

## Optimal tax rate and economic growth. Evidence from Nigeria and South Africa

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**Abstract.** The recent economic crisis had made developing countries to look inward for financial resources to finance development. The readily alternative is the tax revenues however, the possible adverse direct and indirect effects of tax on productivity and work efforts as well as on aggregate consumption had make some African countries (especially Nigeria and South Africa) reluctant in implementing far reaching tax policy reform. This paper examines optimal tax burden and real output growth Nigeria and South Africa, two of the top four economies in Africa. The paper empirically determined what should be the optimal tax rate for Nigeria and South Africa-the two leading economies in Africa. The paper found that nonlinearity hypothesis in the effects of tax in the case of South Africa is rejected while a significant nonlinear relationship is found in the case of Nigeria. The results suggest that the growth-maximizing tax rate is about 15% of per capita GDP for South Africa and 30% for Nigeria. At that tax rate, the economic growth rate would be around 6% and 8% instead of the actual mean growth rate of 2.84% and 4.51% for South Africa and Nigeria respectively. The paper concluded the current tax burden in the two countries may be sub-optimal and may hurt long term sustainable growth process in the two countries

**Keywords:** growth; tax structure; fiscal policy, public finance

### 1 Introduction

The issue of whether taxes have little or no impact on growth has been pursued aggressively in public finance literature. Adam Smith in his book *“Inquiry into the Nature and Causes of the Wealth of Nations”*, laid the foundation for such discourse when he opined that raising (import) tax rates beyond a certain level discouraged compliance, encouraged smuggling and, therefore, lowered tax revenues. Smith (1776) believed that taxes should be designed so as to minimize taxpayers’ compliance costs and government’s administrative cost, while also discouraging tax avoidance and evasion. Smith’s wisdom regarding the macroeconomic effects of taxation continues to elude some economists. Laffer (1981) illustrated this principle by drawing an inverted U shaped curve to show the optimal tax for a specific country. In recent years, a number of economists have investigated the relationship between the tax rate and the rate of economic growth. They found a similar “Laffer curve” in this relationship, suggesting that, up to some level, fiscal policy is growth promoting, but beyond this level increased taxation has a negative externality on the economic activity (Keho, 2010).

Literature on the search for the optima tax rate- the tax rate at which tax becomes harmful to the economy is just building up. In a series of studies, Scully (1995, 1996, 2000, 2003, 2006) has attempted to find the appropriate tax rate for the US and some other European countries. Similarly, Keho (2010) had used the methodology developed by Scully to determine the optimal tax rate for Cote D’Ivoire. The aim of this study is to adopt similar approach to Nigeria and South Africa to determine

the optimal tax rate that enhances the overall economic activities in these two countries. The rest of the paper is organised into four sections. Section 2 reviews some relevant empirical studies while section 3 presents the methodological approach adopted while section 4 presents the analyses of the data and discusses the findings, section 5 concludes with policy implication of the optimal tax policy and strategy that can optimize output and enhance welfare of the people in the two countries and in developing countries in general.

## 2 Literature review

Empirical evidences of optimal tax rate are very scanty, the bulk of studies in the literature has concentrated on the relationship between tax and growth and whether the composition of the tax instrument matter for economic growth but most of these studies focused on cross-country analysis and developed economies like US and Canada while only few studies have investigated the issue using country specific data from developing countries especially Africa.

A review of empirical studies from developed countries further confirmed such negative relationship between tax rates and economic growth. McBride (2012) reviewed twenty-six of such studies and found that all but three of those studies, and every study in the last fifteen years, find a negative effect of taxes on growth<sup>1</sup>. Of those studies that distinguish between types of taxes, corporate income taxes are found to be most harmful, followed by personal income taxes, consumption taxes and property taxes. He then concluded that these empirical evidence on tax and growth support the Neo-classical view that income and wealth must first be produced and then consumed, meaning that taxes on the factors of production, i.e., capital and labor, are particularly disruptive of wealth creation. Corporate and shareholder taxes reduce the incentive to invest and to build capital. Less investment means fewer productive workers and correspondingly lower wages. Taxes on income and wages reduce the incentive to work. Progressive income taxes, where higher income is taxed at higher rates, reduce the returns to education, since high incomes are associated with high levels of education, and so reduce the incentive to build human capital. Progressive taxation also reduces investment, risk taking, and entrepreneurial activity since a disproportionately large share of these activities is done by high income earners (Arnold et al 2011).

