Journal of Research in Economics and International Finance (JREIF) (ISSN: 2315-5671) Vol. 2(3) pp. 39-48, March, 2013
Available online http://www.interesjournals.org/JREIF

Full Length Research Paper

The structure of taxes and economic growth in Cote d'ivoire: An econometric investigation

Yaya Keho

National School of Statistics and Applied Economics (ENSEA), Abidjan, Abidjan 08, Côte d'Ivoire
E-mail: yayakeho@yahoo.fr

Abstract

This paper investigates the relationship between taxation and economic growth in Côte d'Ivoire. For this, we use data from 1961 to 2006 and a two-stage modelling technique to control for unobserved non-tax growth determinants. We find that increases in the tax burden and the share of direct tax to total tax revenue are strongly associated with decreases in economic growth, with an excessive tax burden being much more damaging than the share of direct tax. We estimate a growth-maximising tax structure over the sample period and find a time-varying tax burden with a period mean of 11.4%, and a time-varying direct tax ratio having a period mean of 12.9%. A move to a growth-maximising tax structure would generate an increase in real GDP, but would yield a reduction in tax revenues.

Keywords: Tax revenue, tax structure, economic growth, *JEL Classification*: C13, E62, H21, C61.

INTRODUCTION

The role of tax policy in explaining long-run economic growth has been an ongoing issue in debates on macroeconomy and public finance. The thrust of these debates has been whether the policy makers can use taxation to stimulate economic growth. On the one hand, neoclassical growth theory maintains that exogenous forces, such as technological progress and population dynamics, drive steady state growth. Taxes may exert a temporary influence on the growth rate of income. Endogenous growth models, on the other hand, contend that steady state growth is determined by the parameters of the economy. Taxes that affect any of these parameters should have a permanent influence on long-run growth. Therefore, while they disagree on the actual dynamics – temporary or permanent– of the relationship, growth models of both paradigms concur that taxes depress growth.

Yet, empirical investigations still fail to provide conclusive results about the growth effect of taxation. The empirical evidence is mixed across countries, data and methodologies, with some finding a negative impact, while others find little or no significant growth effect of taxation. However, a common limitation of most of the empirical studies of taxation and growth is that they are based on linear models in which taxes enter the growth rate equation in a linear fashion. They have not investigated the existence of a non-linearity in the tax-growth nexus as suggested by Barro (1990). In addition, a strand of the public finance literature argues that what matters for growth is not only the level of taxes but also the way in which different tax instruments are designed and combined to generate revenues. Some taxes are significantly negatively associated with economic growth than others. For example, consumption taxes are found to be less distortionary than taxes on capital and income (see Skinner, 1987; Wang and Yip, 1992; Widmalm, 2001). Higher direct taxes reduce personal disposal income, discourage private investment and consumption, thereby impeding economic growth. Moreover, higher direct taxes create incentives for agents to engage in less productive and more lightly taxed activities, leading to lower rates of economic growth (Mendoza et al., 1997; Engen and Skinner, 1996; Myles, 2000). Thus, holding constant the overall tax burden, it is possible to obtain higher levels of output by shifting away the tax structure from income taxes towards non-distorting consumption taxes.

The tax policy in Cote d'Ivoire has been scrutinized and revised continuously since 1960. The country has undertaken a series of reforms in its tax system aiming at increasing tax revenues and promoting economic growth. Some of the reforms intended to extend the tax base, reduce exemptions and improve the collecting system by decentralizing the fiscal administration and eliminating fraud (An overview of a chronology of fiscal reforms implemented in Côte d'Ivoire from 1960 to 2006 can be found in "Code Général des Impôts, Livre de procedures fiscales, Autres textes fiscaux, 2007", Direction Générale des Impôts, Côte d'Ivoire). Despite these reforms, the overall tax rate shows a downward trend, declining from 21.6% in 1965 to 17.5% in 1990 and 15% in 2006. The tax performance does not meet the requirement of convergence criteria that target a level of tax revenues exceeding 17% of GDP (Côte d'Ivoire is member of the West African Economic and Monetary Union. This union has adopted in 1994 convergence criteria aiming at explicit targets for inflation, public debt and deficits to monitor the fiscal situation of the member countries. To meet the convergence criteria, the member countries should, among others, increase tax revenues over 17% of GDP and keep public deficit at a minimum of zero percent of GDP). Over the same time period, the share of indirect taxes in total tax revenues has fallen, declining from 85.5% in 1965 to 72.4% in 1990 and 70% in 2006. In the eyes of some observers, a reduction in direct taxes can contribute to reduce tax avoidance (Fiscal fraud amounts to 500 trillions of FCFA, some 31% of total tax revenue) and improve tax burden as well as economic growth. With respect to economic performance, the country enjoyed two decades (1960-1980) of good economic performance and entered in a long period of economic crisis. Domestic adjustment strategies pursued during the 1980s failed to boost economic activity and to close all deficits. As a necessary response to the failure of macroeconomic policies, the country experienced the devaluation of its currency on January 11, 1994. The devaluation accompanied by structural reforms led to an encouraging recovery: economic performance has strengthened significantly from 1994 and budget deficits fell. But all will change on December 24, 1999, when rebels overthrew the government in the country's first military coup. Since that time, the political agenda of Cote d'Ivoire has been dominated by political and social tensions. Today, government is looking for revenues to rebuild the country's infrastructures and boost the economic activity.

