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THE TAX RATE THAT OPTIMIZES ECONOMIC GROWTH IN KENYA

(1990-2013)

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KENYATTA UNIVERSITY

JUNE 2015

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DECLARATION

This project is original work and has not been presented for an academic award in any other university.

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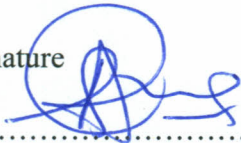
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This research project has been submitted to the School of Economics, Kenyatta University, with our approval as supervisors.

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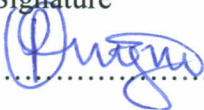


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DEDICATION

I dedicate this project to the Almighty God, who is the source of all knowledge and wisdom. I also dedicate it to my parents Mr and Mrs. John Chuma for their overwhelming support and prayers during the study period.

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First and foremost I would like to thank the almighty God for the great opportunity He has granted me up to this moment, praise be to Him. I wish to express my deepest gratitude to my supervisors Dr. James Maingi and Dr. Perez Onono for their time devoted going through a number of drafts while at the same time providing significant guidelines that equally played a huge role in shaping the understanding of the main tenets guiding the writing of the research project. I would also like to extend my appreciation to my lecturers for their immense contribution to the content of this research project, the classmates for their encouragement and all other persons that directly or indirectly made this research project successful.

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ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
GNP	Gross National Product
R&D	Research and Development
VAT	Value-added Tax
PAYE	Pay As You Earn
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
SURE	seemingly unrelated regression equations
CRS	Constant Returns to Scale
ECM	Error Correction Model
E&G	Engel and Granger
KIPPRA	Kenya Institute of Public Policy and Research
KNBS	Kenya National Bureau of Statistics

OPERATIONAL DEFINITION OF TERMS

Error correction model- An error-correction model is a dynamic model in which the movement of the variables in any periods is related to the previous period's gap from long-run equilibrium.

Gross Domestic Product (GDP) The monetary value of all the finished goods and services produced within a country's borders in a specific time period, though GDP is usually calculated on an annual basis.

ABSTRACT

The economic growth and taxes are very important aspects in the development of any economy. This research analyses the tax rate that optimize economic growth in Kenya. The specific objectives of the study were to: To establish the effect of tax rate on economic growth in Kenya and to determine the tax rate that maximizes economic growth. This study adopts the Scully model and a balanced budget approach that is revenue being equal to expenditure using time series data from the period 1990 to 2013. Sources of data were Kenya National Bureau of Statistics (Economic Survey) and the World Development Indicators of the World Bank. The theoretical background and some major empirical as well as the applicability of the model to the tax rate and economic growth are critically reviewed. The diagnostic tests were conducted so as to ensure that the results from the regressions were not spurious. The multiple regression analysis was carried out using four main variables which included GDP, tax rate, government expenditure, Real GDP at previous period. The estimated model showed that GDP is a positive function of tax rate and a negative function of government expenditure and GDP at previous Period. The coefficients of the independent variables were significant and of the expected signs. The optimum tax rate was found to be 17.3 per cent. Examining the historical data, the tax rates are below 17%. The study concludes that tax rate has a positive impact on economic growth and that economy has grown more slowly than it would have if the rate of taxation had been constrained to the growth-maximizing level.

CHAPTER ONE

INTRODUCTION

1.1 Background

Taxation plays a role of financing public goods and services, hence achieving other main objectives which involve; raising revenue for funding government operations, to assist in the redistribution of wealth or income and to encourage or discourage certain activities through the use of tax provisions (Musgrave, 2004). The lack of sufficient revenue, which is normally achieved through an efficient tax system and rates that are easy to administer and comply with, responsive to both growth and productivity, often leads to a huge budget deficit. Which will generally have undesirable macroeconomic consequences such as crowding out investments. Over a long period of time, the effect of taxes on economic growth has been questioned, (Keho, 2010)