For South African economy, Koch, Schoemann and Tander (2004) and Wet, Schoemann and Koch (2005) examined the implication of tax structure on economic growth. Koch, Schoemann and Tander (2004) examine the relationship between total taxation, the mix of taxation and economic growth using tax and economic data from 1960 to 2002 and a two-stage DEA modelling technique to control for unobservable business cycle variables. They find that decreased tax burdens are strongly associated with increased economic growth potential; in addition, contrary to most theoretical research, decreased indirect taxation relative to direct taxation is strongly correlated with increased economic growth potential. Wet, Schoemann and Koch (2005) also estimated the impact on economic growth of changes in direct and indirect tax along with other fiscal variables and found that economic growth is negatively affected by direct taxes while indirect taxes has no significant effect on growth in South Africa.

With respect to Nigeria, the issue of tax structure and tax mix is less explored. The two most cited studies in Nigeria are Ariyo 1997 and Odusola(2006). While Ariyo (1997) appraised the productivity of the Nigeria tax system between 1970 to 1990 in order to assess the country's sustainable level of

<sup>1</sup> William McBride( 2012) for a review of some of these studies

revenue as a basis for determining on optimal level of expenditure, Odusola (2006) examines tax policy reforms in Nigeria and found out that Nigeria's tax system is characterized by unnecessarily complex, distortionary and largely inequitable taxation laws that have limited application in the informal sector that dominates the economy.

However, with respect to empirical literature on the search for the optima tax rate- the tax rate at which tax becomes harmful to the economy is just building up and only few studies have attempted to examine this important issue. However, in a series of studies, Scully (1996, 2000, 2003) has attempted to find the appropriate tax rate for the US and some other European countries.

Similarly Keho (2010) had used the methodology developed by Scully to determine the optimal tax rate for Cote D'Ivoire. Specifically Scully (1996, 2000) finds evidence of the inverted-U relationship for New Zealand over the period 1927 - 1994. The tax rate that maximizes the growth rate is about 20% of GDP. This implies that for all values of the tax burden exceeding that level, taxes act as a negative externality using data spanning 1949 - 1989, Scully (1995) finds the optimal tax rate for the United States to be in the range of 21.5 and 22.9% of GDP. The optimal growth rate corresponding to that tax rate is about 5.56% compared to an average growth rate of 3.5%. However, when the data span is restricted to the period 1960 - 1990, the estimated growth-maximizing tax rate for the United States is 19.3% (Scully, 2003). At that tax rate, the growth rate would have been 6.97% per year.

Scully also reports results for other developed countries using the same economic method applied to the US data. The sample of countries includes the United States (1929 - 1989), Denmark (1927 - 1988), United Kingdom (1927 - 1988), Italy (1927 - 1988), Sweden (1927 - 1988), Finland (1927 - 1988) and New Zealand (1927 - 1994). On the average, the optimal tax rate is about 20% ranging from 16.6% for Sweden to 25.2% for the United Kingdom. Current levels of taxation, however, range from 34.1% in the United Kingdom to 51.6% in Denmark. These findings show that tax rate far above the optimal rate is common among developed countries. This has slowed the economic growth rate of these countries. Branson and Lovell (2001) used a linear programming model to estimate a growth-maximising tax structure for New Zealand over the period 1946 - 1995. They find a mean growth-maximizing tax burden of 22.5% of GDP. Davidson (2012) also carried out similar analysis for twelve different countries<sup>2</sup> all with different growth and tax rates and the analysis consisted of data from the years 1982 until 2002.