Our objective in this paper is to contribute to the tax-growth literature by examining if there is any evidence that taxation plays a role in explaining the process of economic growth in Cote d'Ivoire. More precisely, the study addresses the following questions. How are taxes related to economic growth? Which component of the tax structure – the tax burden or the tax mix –has the more potent influence on the real GDP growth rate? Is it possible to derive a growth-maximising tax structure for the Ivorian economy? If so, what would be the effects on both real GDP and treasury tax revenues of moving to such a tax structure? To provide answers to these questions, we use annual time-series data for the period 1961 to 2006. We argue that the failure of some empirical studies to find significant correlation between taxation and growth is due to an incorrect choice of the tax variables and the way non-tax growth determinants are controlled for.

The remainder of the paper is organized as follows. Section 2 reviews previous literature on taxes and economic growth. Section 3 outlines the analytical framework. We first use data envelopment analysis to isolate non-tax economic growth determinants in a scaling factor. Using this factor as proxy for non-tax determinants, we use econometric methods to estimate the separate growth effects of the tax burden and the tax structure. This enables us to determine a growth-maximising tax structure and to quantify the cost or the potential benefit of adopting such a tax structure. Section 4 presents and discusses the empirical results of the analysis. Section 5 summarizes the main findings.

Literature Review

Neoclassical and endogenous growth models have different long-run predictions about the growth effects of fiscal policies. In the neoclassical growth models of Solow (1956) and Swan (1956), the long-run growth rate is exogenous and determined by demographic and technological progress, but not subject to fiscal policy influence. Hence fiscal policy differences among countries may only explain the observed differences in income *levels* but not in long-run *growth rate.* By contrast, endogenous growth theory produced growth models in which public investment in human and physical capital can have long-term or permanent growth effects, and consequently there is much more scope in these models for at least some elements of tax and government expenditure to play an important role in the growth process. These models tell us that taxation can have both a negative and a positive effect on growth rate (see Lucas, 1988; Barro, 1990; Barro and Sala-i-Martin, 1992; Stokey and Rebelo, 1995; Mendoza et al. 1997). The positive effect arises indirectly through the expenditures financed by taxation. If taxes are used to fund investment in public goods, especially goods resulting in external benefits (infrastructure, education and public health), the economic growth rate could be positively influenced by taxation. The negative effect of taxation on growth arises from the distortions to choice and the disincentive effects. As Skinner (1987) and Engen and Skinner (1996) explain, a country's tax policy can affect the stock of human and physical capital directly by discouraging investment and lowering their investment rate. Tax policy can also influence the allocation of labour and capital, and hence their productivities.

On the empirical ground, a growing body of empirical studies has investigated the effects of taxes on economic growth. Results are far from being conclusive, varying across countries, methodologies, and fiscal variables involved. Engen and Skinner (1996), Arnold (2008) and

Myles (2000) provide surveys on this literature. The influential work by Barro (1990), using a data set covering a large cross-section of both rich and poor countries, presents strong empirical evidence favoring the view that higher taxes are growth-impeding. This suggests that tax cuts would stimulate the economy. This result has been confirmed in some subsequent studies, but has been challenged in others. For example, studies such as Engen and Skinner (1992), Kormendi and Meguire (1995), Cashin (1995), Kneller et al. (1999), Fölster and Henrekson (2001), Bleaney et al. (2001), Blanchard and Perotti (2002), Holcombe and Lacombe (2004) and Karras and Furceri (2009) present evidence showing that taxation is negatively associated with economic growth. While others such as Katz et al. (1983), Koester and Kormendi (1989), Easterly and Rebelo (1993), Slemrod (1995) and Mendoza et al. (1997), do not detect any significant effect of taxation on economic growth.

A number of empirical works look at the effects of different types of taxes on growth, arguing that the structure of taxation is more important for growth than the level of the tax rate. Changes in any single tax may simultaneously affect several determinants of GDP per capita. For instance, a reduction in the labour tax may increase employment and the amount of hours worked in the economy, ultimately affecting labour utilisation. But at the same time it increases the opportunity cost to undertake higher education and, therefore reduces incentives to invest in education, ultimately affecting labour productivity. Marsden (1986) works with a cross-section data of 20 countries over the period 1970 to 1979, and finds that the average tax ratio has a significant negative impact on the average per capita growth rate of GDP. He also finds that the tax ratio has a negative effect on the growth rate of investment, although among individual categories of taxes only domestic taxes on goods and services have a significant effect. Skinner (1987) analyses the effect of taxation in Sub-Saharan Africa over the period 1965 to 1982. He finds that taxes levied on personal and corporate income reduce economic growth, while sales and excise taxes have no significant effect on economic growth. Study by Dowrick (1992) finds a strong negative effect of personal income taxation, but no impact of corporate taxes, on output growth in a sample of OECD countries between 1960 and 1985. Wang and Yip (1992) show that the structure of taxation is more important than the level of tax rate in explaining economic growth in Taiwan from 1954 to 1986. They find significant and negative impacts of specific taxes on economic growth, but the effect of total taxation is not significant. Kim (1998) compares economic performance and taxation in the US with economic growth and taxation in Korea. According to his analysis, 30% of the difference between US and Korean economic growth rates can be explained by differences in the tax structure between the two countries. The remaining 70% can be ascribed to differences in technologies. He further decomposes the growth rate difference to identify which tax variables are more important in explaining the difference in growth rates. Among the tax instruments, He found labour income tax to be at least important as taxes on capital income in accounting for the growth rate diversity. Widmalm (2001) uses cross-section data of 23 OECD countries over the period 1965 to 1990, and finds that the share of total taxes levied on personal income has negative effect on economic growth, while consumption taxes are growth enhancing. Lee and Gordon (2005) find that the corporate tax rate is significantly negatively correlated with economic growth in a cross-section data set of 70 countries during 1970-1997. They also find that tax rate on labor income is not significantly associated with economic growth rate. Results obtained by Arnold (2008) from 21 OECD countries over the period 1970 to 2005 suggest that income taxes (personal and corporate) are associated with significantly lower economic growth rates than taxes on consumption and property.