The standard theory of optimal taxation posits that a tax system should be chosen to maximize a social welfare function subject to a set of constraints. The literature on optimal taxation typically treats the social planner as a utilitarian: that is, the social welfare function is based on the utilities of individuals in the society (Mankiw et al, 2000).The effects of tax levels and tax structures on agents' economic behavior are likely to be reflected in overall living standards. Recognizing this, over the past decades many OECD countries have undertaken structural reforms in their tax systems. Most of the personal income tax reforms have tried to create a fiscal environment that encourages saving, investment, entrepreneurship and provides increased work incentives. Likewise, most corporate tax reforms have been driven by the desire to promote competition and avoid tax-induced distortions. Almost all

of these tax reforms can be characterized as involving rate cuts and base broadening in order to improve efficiency, while at the same time maintaining tax revenues. It has been reported that increasing taxes, especially indirect taxes have little impact if any on economic growth while others have aggressively pursued tax policies so as to increase revenue productivity and hence economic growth. Those who are in favor for tax cuts believe that reduction in tax rate will lead to increased economic growth which is the basis of increased prosperity, however recent research in public finance. (Scully, 1991) shows that high levels of taxation inhibit economic growth while the emerging consensus among the economists is that tax rates matter for economic growth.

Laffer (1981) posits that excessive taxation is extremely costly to the government in matters of growth and tax revenue and that the government tax revenue does not necessarily increase as tax rate increases since. According to him taxable income changes when rates are altered. Moreover, he cited an example in his study that the government will earn more tax income at 1% rather than at 10%, but it will not earn more at 80 percent than it will at 10 percent. From the conventional knowledge, higher tax rates imply more tax evasion and avoidance, and the more people avoid and evade tax, the less the revenue the government will collect per unit of the taxable base it will have to spend more to monitor and enforce taxes.

Lowering tax rates may be expected to reduce tax evasion and avoidance. This means that there exists a peak tax rate where the government tax revenue is highest (Keho, 2010). A trade-off between tax ratios and tax revenue which is known as the Laffer curve demonstrates this. In his inquiry into the nature and causes of wealth of nations ,(Smith, 1776) argued that raising import tax rates beyond a certain level

discouraged compliance, encouraged smuggling which lead to black market and therefore lowered tax revenues. He believed that taxes ought to be designed in such a way that taxpayers' compliance costs and government's administrative costs are minimized as much as possible, while at the same time discouraging tax avoidance and evasion.

1.2 Tax Regime

Tax systems are primarily aimed at financing public expenditures and are also used to promote other objectives, such as equity, and to address social and economic concerns. They need to be set up to minimize taxpayers' compliance costs and governments administrative cost, while also discouraging tax avoidance and evasion. But taxes also affect the decisions of households to save, supply labour and invest in human capital, the decisions of firms to produce, create jobs, invest and innovate, as well as the choice of savings channels and assets by investors. What matters for these decisions is not only the level of taxes but also the way in which different tax instruments are designed and combined to generate revenues.

Taxation affects productivity in a variety of ways; it distorts factor prices and their allocation, it also affects entrepreneurship and research and development(RD), (Vertia, 2008). High corporate taxes kill firm's incentive to invest in technology and productivity by reducing the revenues that is generated by the investments. This will result to a decline in productivity in the formal sector which hinders the overall long-term economic growth. The majority of the countries of the world have their corporate tax schedules characterized by an asymmetric treatment of profit and losses; their revenues are taxed at a higher rate than the way their losses are compensated. Therefore it is only in the event that when a risky project becomes

successful, a statutory corporate tax is paid by the firms, otherwise it is not. In a nutshell corporate taxes and tax have the capacity to discourage productivity growth by attenuating activities that determine the growth rate of a country.

Tax revenues account for over a third of GDP in OECD countries. But they account for far less in developing countries, particularly in sub-Saharan Africa, where they correspond to less than a fifth of GDP. More tax revenue would not only help the governments of these countries function and pay for goods and services, but would open the way for other market and state reforms that would promote economic, social and environmental development.