The lack of significant number of empirical studies on tax policy, its composition and optimal rate on Nigeria and South Africa as well as many other Africa countries justify the need to focus on these countries. The evidence from other economy may be robust in term of data and reality in the countries investigated but may not be sufficiently adequate to guide policy decision in African economic context, indeed the lack of consensus about the appropriate tax policy m in the studies from other clime make examining the African country specific studies imperative. Koch et al (2004) identified a number of reasons the impact of taxation in the developed world is likely to be different from the impact in the developing world, especially in Africa. The authors argued that (i) developing countries do not have the infrastructure to adequately police tax compliance; thus, shifts in tax policies in developing countries, especially increases in income taxes, are likely to push economic activity underground.(ii) governments in developing countries may not return taxes back to the public in an efficient manner (e.g., by not adequately investing in public goods),(iii) governments might be corrupt or otherwise not trustworthy (e.g., by squandering resources on lavish residences, by changing tax policies in an ad hoc manner, or taking control of economic resources) and (iv) finally, government

<sup>2</sup> The countries that were included are New Zealand, Chile, Brazil, Australia, Mexico, Argentina, Pakistan, Paraguay, South Africa and United States, Germany and Kuwait

agents have the incentive to increase the tax base of taxed activities. In the case of developing countries, which often rely on corporate taxes imposed on large (often state-owned) companies, the tax structure provides incentives to increase the profits of these companies, often to the detriment of competition, which could have significant economic growth effects.

Adopting similar approach, Keho (2010) investigated the optimal tax burden for the Ivorian economy. The empirical analysis conducted used both Scully and quadratic regression models and annual data covering the period from 1960 to 2006 for Cote D'Ivoire and the models suggest that the growth-maximizing tax rate is in the range of 21.1 to 22.3% of GDP. At that tax rate, the economic growth rate would be around 6.2% instead of the actual 3.2%. The actual low tax rates are shown to be responsible for substantial losses in growth and tax revenues. As can be seen from the empirical literature, except for Keho, (2010) there exist no other studies on African countries devoted to estimating an optimal tax rate. Empirical works that have been conducted for these countries have been focused on the growth effects of taxes and have not investigated the existence of a U-inverted curve in the tax-growth relationship. This study attempts to contribute to the empirical literature by examining the case of Nigeria and South Africa over the period 1960 - 2012. Establishing such a unique tax rate helps us determine whether there exists a threshold level above which taxation lowers the rate of economic growth.

### 3 Methodology, results and discussion

To investigate the empirical link between taxes and economic growth we utilize annual data covering the period 1964 to 2012 for South Africa and 1970 to 2012 for Nigeria. The choice of this timeframe is guided by data availability. The data comprise time series data on tax revenue and some selected macroeconomic indicators all the data sets for South African economy were collected from the South African Reserve bank Quarterly Bulletin while data on Nigerian economy were collected from Central bank of Nigeria Statistical Bulletin.

#### *Model specification*

The main focus of this paper is to determine empirically the optimal tax rate for Nigeria and South Africa. The argument in this paper is that the tax rates in these two countries are not optimal and hence may be less productive and inefficient considering the level of development in the two countries. We rely on a model developed by Scully (2003) and adapted by Keho (2010) for Cote D'Ivoire The model is based on balanced budget assumption where assumed that government activities are financed exclusively out of taxes collected  $G = \tau Y$ , where  $Y$  is the national output and  $\tau$  is the total tax rate. The share of output left for private sector  $(1 - \tau)Y$  is used to produce private goods and services such that the production function takes the form of Cobb-Douglas production relation:

$$Y_t = a(\tau_{t-1} Y_{t-1})^b [(1 - \tau_{t-1}) Y_{t-1}]^c \tag{1}$$

Where  $a, b$  and  $c$  are parameters such that  $b, c < 1$  and expressing equation 1 in log form yields:

$$\log(Y_t) = \log(a) + b \log(\tau_{t-1} Y_{t-1}) + c \log(1 - \tau_{t-1}) Y_{t-1} \tag{2}$$