A common limitation of most of the empirical studies of taxation and growth is that they are based on linear models in which taxes enter the growth rate equations in a linear fashion. They have not investigated the existence of a U-inverted curve in the tax-growth relationship as suggested by Barro (1990). Consequently, they fail to derive any optimal level of tax rate beyond which taxes are growth retarding. Another strand of the public finance literature has investigated this topic. However, these studies are not for African countries. In a series of studies, Scully derives the growth-maximising tax rate for New Zealand (Scully, 1996, 2000), the United States (Scully, 1995), Denmark, United Kingdom, Italy, Sweden, Finland and New Zealand (Scully, 2003). Although the works of Scully are an advance over most existing studies, they do not derive a growth-maximising tax structure for the countries analysed. Branson and Lovell (2001) use a linear programming approach and non-linear specification to estimate a growth-maximising tax structure for New Zealand over the period 1946-1995. They find a growth-maximizing tax burden which varies around a period mean of 22.5% of GDP and a growth-maximising tax mix having a period mean of 0.54, which implies a mean 65% share of direct taxes in total tax revenue. Koch et al. (2005) conduct a similar exercise for South Africa, but do not derive a growth-maximising tax structure for this country. They find that decreased tax burdens lead to increased economic growth and decreased indirect taxation relative to direct taxation is strongly associated with increased economic growth. Using the model of Scully, Keho (2010) estimates a growth-maximising tax burden for Cote d'Ivoire. He finds an optimal taxation rate of 22% beyond which taxation reduces economic growth rate. However, like Scully'studies, Keho (2010) has not investigated the relationship between tax structure and economic growth and, therefore, has not derived a growth-maximising tax structure for the Ivorian economy. This study attempts to investigate this topic for Cote d'Ivoire over the period 1961-2006. Following the analytical framework developed by Branson and Lovell (2001), we seek to estimate a combination of tax burden and tax mix which would maximise the economic growth rate.

Econometric Framework

Traditional growth accounting approach based on aggregate function originally developed by Solow (1956) is still the most widely used method for establishing factors influencing growth of countries. The approach has been extensively revised to incorporate human capital (Lucas, 1988) and public spending (Barro, 1990). In its simplest form, an aggregate production function is described as follows:

$$Y_t = F(A_t, K_t, L_t) \quad (1)$$

Where A is the coefficient measuring the total factor productivity, K represents the economy's capital stock and L is the labor force. Assuming constant returns to scale and differentiating with respect to time, Eq.(1) can be expressed in the following growth equation:

$$y_t = \gamma\dot{A}_t + \alpha\dot{K}_t + \beta\dot{L}_t \quad (2)$$

Where y is the growth rate of real GDP, $\dot{A}$, $\dot{K}$ and $\dot{L}$ are the growth rates of A, K and L, respectively, γ, α and β are the elasticities of real GDP with respect to A, K and L. As Engen and Skinner (1996) explain, tax policy directly and indirectly affects the economic growth rate through all five variables on the right side of Eq. (2). Income, business and consumption taxes can alter the incentives to invest in physical and human capital, and therefore altering the growth rates of human and physical capital, as well as technical progress. Furthermore, tax policy can also influence the relative cost of physical and human capital and research and development expenditures, and thereby influencing input elasticities for human and physical capital and productivity growth.

We consider two separate measures of tax policy. One is the ratio of GDP to direct tax revenue (Y/D) and the other is the ratio of GDP to indirect tax revenue (Y/I). Since these tax variables influence all the variables on the right hand side of Eq. (2), we replace the production function Eq. (2) with:

$$y_t = f\left(\frac{Y_t}{D_t}, \frac{Y_t}{I_t}, Z_t\right) \quad (3)$$

where Z is a vector of other non-tax economic growth determinants. It is also possible to replace Y/D and Y/I with the tax burden *b=(I+D)/Y* and the direct tax share *m=D/(D+I).*

$$y_t = f(b_t, m_t, Z_t) \quad (4)$$

The empirical problem with Eq.(3) or equivalently, Eq. (4), is that many of the non-tax variables in Z cannot be observed. If the variables in Z were uncorrelated with the tax variables, we could estimate Eq. (4) without concern for bias, even if we ignore Z and treat it as a vector of omitted variables (see Frisch-Waugh theorem). However, following the arguments of Engen and Skinner (1996), the assumption of no correlation between the non-tax variables in Z and the tax variables (tax burden and tax mix) is not reasonable. One approach for dealing with this problem is to use instrumental variables techniques. However such an option is made difficult by the selection of appropriate instruments. Also, parameter estimates are likely to be sensitive to the selection of instruments. To overcome these difficulties an alternative approach based on Data Envelopment Analysis (DEA) is adopted in this study. The objective of this linear programming model is to isolate the influence of the unobserved factors in Z on growth prior to the estimation of Eq. (4).