Kenya's tax system has undergone more or less continual reform over the last twenty years. On the policy side, rate schedules have been rationalized and simplified, a new value-added tax introduced, and external tariffs brought in line with those of neighboring countries in East Africa. At the same time, administrative and institutional reforms have taken place. Kenya has the trappings of a modern tax system, including, for example, a credit-invoice VAT, a PAYE individual income tax with graduated but arguably moderate rates, and a set of excise taxes focused on the usual suspects like alcohol (Eissa and Jack, 2009). However, with up to 70 percent of GDP produced and possibly as much as 75 percent of labor employed in the informal sector, the ability of the tax system to raise sufficient revenue with minimal distortions is severely circumscribed. In such an environment, raising around one-fifth of GDP in tax revenue is likely to impose very large distortionary costs on the economy. Continued reform of both the policy instruments and the administrative and enforcement capacity of the tax system is therefore imperative.

1.3 Tax and Economic Growth

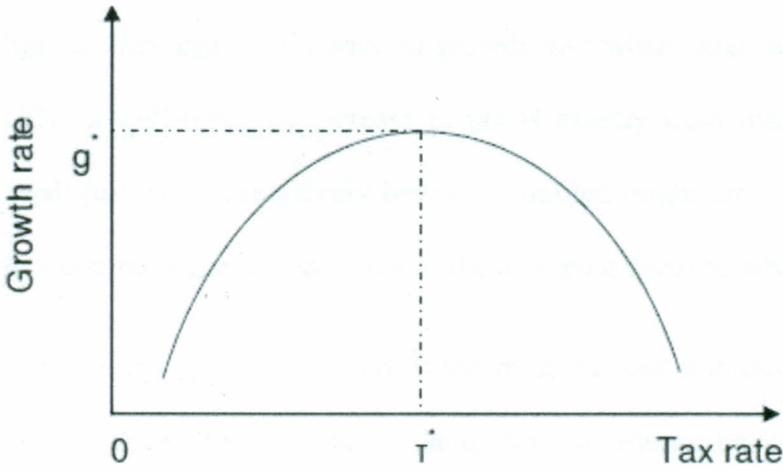
Proponents of government intervention in economic activity maintain that such intervention can spur long term growth. They cite government's role in ensuring efficiency in resource allocation, regulation of markets, stabilization of the economy, and harmonization of social conflicts as some of the ways in which government could facilitate economic growth. More tax revenue would not only help the governments of these countries function and pay for goods and services, but would open the way for other market and state reforms that would promote economic, social and environmental development.

Economic growth which is the basis of heightened prosperity can be achieved through an investment in both new human and physical capital and new technological progress which will lead to increased input productivity and output levels. The decisions that are made through the implementation of taxation policies often affect the rate of growth since for an instance, an increase in tax rates will lead to low returns from investment of both human capital and expected profitability of Research and Development activities, (R&D (Arisoy, 2010). Increase in tax rates will result to lower productivity and savings (especially household savings), this will lead to a decline in disposable income hence consumption, and investment falls causing the substitution of leisure for labor. This will result in loss of labor productivity, (Fieldstein, 2006).

Until recently economic growth models that was supposed to offer an insight as to whether a significant increase in taxation can affect economic growth or not were lacking, (Myles, 2000) reported that in most developed countries, the level of taxes has risen steadily over the course of the last century which has raised a lot of

questions about the effect they had upon the growth. The early Neo-classical growth model commonly known as exogenous had limited value for exploring the determinants of growth. It implied that taxation only affect output level but not the growth rate of the economy since, according to these models the output of the economy grows as a result of an increase in physical inputs such as capital and labor, and since technological progress and the growth rate of the economy are said to be “exogenous”, the underlying fact according to (Solow, 1956) as cited by (Arisoy; Unlukaplan, 2010) is that the fiscal policy instruments and non-physical variables such as human capital in these models have no permanent impact on the growth rate of the economy. According to this model, growth in per capita input arises from exogenous technological progress and the magnitude of the composition of the tax revenue on economic growth does not have a permanent effect on output growth, it only generate temporary level effects (Lee and Gordon; 2005). In their view government’s tax policy has no responsibility to promote growth in these models as tax policies only generate level effects in correspondence to temporary growth.