The growth maximising tax rate  $\tau^*$  is obtained by differentiating  $\log Y$  in equation 2 with respect to the tax rate  $\tau$  and setting the result to zero and solving for  $\tau$  gives:

$$\frac{\partial \log(y)}{\partial \tau} = \frac{b}{\tau} - \frac{c}{1-\tau} \tag{3}$$

And solving for the growth maximising tax rate yields:

$$\tau^* = \frac{b}{b+c} \tag{4}$$

Equation 4 gives the optimum tax rate that maximise the growth rate of output. Therefore to estimate the parameter in equation 8 we estimate the following equation:

$$\log(Y_t) = \log(a) + b \log(\tau_{t-1} Y_{t-1}) + c \log(1 - \tau_{t-1}) Y_{t-1} + \varepsilon_t \tag{5}$$

Where  $Y_t$  is the real GDP and  $\varepsilon_t$  is an error term assumed to be normally distributed with zero mean and constant variance.

Kennedy (2000) and Hill (2008) argued that using equation 5 to estimate the optimal tax rate implies that the contribution of capital goods to output are omitted in the production function and this may produce spurious and biases estimates of optimal tax ,because. Scully (2000) notes that the contribution of previously-accumulated capital and technological changes in the aggregate production function are implicitly captured by the presence of the lagged production term  $Y_{t-1}$  in the current production function. He also demonstrated that including factor inputs does not change the analytical results (Keho, 2010). Keho (2010) argued that the pattern of the relationship between tax and economic growth variables might be theoretically characterized by the inverted U curve. Therefore except otherwise confirmed using the Equation 5 to estimate the optimal tax rate may also generate biased estimate of optimal tax rate. The alternative way is to estimate a quadratic relation by including a square of the explanatory variable. Thus, to complement the Scully model, following Keho (2010) we specify the growth rate  $y_t$  that is related to  $\tau_t$  in the following way:

$$y_t = \alpha + \beta \tau_t + \delta \tau_t^2 + e_t \tag{6}$$

The tax rate  $\tau^*$  that maximizes economic growth from equation 6 is found by differencing  $y_t$  with respect to  $\tau$  and expressing the resultant equation in term of  $\tau^*$  yields:

$$\tau_2^* = -\frac{\beta}{2\delta} \tag{7}$$

Our intention is to apply equation 4 and 7 to the case of Nigeria and South Africa. Though South Africa was included in the Davidson study but it is difficult rely exclusively on the cross countries results for country specific policy inference. In addition another novelty in this study is the extension of the framework to other tax rate rates especially for direct and indirect taxes, income and VAT taxes in addition to the aggregate tax rate.

## 4 Empirical results and discussion

### 4.1 Basic macroeconomic statistics of the two countries

As a prelude to the empirical analysis, some basic macroeconomic statistics of the two countries are examined in order to lay background for the possibility that the two countries experience with respect to tax performance may difference. Nigeria and South Africa are regarded as the hub of African economy but the basic statistics from these two giants of Africa seem to show wide gap. One would have expected the two countries to drift progressively together such that common trends can be observed. Using data from African development Outlook 2009, Table 1 and 2 clearly show a clear disproportionally economic disparity in the two countries. By population Nigeria is three time the size

of South Africa while the Nigerian economy grew by 8.2% between 2001 and 2009, South African economy grew only by 5.3 but with annual per capita GDP of US 9.721 as against Nigerians 2.119.