Data Envelopment Analysis is a linear programming-based methodology to measure the efficiency of multiple decision-making units (DMUs) when the production process presents a structure of multiple inputs and outputs (see Charnes et al., 1994; Ramanathan, 2003; Ray, 2004). It aims to measure how efficiently a unit uses the resources available to generate a set of output. Efficiency is defined as a weighted sum of outputs to a weighted sum of inputs. As its name suggests, DEA envelops the data so that observations on the "edge of the envelope" represent economic frontiers. The "edge of the envelope" is used to determine how far the remaining observations are from the frontier using a simple scaling factor. Assuming that there are *n* DMUs, each with *m* inputs and *s* outputs, the relative efficiency score of a test DMU *p* is obtained by solving the following model:

$$\begin{aligned} & Max_{u,v} \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}} \\ & s.t. \quad \frac{\sum_{k=1}^{s} v_k y_{ki}}{\sum_{j=1}^{m} u_j x_{ji}} \leq 1, \forall i \\ & v_k, u_j \geq 0 \quad \forall k, j \end{aligned} \quad (5)$$

Where y_{ki} is the amount of output *k* produced by DMU *i*, x_{ji} is the amount of input *j* utilized by DMU *i*, v_k is the weight given to output *k*, and u_j the weight given to input *j*.

One problem with this fractional program is that it has an infinite number of solutions. To avoid this one can impose the constraint $\sum_{j=1}^{m} u_j x_{jp} = 1$ and the programme becomes:

$$
\begin{aligned}
& Max_{u,v} \sum_{k=1}^{s} v_k y_{kp} \\
& s.t. \quad \sum_{j=1}^{m} u_j x_{jp} = 1 \\
& \sum_{k=1}^{s} v_k y_{ki} - \sum_{j=1}^{m} u_j x_{ji} \leq 0 \quad \forall i \\
& v_k, u_j \geq 0 \quad \forall k, j
\end{aligned}
\tag{6}
$$

The above problem is run *n* times in identifying the relative efficiency scores of all the DMUs. Each DMU selects input and output weights that maximize its efficiency score. In general, a DMU is considered to be efficient if it obtains a score of 1 and a score of less than 1 implies that it is inefficient.

The dual problem associated with (6) is:

$$
\begin{aligned}
& Min_{\theta,\lambda} \theta \\
& s.t. \quad \sum_{i=1}^{n} \lambda_i x_{ji} - \theta x_{jp} \leq 0, \forall j \\
& \sum_{i=1}^{n} \lambda_i y_{ki} - y_{kp} \geq 0 \quad \forall k \\
& \lambda_i \geq 0 \quad \forall i \\
& \sum_{i=1}^{n} \lambda_i = 1
\end{aligned}
\tag{7}
$$

where θ_t is the efficiency score, and λ_is are dual variables.

In this study, two input variables (*m=2*) and one output variable (*s=1*) are considered for efficiency measurement. Input variables include the ratio of GDP to direct taxes (Y/D) and the ratio of GDP to indirect taxes (Y/I). The output variable is real GDP growth rate y. Thus, the linear program seeks the smallest reciprocal tax burden or, equivalently, the heaviest tax burden, which is consistent with the observed growth rate, given a history of observed tax burdens and growth rates in the economy over the time period. The linear programme to be solved is as follows:

$$
\begin{aligned}
& Min_{\theta,\lambda} \theta \\
& s.t. \quad \sum_{t=1}^{T} \lambda_t \left(\frac{Y_t}{D_t} \right) - \theta \left(\frac{Y_p}{D_p} \right) \leq 0 \\
& \sum_{t=1}^{T} \lambda_t \left(\frac{Y_t}{I_t} \right) - \theta \left(\frac{Y_p}{I_p} \right) \leq 0 \\
& \sum_{t=1}^{T} \lambda_t y_t - y_p \geq 0 \\
& \lambda_t \geq 0 \quad \forall t \\
& \sum_{t=1}^{T} \lambda_t = 1
\end{aligned}
\tag{8}
$$

As explained earlier, the programme given by (8) is solve T=46 times, once for each year in the data. A value of θ is then obtained for each year. For year *p* the program tries to find the largest increase in the indirect and direct tax burden consistent with the constraints. The first two constraints require that the increase in the direct (indirect) tax burden, as measured by the reciprocal direct (indirect) tax share of income, cannot exceed a linear combination of all other years' tax burdens. The third constraint requires that a linear combination of all other years' growth rates cannot be exceeded by the growth rate in year *p*. The final T+1 constraints force the linear combinations to be convex with non-negative weights. Given the fact that real GDP growth rates are occasionally negative, we add a constant $\tau = 0.12$ to all growth rates to makes them positive. Lovell and Pastor (1995) have shown that the procedure is invariant to such a translation.

The solution θ_t is interpreted as a normalised proxy for the unobserved non-tax influences Z_t on economic growth. Unlike Branson and Lovell (2001) and Koch et al. (2005), we replace annual values of Z_t with calculated values of θ_t and specify the estimable growth equation in its more general form as follows:

$$
y_t = f(b_t, m_t, \theta_t) + \mu_t \tag{9}
$$

where μ_t represents the error term. Writing this equation in translog-quadratic form yields:

$$
y_t = \phi_0 + \phi_b \ln b_t + \phi_m \ln m_t + \frac{1}{2}\phi_{bb}[\ln b_t]^2 + \frac{1}{2}\phi_{mm}[\ln m_t]^2 + \phi_{bm} \ln b_t \times \ln m_t + \gamma\theta_t + \mu_t \tag{10}
$$

From Eq. (10) we can compute time-varying elasticities of growth with respect to the tax burden and the tax mix. Those elasticities are:

$$\varepsilon_{t,b} = \phi_b + \phi_{bb} \ln b_t + \phi_{bm} \ln m_t \quad (11a)$$

$$\varepsilon_{t,m} = \phi_m + \phi_{mm} \ln m_t + \phi_{bm} \ln b_t \quad (11b)$$

These two elasticities provide us an indication of which component of the tax structure has the stronger effect on economic growth. It is possible to determine time-varying growth-maximising tax rates and tax mixes by setting the above elasticities equal to zero:

$$b_t^* = \exp\{-(\phi_b + \phi_{bm} \ln m_t)/\phi_{bb}\} \quad (12a)$$

$$m_t^* = \exp\{-(\phi_m + \phi_{bm} \ln b_t)/\phi_{mm}\} \quad (12b)$$

To be maxima, we should have $\phi_{bb} < 0$ and $\phi_{mm} < 0$. Substituting b_t^* from (12a) into Eq. (10) yields a rate of growth y_t^* which is maximal, conditional on the observed tax mix ($y_t^* = y_t(b_t^*, m_t)$). The same applies with m_t^*. Eq. (12a) derives the growth-maximising tax burden consistent with a given tax mix m_t in year *t*. Eq. (12b) derives the growth-maximising tax mix for a given tax burden b_t in year t.

