our calculations on Eviews12

The table above shows us that the gross domestic product is statistically correlated with these two determinants (the tax pressure and its square) at the 5% threshold. This correlation matrix shows that the correlation coefficients are low for most of the variables used. All in all, the correlation matrix reading proves the existence of a weak correlation between the variables. This makes it possible to conclude that there is no problem of multi-collinearity. Therefore, all variables can be taken into account in the model.

Table 4: Descriptive statistics of the variables of the Scully model

	$log(Y_t)$	$log(r_{t-1}Y_{t-1})$	$log[(1-r_{t-1})Y_{t-1}]$	GFCF	GDPC
Mean	23.7957	26.6768	23.5560	14.6979	13.4694
Median	23.7915	26.5962	23.5857	12.5607	13.4172
Maximum	24.4711	27.2961	24.2945	29.6612	13.9640
Minimum	23.4475	26.2892	22.9733	8.2534	13.1839
Std. Dev.	0.2656	0.2486	0.3121	5.7878	0.2072
Skewness	1.0318	0.9193	0.3789	0.8938	0.8912
Kurtosis	3.2863	3.1141	2.7726	2.7469	2.9463
Observations	44	44	44	44	44

***Source*:** Our calculations on Eviews12

A remarkable observation from descriptive statistics is that time series behave well. Indeed, thistable shows us that the mean and the median are very close, which implies that the data does not suffer from an "aberrant" problem. Dispersion measurements help determine how widely the values are scattered or spread out. For the study of stationarity, we opted for the ADF and PP tests. The results are shown in the table below.

***Table** 5*: Result of the stationarity tests on the variables

Variables	Model	Level		First difference		Conclusion
		ADF	PP	ADF	PP	
$log(Y_t)$	Constante	0.9705	0.9617	0.0008	0.0010	I (1)
	Cst and trend	0.6212	0.8490	0.0029	0.0031	
	Without	0.9764	0.9977	0.0001	0.0001	
$log(r_{t-1}Y_{t-1})$	Constante	0.7674	0.7674	0.0000	0.0000	I (1)
	Cst and trend	0.9548	0.9745	0.0000	0.0000	
	Without	0.8468	0.8513	0.0000	0.0000	
$log[(1-r_{t-1})Y_{t-1}]$	Constante	0.9850	0.9816	0.0000	0.0000	I (1)
	Cst and trend	0.9180	0.7798	0.0000	0.0000	
	Without	0.9995	0.9998	0.0000	0.0000	
GFCF	Constante	0.5831	0.4538	0.0000	0.0008	I (1)
	Cst and trend	0.9485	0.9081	0.0026	0.0025	
	Without	0.4209	0.3944	0.0000	0.0000	
GDPC	Constante	O.9705	0.9617	0.0008	0.0010	I (1)
	Cst and trend	0.6212	0.8490	0.0029	0.0031	
	Without	0.9764	0.9977	0.0001	0.0001	

Source: Our calculations on Eviews12

The results of the stationarity obtained by the means of the ADF and PP test, reveal that the variables are not stationary in level. But they are all in first difference. Thus, the variables are integrated into the same unitary order I (1) which is the necessary condition for the existence of a long-term relationship (Engle and Granger, 1987; Johansen, 1988). In the following we will carry out the stationarity test on the residue of the long-term estimate.

The residuals of the long-term model are tested in the following way:

H0: No cointegration

H1: cointegration

The results are shown in the table below:

Table 6: ADF test on the residuals of the long-term estimate

Serie	Model	Probability
Residues	Constant	0.0003

Source**:** Our calculations on Eviews12

According to these results, it is clear that the residuals of the model have a p-value of less than 5%. We can therefore conclude that the residuals are stationary at level I (0), hence the sufficient condition for the presence of cointegration. Therefore, the H1 hypothesis is accepted to the detriment of the H0 hypothesis. There is therefore the presence of a long-term relationship. For this presence of cointegration, we opt for an error correction model (ECM) for the following.