**Table 1** Basic Indicators (2009)

	Population (000)	Land area (000 km <sup>2</sup> )	Population Density (pop/km <sup>2</sup> )	GDP(PPP valuation) (US \$ M)	GDP per Capital (PPP valuation,\$)	Real GDP growth ( 2001-2009)
<b>Nigeria</b>	154 729	924	167	327 822	2 119	8.2
<b>South Africa</b>	50 110	1 221	41	487 107	9 721	3.6
<b>Africa</b>	108 354	30 323	33	2 825 691	2 802	5.3

**Table 2** Basic Indicators, 2009

	2008	2007	2007	2008		
	Fiscal revenue per capital (USD)	Tax effort index (including resource rents)	Tax effort index (excluding resource rents)	Total revenue and grants	Total expenditure and net lending	Overall balance
<b>Nigeria</b>	439.8	1.76	0.44	33.8	30.0	3.8
<b>South Africa**</b>	1495.5	1.04	1.62	26.2	27.4	-1.2
<b>Africa</b>	468.6	...	...	32.2	30.0	2.2

Sources: African development Outlook (2009)

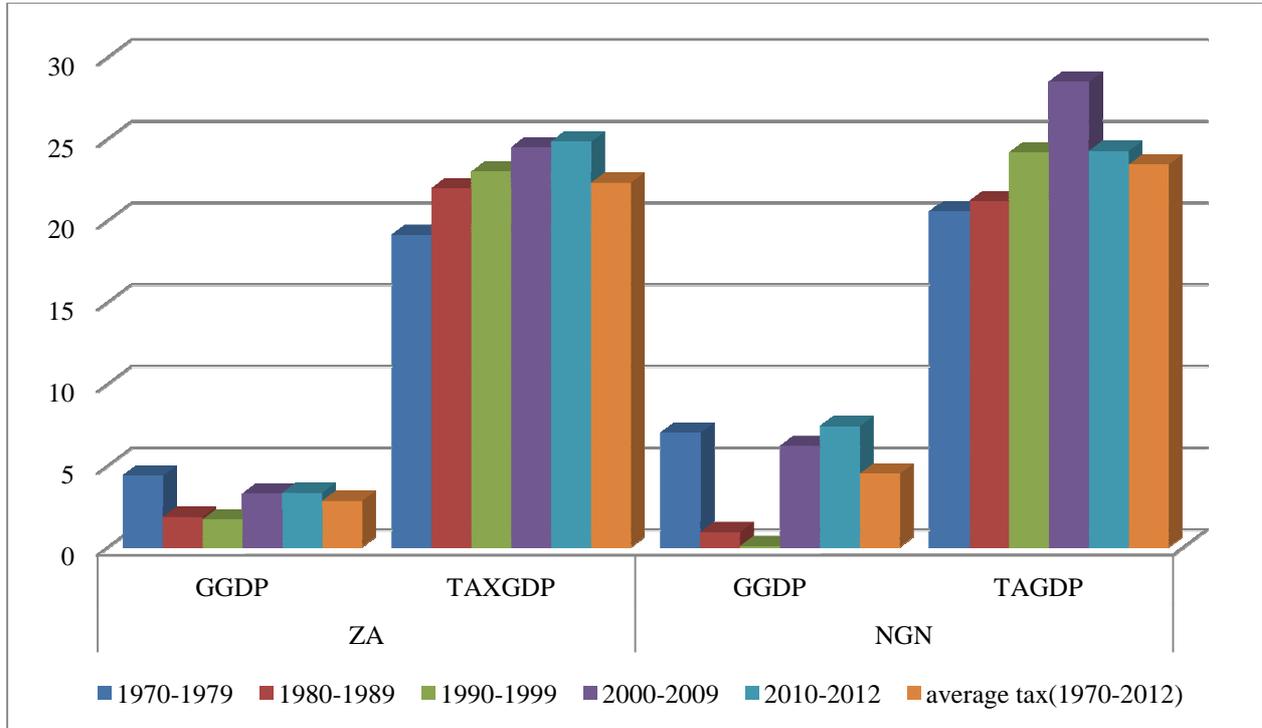
If economic indicator reflects the happening in each country then the economic wellbeing of an average South Africa is at 4 times the wellbeing of an average Nigeria. The tax efforts clearly further show where the strength of Nigeria economy lies with bulk of its tax revenue is from the resource rent and 80% of real investment in Nigeria is in oil and gas industry.