Having determined the growth maximising tax burden and tax mix, it is possible to assess the current costs of maintaining the existing tax structure, or equivalently, the current potential benefits to be gained by adopting a growth maximising tax structure. One measure of the cost or the benefit is provided by the output gap that is the difference between growth maximising and observed real GDP. The growth maximising real GDP is defined as $Y_t^* = (1 + g_t^*)Y_{t-1}$ where g_t^* is the rate of growth of real GDP associated with a growth-maximising tax structure (b_t^*, m_t) or (b_t, m_t^*). The output loss associated with the existing tax structure or the additional output resulting from a shift to a growth-maximising tax structure is thus:

$$(Y_t^* - Y_t) = (g_t^* - g_t) \times Y_{t-1} \quad (13)$$

This output loss can be expressed as a percent of output by dividing by Y_t and it can also be expressed as a percent of tax revenue by dividing by $R_t = b_t \times Y_t$. Another measure of the cost or benefit is provided by the change in tax revenue (total, direct and indirect). In any given year, the ratio of the growth-maximising tax revenue to the observed tax revenue is $\varphi_{Rt} = b_t^* \times Y_t^* / b_t \times Y_t$. It is clear that tax revenue increases (i.e. $\varphi_{Rt} > 1$) if the reduced tax burden is more than offset by an increase in taxable output, and declines otherwise.

EMPIRICAL RESULTS

The two-stage analytical framework developed in the previous section is applied to annual data covering the period 1961-2006. The sample period is chosen according to data availability. Post period data are under validation. Data on tax revenues (total, direct and indirect) are from the National Institute of Statistic and the statistics yearbook 2006 published by the Central Bank of West African States (BCEAO, 2006) and data on nominal and real GDP are from the 2008 World Development Indicators of the World Bank (WDI, 2008). Here, empirical results from the second stage of the analysis are reported.

Table 1 report two sets of regression results. The first specification is performed without the scaling factor θ_t and a 1995 dummy variable set equal to unity in 1995 and zero in all other years. The second model contains both the variable θ_t and the 1995 dummy variable. It is our preferred specification. In this model the estimates of ϕ_{bb} and ϕ_{mm} are significant and have the theoretically correct signs and the adjusted R^2 is a very satisfactory 0.99. However, when the non-tax influences are not taken into account, only the coefficient on the tax burden remains significant, and the adjusted R^2 declines to 0.28. This comparison provides a dramatic illustration of the value of the first stage of the analysis. The primary conclusion from this table is that increases in the tax burden and the direct tax share are associated with reductions in economic growth.

Table 2 presents the range of computed growth elasticities with respect to the tax burden and the tax mix. The tax burden elasticity is negative in every year and has a mean value of -0.132 implying that each 1 percent increase in the tax burden leads to a 0.132 percentage point decrease in economic growth. The elasticity of economic growth with respect to the tax mix has a mean value of -0.072, implying that a 14 percent increase in the tax mix will result in a 1 percentage point decrease in economic growth. Thus, on average over the period, a 1 percent reduction in the tax burden has 1.8 times as large a positive impact on economic growth as does a 1 percent reduction in the share of direct tax revenue in total tax revenue. To place the estimates in perspective, the tax burden since 1995 has fallen from 19.68% to 15.05%, a decrease of 23.5%, which, according to our estimates, is associated with a 3.1 percentage point increase in economic growth. Over the same period of

Table 1. OLS parameter estimates and summary statistics

	Actual Economic Growth, without θ_t		Actual Economic Growth with θ_t	
Variable	Coefficient	T-ratio	Coefficient	T-ratio
Constant	-3.467**	-1.939	-0.722*	-4.003
$\ln(b_t)$	-2.976**	-1.750	-0.509*	-2.991
$\ln(m_t)$	-1.321	-1.649	-0.187*	-2.335
$[\ln(b_t)]^2$	-1.407	-1.578	-0.272*	-3.067
$[\ln(m_t)]^2$	-0.345	-1.417	-0.136*	-5.619
$\ln b_t \times \ln m_t$	-0.384	-1.179	0.053**	1.670
θ_t			0.241*	65.043
Dum95			0.025*	5.524
Log Likelihood	79.536		188.137	
R^2 Adjusted	0.282		0.993	
AIC	-3.197		-7.832	
DW statistic	2.128		1.695	

Note: * denotes statistical significance at 5%.

Table 2. Tax burden and tax mix elasticities

Statistic	Tax burden	Tax mix (D/I+D)
Mean	-0.132	-0.072
Median	-0.155	-0.079
Minimum	-0.197	-0.132
Maximum	-0.047	0.024

Table 3. Observed and growth maximising tax burden and tax mix

Statistic	Observed burden	Growth Maximising Burden	Observed Mix (D/I+D)	Growth Maximising Mix
Mean	0.186	0.114	0.224	0.129
Median	0.196	0.116	0.240	0.132
Minimum	0.139	0.100	0.110	0.115
Maximum	0.229	0.122	0.310	0.140

time, the tax mix increased from 18.7% to 29.7%, an increase of 58.8%, which, according to our calculated elasticities, is correlated with a 4.24 percentage point reduction in economic growth. Combining the effects from the change in the tax burden and with the change in the tax mix, fiscal policy from 1995 has led to a reduction in economic growth of about 1 percentage point.