Thus, a dummy variable has been integrated into the model. It is defined as :

$$Dum11 = \begin{cases} 1; t = 2011 \\ 0; without \end{cases}$$

Finally, we estimated our equations by taking into account the significant shocks that affect the parameters of the model. Our equation becomes :

$$\log(Y_t) = a + b\log(\tau_{t-1}Y_{t-1}) + c\log\left[(1-\tau_{t-1})Y_{t-1}\right] + d\sum_{i=2}^{1} X_t + eDum + \varepsilon_t \qquad (9)$$

- Long-term estimate

Tableau 7 : Long-term estimate

Variables	Coefficient	Std. Error	t-Statistic	Probabilité
$\log\left(\tau_{t-1}Y_{t-1}\right)$	0.3329***	0.0613	5.4266	0.0000
$l\,\text{og}\left[\left(1-\tau_{t-1}\right)Y_{t-1}\right]$	0.6191***	0.0414	14.9394	0.0000
Public investment	0.0100***	0.0019	5.2254	0.0000
Logarithm of GDP per capita (-1)	-0.4828***	0.0818	-5.8963	0.0000
Politic crisis of 2011	-0.0399**	0.0159	-2.4987	0.0169
C	6.6955***	1.2498	5.3568	0.0000
Adjusted R-squared	0.9821	S.D. dependent var		0.265698
F-statistic	473.0168	Durbin-Watson stat		1.259167
Prob(F-statistic)	0.0000			

Note: ******: P-value<0.01; **: P-value<0.05; *: P-value<0.1****. The values in parentheses are the p-values.*

Source: Our calculations on Eviews12

Let the long-term equation be:

$$\log\left(Y_t\right) = 6.6955 + 0.3329l\,\text{og}\left(\tau_{t-1}Y_{t-1}\right) + 0.6191l\,\text{og}\left[\left(1-\tau_{t-1}\right)Y_{t-1}\right] + 0.0100GFCF_t$$
$$-0.4828Log(GDPC)_{t-1} - 0.0399Dum + \varepsilon_t \qquad (10)$$

$$R^2 = 0.98 \ et \ DW = 1.25$$

Several specifications have been developed. We therefore retained the one presented in the table above, all of the variables of which are significant at the 1% level, with the exception of the binary variable which is significant at the 5% level. In addition, we have an overall goodness of fit of the model estimated at 0.98.

- Short-term estimate

Table 8 : Short-term estimate

Variables	Coefficient	Std. Error	t-Statistic	Probabilité
$D\left[l\log\left(\tau_{t-1}Y_{t-1}\right)\right]$	-0.060254	0.0790	-0.7625	0.4507
$D\left(\log\left[\left(1-\tau_{t-1}\right)Y_{t-1}\right]\right)$	-0.5761**	0.222457	-2.5897	0.0138
D (investissement public)	0.0116***	0.002018	5.7957	0.0000
D (Logarithme du PIB par habitant (-1))	0.9275***	0.297909	3.1134	0.0036
Instabilité politique	-0.0253**	0.009847	-2.5772	0.0142
RESID02 (-1)	-0.5240***	0.151041	-3.4696	0.0014
C	0.0525***	0.010754	4.8866	0.0000
Adjusted R-squared	0.713020	S.D. dependent var		0.046255
F-statistic	18.39197	Durbin-Watson stat		1.452252
Prob(F-statistic)	0.00000			

*Note: *****: P-value<0.01; **: P-value<0.05; *: P-value<0.1**. Les valeurs entre parenthèses sont les p-values.*

***Source*:** Our calculations on Eviews12

Let the short-term equation be:

$$D\left[\log\left(Y_t\right)\right]=0.0525-0.0602D\left[\log\left(\tau_{t-1}Y_{t-1}\right)\right]-0.5761D\left(\log\left[\left(1-\tau_{t-1}\right)Y_{t-1}\right]\right)+0.0116D\left(GFCF\right)_t$$
$$+0.9275Log\left(GDPC\right)_{t-1}-0.0253Dum-0.5240\,\mathrm{Re}\,sidue_{t-1} \quad (11)$$

$$R^2=0.71\ ;\ DW=1.45$$

The overall goodness of fit of the short-run model is estimated at 0.75. The speed of adjustment towards equilibrium has fulfilled the condition of the validation of the error correction model (ECM), it means that following a shock, the response variable of the gross domestic product regains its equilibrium according to the frequency of 52.40%. In other words, following a shock the structural variables explain the gross domestic product of 52.40% in the long term, and that the shock is fully absorbed after two years (1 / 0.5240 = 1.99).

For the rest, we will carry out diagnostic tests.

The diagnostic tests contribute to the validation of the estimated model. Thus, we will use three tests: the Breusch Godfrey Serial LM Autocorrelation Test, Breusch-Pargan-Godfrey and the Jarque Bera normality test.