Similarly the trends of real GDP growth and tax burden over the sample period for Nigeria and South Africa in Figure 1 also collaborates differences in these two countries. Using the 10 year- moving averages, the tax burden in South Africa rose from 19% in the 1970 to an average rate of 25% in 2012. The trend in growth rate was also similar to the tax burden; the Real GDP rose from an average of 4.39% in the 70s and fell to 1.86% in the 80s before rising to 3.33 in 2012. The average growth rate for the entire period was 2.84. In the case of Nigeria, The tax burden is relatively higher with a mean value of 23.4 for the entire period the tax burden rose from 20.6% in the 70s to reach the all time peak of 43.1% in 2002 before falling back to 24.3% in 2012. The growth in the overall economic activities in Nigeria was more impressive than the South Africa after the initial economic crisis in 1980s; the economy responded to series of economic reforms and peaked at 10.3% in 2003 and since then maintains an average growth rate of 7.4%.

A notable feature of the trend is the upward trend in the tax burden relatively to the economic growth which implies that tax burden has growth more rapidly than the real GDP. The tax rate after 1980 was above the overall average rate, as such, the government tax revenue is above what would have been

*TAX INSTRUMENTS*

collected, had the tax rate been maintained at the average rate of 22.31% and 23.4% for South Africa and Nigeria respectively over the period.



**Figure 1** Average Real GDP and Tax burden in South Africa and Nigeria

#### 4.2 Estimating the optimal tax rate

The results of estimation equation 5 and 6 are presented in Table 3 below. The coefficients are statistically significant at 1% level. The result show that tax burden has positive and significant effect on economic growth in the two countries however the results of whether there is any threshold at which tax becomes a burden and then retards growth suggest that the south Africa tax rate has not reached its threshold level as the coefficient ( $\delta$ ) was not significant at any level, while the tax burden in results for Nigeria is consistent with the hypothesis that taxes retard economic growth after a certain level.

Solving for the growth-maximizing tax rate, equation (4) suggests that the optimal tax rate as a share of GDP 35% and 33% respectively for South Africa and Nigeria respectively. Equation (5) yields  $\tau_2^* = 15\%$  and 30% respectively. Thus for Nigeria, during periods in which the tax burden was less than 30% of GDP, the effect of a tax increase on the economic growth rate was positive, and during times in which the tax rate exceeded 30%, an increase in tax burden was detrimental to economic growth. Thus optimal (growth-maximizing) tax rate derived from the above equations is in the range of 30% and 35%.

In case of South Africa, the threshold is 15% which is much lower than the actual tax rate suggesting that the tax rate in South Africa may be hurting the economy and the overall well-being of the people.

As such, the economic growth rate and, hence, the level of real GDP, is below that which would have been achieved if the optimal tax burden had been in effect throughout the period. At the optimal tax rate of 15% the average economic growth rate would be 8.0%.

**Table 3<sup>3</sup>** Empirical Results of Linear and Nonlinear Effects of Tax Burden on Growth

Tax parameters	Linear		Non linear
<b>South Africa</b>			
<i>b</i>	0.165(7.06)	$\beta$	-0.016(-2.56)
<i>c</i>	0.302(5.01)	$\delta$	0.002(1.44)
$\tau^*$	<b>35%</b>	$\tau_2^*$	<b>15%</b>
Tax elasticity	<b>0.7%</b>		-
Adj r-squared	0.329		0.369
F-stat	318.8		25.89(0.00)
D-w stat	1.996		1.89
<b>Nigeria</b>			
<i>b</i>	0.322(3.67)	$\beta$	52.37(3.49)
<i>c</i>	0.641(6.40)	$\delta$	-87.20(-3.12)
$\tau^*$	<b>33%</b>	$\tau_2^*$	<b>30%</b>
Tax elasticity	<b>2%</b>		-
Adj R-squared	0.995		0.84
F-stat.	298.86(0.00)		79.06
D-w stat	1.708		0.55