We have computed a growth maximising tax burden, conditional on the observed tax mix (see Table 3). The growth maximising tax burden is lower than the observed tax burden in every year. It varies from a low of 10% to a high of 12.2%, and has a period mean of 11.4%, nearly 39% beneath the period mean observed tax burden of 18.6%. In 2006 the growth maximising tax burden was 12%, some 20% beneath the observed tax burden of 15%. The time paths of observed and growth maximising tax burden are plotted in Figure 1, where it is clear that the gap between observed and growth maximising tax rate which prevailed for 30 years is lessening since 1995.

The mean observed tax mix, defined as the ratio of direct taxes to total tax revenues, for the period is 22.4%, and annual values of the tax mix have exceeded the period mean in every year since 1995. The mean growth maximising tax mix is estimated to be 12.9%, implying a

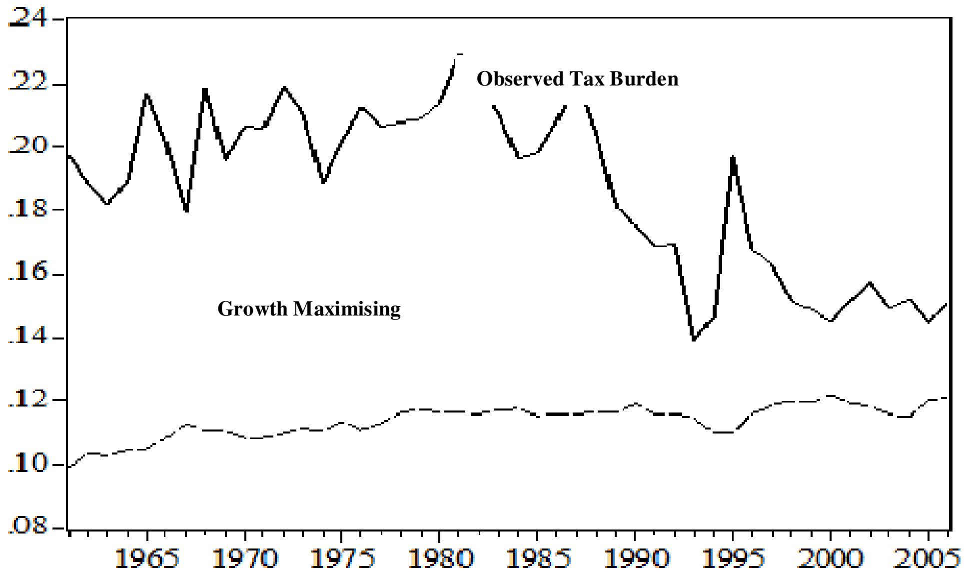

Figure 1. Observed and growth maximising tax burden over time

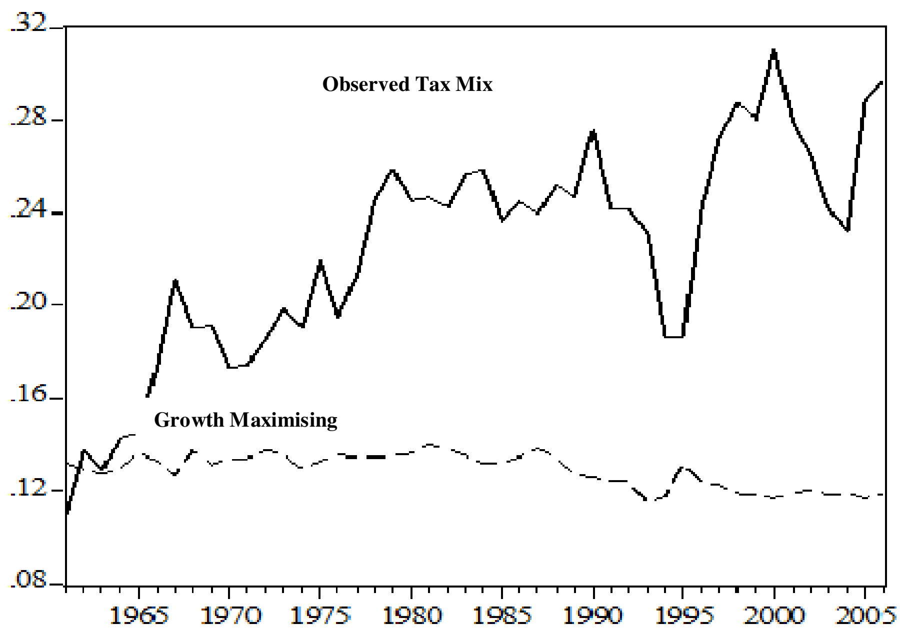

Figure 2. Observed and growth maximising tax mix over time

tax structure comprised of 12.9% direct tax and 87.1% indirect tax. Thus, the growth maximising tax mix places a heavier emphasis on indirect taxes than does the mean observed tax mix. As shown in Figure 2, the observed tax mix has been far greater than the growth maximising tax mix over the sample period. In 2006 the growth maximising tax mix was 11.8%, about 60% beneath the observed tax mix of 29.7%.

As the growth-maximising tax mix depends upon the tax burden, it is possible to compute the growth-maximising tax mix for a given level of tax burden. Thus, for a tax burden equal to the mean observed value in the sample (18.6% of GDP), the optimal tax structure would comprise 13% direct tax and 87% indirect tax. The growth-maximising direct tax share increases with the level of tax burden.