Figure 1-1: Growth Rate and Tax Rate



In figure 1, T^* is the growth maximizing tax rate and g^* is the optimal growth rate of the economy in a regime where there is a constant tax rate of T^* . The provision of public goods and services up to point T^* makes private sector economic activities to be more productive, this will in turn increase government revenue through taxation up to T^* which will also increase the rate of growth but at a decreasing rate. The growth rate is at its maximum at the tax rate equal to T^* , but beyond which, more taxes would impinge the growth rate at an increasing rate, resulting to a large deadweight loss.

From the foregoing, suggests that up to a certain level(which in this case is T^*), fiscal policy is growth promoting but beyond it, more increase in taxation has a negative effect on the economic activity impacting negatively on the morale of the tax-paying public resulting in lower productivity and low savings. Scully (1991) as cited by (Heerden and Schoeman, 2008)) suggests that this change in behavior is often caused by double tax effect since taxpayers have to pay taxes which would consequently lead to a decrease in their standard of living.

Raising tax burdens might seem like an odd proposition to policymakers in crisis stricken OECD countries as they bid to raise revenues while keeping tax burdens as light as they can for the sake of growth. But when taxes account for 10 to 15% of GDP, a well-designed increase in tax is exactly what many developing countries need: just as an excessively heavy tax burden might crush activity, an excessively low one can starve an economy of the oxygen it needs to advance.

Kenya's tax system has undergone more or less continual reform over the last twenty years. On the policy side, rate schedules have been rationalized and simplified, a new value-added tax introduced, and external tariffs brought in line

with those of neighboring countries in East Africa. At the same time, administrative and institutional reforms have taken place. Most notable among these was the creation of the semi-autonomous Kenya Revenue Authority (KRA) in 1995, which centralized the administration of tax collection.

Kenya has witnessed significant changes in many aspects of its economy over the last four decades. One of the striking characteristics of Kenya is that unlike many other Sub-Saharan countries today, it is a high tax-yield country with a tax-to-GDP ratio of over 20 per cent. Kenya is able to finance a large share of its budget, while external donor finances are used to cover a much smaller share than in other countries of the region. This striking feature, however, does not mean that the country is not without its problems with the tax system. Like most developing countries, it has had to contend and still contends with the common problems that plague tax systems of developing countries. These problems are the existence of tax systems with rates and structures that are difficult to administer and comply with; That are unresponsiveness both to growth and discretionary tax measures hence offering low tax productivity; that raise little revenue but introduce serious economic distortions; that provide opportunities for differential treatment of individuals and businesses in similar circumstances, and that are selective with regard to tax administration and enforcement, and skewed in favor of those with the ability to defeat the system(Karingi and Wanjala, 2005)

Kenya has the trappings of a modern tax system, including, for example, a credit-invoice VAT, a PAYE individual income tax with graduated but arguably moderate rates, and a set of excise taxes focused on the usual suspects (alcohol, cigarettes, gasoline, etc.). However, with up to 70 percent of GDP produced and possibly as

much as 75 percent of labor employed in the informal sector, the ability of the tax system to raise sufficient revenue with minimal distortions(Jack and Eissa, 2009)

1.4 Statement of the problem

Tax revenue plays a vital importance for the sustainability of a country, as it is the main source of central government revenue and meets the social and public needs by providing public goods and services. Many developing countries experience a low tax revenue/GDP ratio which prevents them from undertaking ambitious expenditure programs. Thus a rapid increase in domestic revenue and a corresponding increase in public services is a policy priority. However, one needs to be cautious about increased public spending and increased taxation, as distortionary taxes begin to reduce growth when pushed beyond certain levels: tax bases are not simply given to governments: they can be grown or destroyed (Bird, 2008).