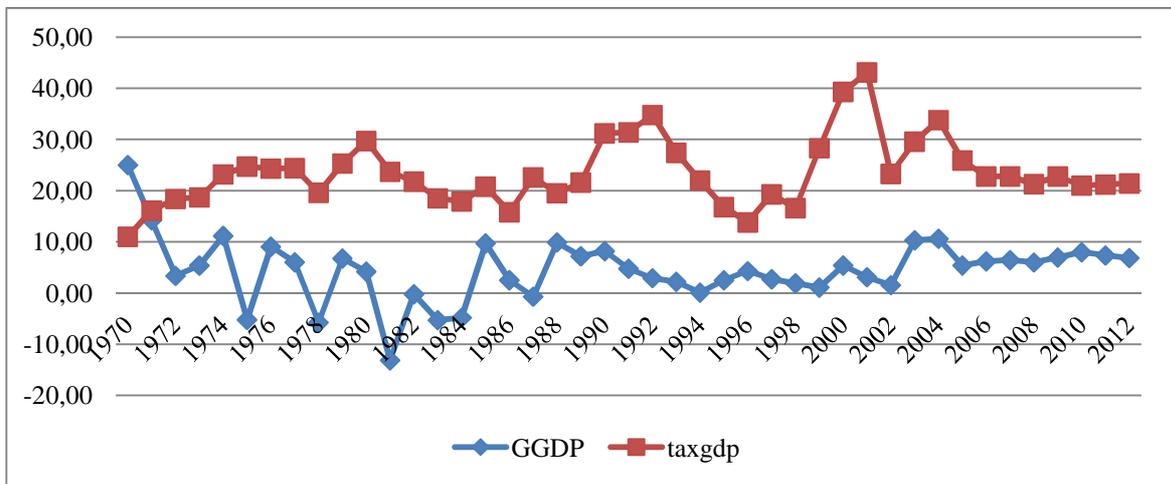
Examining the historical data, the tax rates are far above 21% from 1970. For Nigeria on the other hand at the optimal tax rate of 30% the economic growth on the average would have been 6%. As shown in the trend, this optimal growth rate was only achieved at periods when the tax burden was close or above the optimal tax rate in Nigeria. This means that the economy has grown more slowly than it would have if the rate of taxation had been constrained to the growth-maximizing level.

However, for south African economy, instead of the growth-maximizing tax rate, the taxes has been above the optimal rate and since 1970 when it was 17% of GDP and it has continued to rise thereafter. This means that since 1970 the country is on the negative side of the Laffer's inverted U