Table 4. Observed and growth maximising real GDP and output gap

Statistic	Observed Real GDP	Growth Maximising Real GDP	Output Gap (% real GDP)	Output Gap (% Real Tax Revenue)
Mean	4785.251	4920.198	3.20	16.07
Median	5203.88	5452.432	3.68	18.95
Minimum	1439.971	1521.606	-0.11	-0.75
Maximum	6987.1	7003.751	7.60	34.97

We now assess the potential impact on output of a one-off shift from the observed tax system to a growth maximising tax system. The first two columns of Table 4 report period summaries of annual values of observed and growth-maximising real GDP. The third and fourth columns report period summaries of output gap, expressed as a share of real GDP and as a share of real tax revenue. The output gap ranges from a low of -0.11% of real GDP in 2005 to a high of 7.6% of real GDP in 1965, and averages nearly 3.20% of observed real GDP throughout the period. Expressed as a percent of tax revenue, the output gap varies from -0.75% of total tax revenue in 2005 to 34.97% in 1965, and averages 16.07% of total tax revenue throughout the period. In 2006 the output gap amounted to 1.8% of real GDP and 11.6% of real tax revenue. These estimates provide an indication of the cost of maintaining the existing tax system, or the potential benefits to be gained by adopting a growth maximising tax system. The real output sacrificed to the existing tax system represents 3.2% of GDP and 16% of total tax revenue.

The cost of the actual taxation or the potential benefit to be gained by moving to a growth-maximising tax structure can also be quantified in terms of tax revenues lost. If an optimal tax burden is adopted, the Treasury would have been collecting taxes on a larger tax base, thanks to a higher growth rate (7% per annum, on average, against a mean observed growth rate of 3.5%). However, the Treasury would receive less tax revenue under a growth maximising tax burden than it would under the actual tax burden. This is because the output gap averages 3.20% of real GDP, while the tax burden would decline by 38.7% on average during the period. The loss of tax revenues would amount to FCFA 164 trillion per year.

CONCLUSION

The link between fiscal policy and economic growth has long been one of the most well-known and contentious issues in academic circle. This paper contributes to the literature by providing the first evidence for Cote d'Ivoire over the period 1961 to 2006. The aim of the study was to shed light on the dynamic relationships between taxation and economic growth for that country. The empirical analysis is predicated on a modified version of the model developed by Branson and Lovell (2001). Prior to estimation, the analytical framework involves capturing the influence of non-tax variables on economic growth through Data Envelopment Analysis. The results of the study can be summarised as follows. First, we found that higher taxes are associated with reduced economic growth. Thus switching the tax burden from direct to indirect taxes is likely to have a positive effect on growth. The effects of recent reductions in indirect taxes should result in a decrease in the tax burden, which is good for growth, but also increase the share of direct taxes in total tax revenue, which is bad for growth. Our estimates suggest that tax burden has done much more damage to economic growth than has a tax mix that has placed excessive emphasis on direct taxes. This suggests that any negative effect from an increase in the share of direct taxes is more than offset by the positive effect associated with a reduction in the tax burden. This finding also implies that reducing the tax burden is a more potent way of enhancing economic growth than is fine-tuning the share of direct taxes in total tax revenue. Second, we estimated a growth-maximising tax structure over the sample period. We found a time-varying tax burden with a period mean of 11.4%, well beneath the actual period mean tax burden of 18.6%. We found a time-varying direct tax ratio having a mean of 12.9%, far beneath the observed mean of 22.4%. Third, we have quantified the cost of maintaining the existing tax rate, or the potential benefit to be gained by adopting a growth-maximising tax burden. According to the estimates, a move to a growth-maximising tax burden would on average generate an increase in the level of real GDP, but would yield a reduction in government tax revenue. This is because adoption of a growth maximising tax structure would involve a reduced tax burden.

In terms of implication, our findings show that tax policy has not been pro-growth in Cote d'Ivoire over the sample period. To break away from this historical fiscal policy, government should try to return taxes back to the economy in an efficient manner so that they contribute to growth. Taxpayers complain that government is not using taxes for development purposes. To justify their perception, they mention the increasing poverty among population, the insufficient electricity connection and the road damage. For these reasons, they find that government is squandering public resources on unproductive and political activities. Using taxes in an efficient manner by adequately investing in public goods and services could encourage tax compliance and realise the double-dividend of taxation. In addition, as more growth can be generated through a switch from direct to indirect taxes, policy makers should look towards that direction while trying to improve the tax collecting system by decentralizing the fiscal administration and eliminating fraud.

REFERENCES

Arnold J (2008). “Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from A Panel of OECD Countries”, OECD Economics Department Working Papers (643).

Barro RJ (1990), “Government Spending in a Simple Model of Endogenous Growth”, J. Polit. Econ.; 98 (5):103-125.

Barro RJ, Sala-I-Martin X (1992), "Public Finance in Models of Economic Growth", Rev. Econ. Stud.; 59 (201):645-662.

BCEAO (2006). Statistics Yearbook 2006. Central Bank of West African States

Blanchard OJ, Perotti R (2002). “An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output”, Quart. J. Econ.; 117(4): 1329-1368.

Bleaney M, Kneller R, Gemmell N (2001). “Testing the Endogenous Growth Model: Public Expenditure, Taxation, and Growth over the Lung-Run”, Can. J. Econ.; 34(1): 36-57.

Branson J, Lovell CAK (2001). “A Growth Maximising Tax Structure for New Zealand”, International Tax and Public Finance, 8:129-146.