Table 9 : Results of diagnostic tests

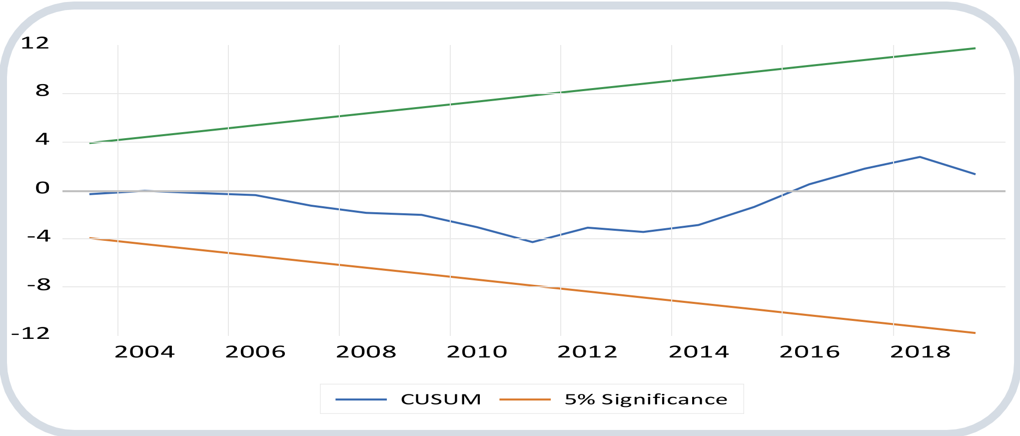
Objet	Test	Statistique du test	P-value	Conclusion
Autocorrélation	Breusch Godfrey Serial LM Test	$nR^2 = 2.3063$	0.0822	No autocorrelation
Hétéroscédasticité	Arch	$nR^2 = 0.0426$	0.8326	No heteroskedasticity
Normalité	Jarque Bera	JB = 0.7166	0.6988	Normal distribution

Source**:** Our calculations on Eviews12

The p-values of the various tests are above the significance level of 5%. This states that all the tests performed were important. Therefore, it seems reasonable to conclude that the residuals satisfy the assumptions of the classical normal linear regression model.

The stability of the model is ensured through the results of CUSUM.

***Figure** 3 :* Cusum test



Source**:** Our calculations on Eviews12

As the short-term model is dynamic, it only applies to the long-term model. If the curve does not intersect the corridor (in dotted lines) then the model is stable; on the other hand, it is unstable as soon as the curve intersects the corridor. The result shows that the recursive residuals (in blue) are very close to zero, it is well inside the confidence interval (in red) in other words, the curve is contained in a corridor. We therefore generally reject the hypothesis of structural change. We can then conclude that the model object of this study is stable from where there is no instability of the parameters in time.

To determine the optimal taxation maximizing the economic growth rate, it comes down to replacing the coefficients of the long-term model in *equation (8):*

$$\log(Y_t) = 6.6955 + 0.3329 \log(\tau_{t-1} Y_{t-1}) + 0.6191 \log[(1-\tau_{t-1}) Y_{t-1}] + 0.0100 GFCF_t$$
$$- 0.4828 Log(\text{GDPC})_{t-1} - 0.0399 Dum + \varepsilon_t$$

$$R^2 = 0.98 \ et \ DW = 1.25$$

Therefore,

$$\tau^* = \frac{b}{c+b}$$

$$\tau^* = \frac{0.3329}{0.6191 + 0.3329}$$

$$\tau^* = 0.3496 \Rightarrow 34.96\% \text{ of GDP.}$$

The result easily describes that the optimal tax rate in Côte d'Ivoire is 34.96% of GDP. The real level of the tax rate in GDP for 2018 was 16.47%. In 2019, this rate rose to 16.18%. In addition, the tax rate that maximizes growth is significantly higher than the current realized rate. Thus, we can deduce that the fiscal optimum has not been reached in Côte d'Ivoire. It should be noted that, this threshold differs from the work of Keho (2010) because the dynamism of the current economy is not the same as the dynamism of the economy of the 2000s.

Conclusion

This study focuses on the analysis of the fiscal optimum in Côte d'Ivoire while relying on theoretical studies. The study therefore required the estimation of an augmented Scully model.