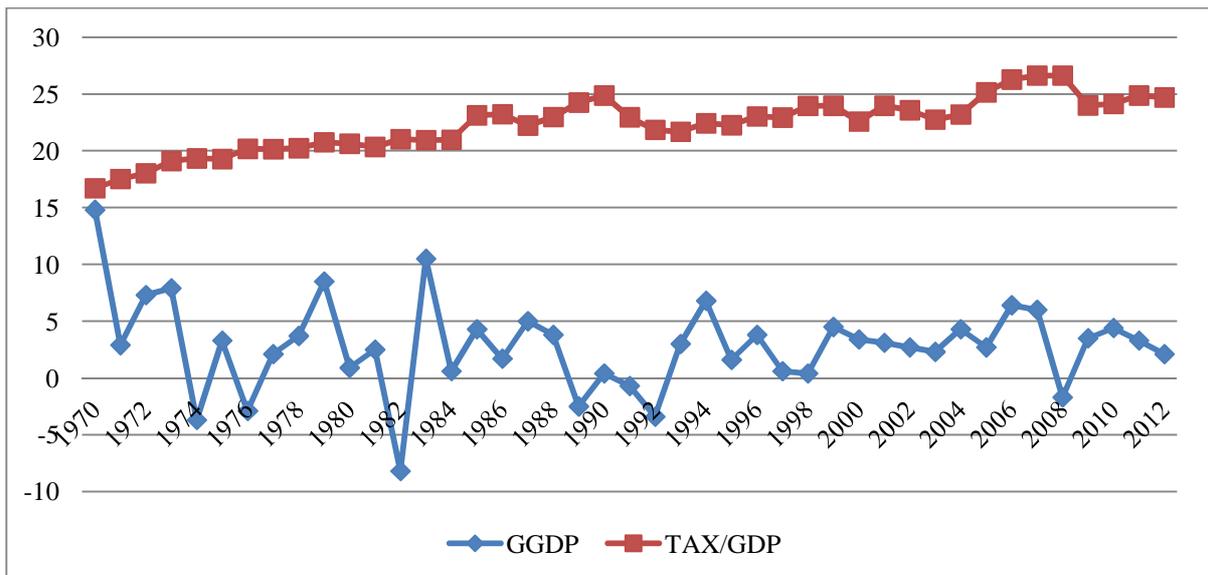
<sup>3</sup> Table 3 contains only parameters that were used to calculate the tax rates and the overall model statistics. The full details are not reported to conserve space and to keep the table concise. However the full estimates are available on request from the author.

curve. For the Nigerian economy, the actual tax rate has drifted below the optimal tax rate and thus country is on the positive side of the inverted U curve of tax burden/growth rate relationship. Using the optimal tax rate, the results suggest that the growth-maximizing tax rate is about 15% of GDP for South Africa and 30% for Nigeria. At that tax rate, the economic growth rate would be around 6% and 8% instead of the actual mean growth rate of 2.84% and 4.51% for South Africa and Nigeria respectively.

The results also fall in line with evidence in the previous studies like Davidson, 2012; Keho, 2010; and Scully, 2006), they all found a less optimal tax rate for the individual and group of countries they examined. The paper concluded that to maximise economic growth in South Africa, the tax rate should follow a downward trend and upward trend in Nigeria as against the current proposal in South Africa to increase tax rate on certain categories of taxable income.



**Figure 2** The tax burden and rate of economic Growth in Nigeria (1970-2012)



**Figure 3** Tax burden and Economic Growth in South Africa (1970-2012)

## 5 Conclusion and policy implications

This paper has adopted two approaches to determine the optimal tax burden in two African emerging economies. The results support the conclusion that higher taxes are strongly correlated with reduced economic growth. The tax rate that maximizes the growth rate should be in the range of 15% and 30% of GDP in South Africa and Nigeria respectively. The actual tax rates are substantially far above the optimal tax rate in South Africa but lower in Nigeria. Hence, the economic growth and the level of real GDP as well are far lower than that which would have been achieved if the optimal tax rate had been kept in effect throughout the period. The implication of these findings is that if the two countries is to achieve higher long-term real growth rates of GDP the tax structure in South Africa should be restructured to bring about a reduction in the current tax burden ratio. For Nigeria, the tax structure should be readjusted to ensure that the tax burden is increased in order to harness the full potential of the economy. The current low tax regime in Nigeria is induced by the oil resources, with persistent fall in the revenue and its volatile nature, there is need for the Nigeria government to begin a process of re-examining the tax policy as a potential alternative source of sources of income.

However, this does not necessarily imply that government should increase the rates of different taxes or create new taxes. As there is a large share of potential tax resources that is not being collected by the tax system, a credible strategy should look for ways to improve the collecting system. Any attempt to improve the overall tax burden by raising tax rates without improving the efficiency of the tax system will be counter-productive. Increases in taxes are likely to encourage tax evasion and push economic activity underground. Additional efforts should be done by decentralizing the fiscal administration, eliminating fraud, evasion and corruption.

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