Cashin P (1995). Government Spending, Taxes, and Economic Growth, IMF Staff Papers 42(2).

Charnes A, Cooper WW, Lewin AY, Seiford LM (1994). Data Envelopment analysis: Theory, Methodology, and Applications. Boston: Kluwer.

Direction Générale des Impôts (2007). Code Général des Impôts, Livre de procédures fiscales, Autres textes fiscaux, République de Côte d’Ivoire.

Dowrick S (1996), “Estimating the Impact of Government Consumption on Growth: Growth Accounting and Optimizing Models”, Empirical Economics, 21(1):163-186.

Easterly W, Rebelo S (1993). “Fiscal Policy and Economic Growth: An Empirical Investigation”, J. Monet. Econ.; 32(3):417-458.

Engen EM, Skinner J (1992). Fiscal Policy and Economic Growth, NBER Working Paper No 4223, Cambridge, MA: Nat. Bureau.f Econ. Res.

Engen EM, Skinner J (1996). "Taxation and Economic Growth", Nat. Tax J.; 49(4): 617-642.

Fölster S, Henrekson M (2001). "Growth Effects of Government Expenditure and Taxation in Rich Countries", Eur. Econ. Rev.; 45 (8):1501-1520.

Holcombe R, Lacombe D (2004). “The Effect of State Income Taxation on Per Capita Income Growth,” Publ. Finan. Rev.; 32(3):292-312.

Karras G, Furceri D (2009). “Taxes and Growth in Europe”, South-Eastern Eur. J. Econ.; 2:181-204.

Katz CJ, Mahler VA, Franz MG (1983). “The Impact of Taxes on Growth and Distribution in Developed Capitalist Countries: A Cross-national Study”, The Am. Polit. Sci. Rev.; 77(4):871-886.

Keho Y (2010). “Estimating The Growth-Maximizing Tax Rate for Cote d’Ivoire, 1960-2007", J. Econ. Int. Finan.; 2(9):164-174.

Kim SJ (1998). "Growth Effect of Taxes in an Endogenous Growth Model: To What Extent do Taxes Affect Economic Growth?" J. Econ. Dynam. Contr.; 23(1):125-158.

Kneller R, Bleaney M, Gemmell N (1999). "Fiscal Policy and Growth: Evidence from OECD Countries", J. Publ. Econ.;74(2):171-90.

Koch SF, Schoeman NJ, Van Tonder JJ (2005). “Economic Growth and the Structure of Taxes in South Africa: 1960-2002”, South Afri. J. Econ.; 73(2):190-210.

Koester RB, Kormendi RC (1989). “Taxation, Aggregate Activity and Economic Growth: Cross-Country Evidence on Some Supply-Side Hypotheses”, Economic Inquiry, 27(3):367-386.

Kormendi RC, Meguire PC (1995). "Macroeconomic Determinants of Growth", J. Monet. Econ.; 16(2):141-163.

Lee Y, Gordon RH (2005). "Tax Structure and Economic Growth", J. Publ. Econ.; 89(5-6): 1027-1043.

Lovell CAK, Pastor JT (1995). “Units Invariant and Translation Invariant DEA Models”, Operations Research Letters, 18(3):147-151.

Lucas RE (1988). "On the Mechanics of Economic Development", J. Monet. Econ., 22(1):3-42.

Marsden K (1986). "Links between Taxes and Economic Growth: Some Empirical Evidence", J. Econ. Growth;1(4):3-16.

Mendoza E, Milesi-Ferretti G, Asea P (1997). "On the Effectiveness of Tax Policy in altering Long-run Growth: Harberger’s Superneutrality Conjecture", J. Publ. Econ.; 66 (1): 99–126.

Myles GD (2000). "Taxation and Economic Growth", Fiscal Studies, 21(1): 141-168.

Ramanathan R (2003). An Introduction to Data Envelopment Analysis: A Tool for Performance Measurement, Sage Publishing.

Ray S (2004). Data Envelopment Analysis: Theory and Techniques for Economics and Operations Research, Cambridge University Press.

Scully GW (1995). “The ‘Growth tax’ in the United States”, Public Choice 5(1/2): 71–80.

Scully GW (1996). “Taxation and Economic Growth in New Zealand”, Pac. Econ. Rev.; 1(2): 169–177.

Scully GW (2000). “The Growth-Maximizing Tax Rate”, Pac. Econ. Rev.;5(1): 93-96.

Scully, G. W. (2003). “Optimal Taxation, Economic Growth and Income Inequality”, Public Choice, 115(3/4): 299–312.

Skinner, J. (1987). Taxation and Output Growth: Evidence from African Countries, NBER Working Paper No, 2335, Cambridge, MA: Nat. Bureau.f Econ. Res.

Slemrod J (1995). “What do Cross-country Studies teach about government involvement, prosperity, and economic growth? Brookings Papers on Economic Activity 2:373-431.

Solow, R. M. (1956). "A Contribution to the Theory of Economic Growth", Quart. J. Econ.; 71 (1): 65–94.

Stokey N, Rebelo S (1995). "Growth Effects of flat-rate Taxes", J. Polit. Econ.; 103(3): 510–550.

Swan TW (1956). "Economic Growth and Capital Accumulation", Economic Record, 32 (3):334–361.

Wang, P. and Yip, C. K. (1992). "Taxation and Economic Growth: The Case of Taiwan", Am. J. Econ. Sociol., 51(3):317-331.

WDI (2008), World Development Indicators, World Bank.

Widmalm F (2001), "Tax Structure and Growth: Are Some Taxes Better Than Others?" Public Choice, 107(3/4):199-219.