In terms of results, these estimates reveal that from 1995 to 2019, the optimal tax pressure stagnated around 34.96% of GDP. Thus, it is clear that the critical threshold obtained differs from that of Keho (2010) which was 21.1%. In view of these results, appears the inefficiency of the Ivorian tax system to mobilize more resources to finance the needs of the economy. In addition, despite the continuous effort of the Ivorian State in the context of the implementation of effective policies to fight against poverty, the strategies for mobilizing tax revenues remain an advantage for the expansion of the informal sector. This is why the question of financing by taxes opens up a line of research on certain perspectives, mainly the performance of public goods, since the latter encourage populations to meet their tax obligations, instead of practicing public goods. policies to reduce corruption and tax evasion. The results suggest two majors managerials implications:

- Increase the level of public investment in order to expect a significant long-term effect on economic activity.
- In Côte d'Ivoire, taxation is suboptimal. The tax reforms must be oriented as a priority towards the informal sector to encourage them to formalize.

This study sheds light on the assessment of the Ivorian tax system. In future work, it will be possible to analyze the decision of informal production units to formalize.

References

Barro, R. J. (1990). Government Spending in a Simple Model of Endogenous Growth. Journal of Political Economy, Vol. 98, No. 5, S103–S125.

Barro, R.J., (2012). Convergence and Modernization Revisited. NBER Working Paper, no. 18295, August.

Ehrhart, H., Minea, A., Villieu, P., (2009). Deficit, Seigniorage and the Growth Laffer Curve in Developing Countries. Document de travail de la série, Etudes et Documents, CERDI, N° 6.

Fullerton, D., (1982). On the Possibility of an Inverse Relationship between Tax Rates and

Government Revenues. Journal of Public Economics, vol. 19, 3–22.

Keho, Y. (2010). Estimating the Growth Maximizing Tax Rate for Cote d'Ivoire: Evidence and Implications. Journal of Economics and International Finance, 2(9),164-174.

Laffer, A.B., (1981). Government Exactions and Revenue Deficiencies. The Cato Journal, vol. 1(1), 1–21.

Laffer, A., (2004). The Laffer Curve: Past, Present, and Future. Backgrounder, no. 1765.

Leibfritz W., Thornton J., et Bibbee A., (1997), Taxation and Economic Performance. OCDE, Working Paper No.176.

Lucas, R. E. (1988). On the Mechanics of Economic Development. Journal of Monetary Economics, Vol.22, No. 1, 3-42

Megersa, A., (2014). Economic Effects of Air Target Market Liberalization in Africa. Working Papers in Transport Economics, Transport Studies Stockholm.

Mengue Bidzo, M., (2016), Piège à la Fiscalité : Le Cas de l'Economie Gabonaise. Revue Internationale des Economistes de la Langue Française Vol. 1, N° 1,29–48.

Minea, A., Villieu, P., (2009). Impôt, déficit et croissance économique : un réexamen de la courbe de Laffer. Revue d'économie politique, Vol. 119, N° 4, 653–675.

Myles, G. D. (2000). Taxation and Economic Growth. Fiscal Studies, Vol. 21, No.1, 141-168.

Novales, A., Ruiz, J., (2002). Dynamic Laffer Curves. Journal of Economic Dynamics and Control, vol. 27, 181–206.

Nickell, S., (1981). Biases in Dynamic Models with Fixed Effects. Econometrica, vol. 49, 1417–1426.

Papp, T., Takats, E., (2008). Tax Rate Cuts and Tax Compliance – The Laffer Curve Revisited. IMF Working Paper, no.7.

Piketty, T., Saez, E., Stantcheva, S., (2011). Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities. National Bureau of Economic Research Working Paper, no. 17616, Cambridge.

Saibu, O. M. (2015), Optimal Tax Rate and Economic Growth. Evidence from Nigeria and South Africa. Euro Economica, 1(34)

Scully, G. W. (1991). Tax Rates, Tax Revenues and Economic Growth, National Center for Policy Analysis. Policy Report, 159.

Scully, G.W., (1995). The Growth Tax in the United States. Public Choice, vol. 85, pp. 71–80.

Slemrod, J., (1990), Optimal Taxation and Optimal Tax Systems. Journal of Economic Perspectives, vol. 4, no. 1, 157–78.

Yawovi M. Isaac Amedanou, (2018). Review of the optimality of tax performance in developing countries: evidence from WAEMU. MPRA Paper.