The Government of Kenya has recently raised taxes in order to increase its revenue and finance various development projects. Although an increase in taxes increases the revenue stream to the government, it also has implications for economic growth, since, while an increase in government revenue and hence expenditure may increase income, a raise in taxes could have disincentives in the economy that more than counter the intended increase in economic growth from government expenditure. This is due to the fact that raising tax revenue is likely to impose very large distortionary costs on the economy and also promote tax avoidance and evasion. Therefore, continued reform of both the policy instruments and the administrative and enforcement capacity of the tax system is therefore imperative (Eissa and Jack, 2009). Despite the reforms the overall tax rate has be declining. This claim raises a number of important issues.is growth affected by taxation? how low a tax rate can it

be can an economy through appropriate tax policy , trigger a spurt of growth and at what level ?

There have been a number of studies done with regard to economic growth and taxation. Some of them include (Skinner, 1987) analyses the effect of taxation in sub-Saharan Africa over the period 1965 – 1982 on economic growth. 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.(Ojede and Yamarik 2012), carried out a study on forty eight states in the United States, using a pooled mean group estimator, find that an increase in income tax does not have a long run effect on economic growth while property and sales taxes have a negative effect.

(Scully, 1991) estimated that, for US, the optimal level of federal, state and local government expenditure/ taxation when all were combined was around 19 to 23%. The scully model estimated a growth maximizing tax rate for the years 1997-1994 at an average 19.7% of GDP for the New Zealand in a study by (Caragata, 1998). Also (Mackness, 1990) estimated the optimum size of a tax rate for Canada at around 20% to 30% of the GDP. (Mavrov, 2007) found the optimum ratio for the government expenditures as percentage of GDP in Bulgaria to be 21.4%. In all of these studies, they found out that the optimum tax rate is much lower than the actual tax rate in those countries.

The empirical works that have been conducted in these countries have only been devoted to studying the growth effects of taxes. As a result they failed to derive any optimal level of tax rate beyond which taxes are growth retarding. There is need therefore to study the tax rate that optimizes economic growth.

1.5 Research questions.

This research project answered the following research questions:

- i. What is the effect of tax rate on economic growth in Kenya?
- ii. What is the tax rate that maximizes economic growth in Kenya?

1.6 Objectives of the study

The general objective of this study was to find the optimum tax rate that would optimize economic growth for Kenya. Specifically, this study sought to-

- i. To establish the effect of tax rate on economic growth in Kenya
- ii. To determine the tax rate that maximizes economic growth

1.7 Significance of the study

The basis of increased prosperity of any nation is the economic growth. The policy makers will obtain knowledge of the tax rate and economic growth dynamics and respond appropriately; they will therefore obtain guidance from this study in designing appropriate policies that will regulate the economic growth to its best. This study on optimal taxation in Kenya will have a significant effect on tax policy which will influence the level of revenue collected which is a strong determinant factor for economic growth. Inappropriate tax rates will attenuate the standard of living in the country hence impinging on economic growth. Therefore optimal tax rate will ensure the economic prosperity of every society, which is the objective of this study.

For academicians, this study will form the foundation upon which other related and replicated studies can be based on.

1.8 Scope of the study

This study focused on tax rate that optimize economic growth in Kenya and went further to establish the effect of tax rate and economic growth. The study covered the period 1990- 2013. Annual time series data sourced from the World Bank publications and the Kenya National Bureau of Statistics on economic surveys will be used in the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter both theoretical and empirical literature on taxes and related concepts and optimum levels of taxes that maximizes economic growth are reviewed. The first section recomputations on research data and exposes theoretical foundations that underlie the taxation effects on growth and brief review of some growth theories, traditional and modern growth theories. Most of the theoretical models and empirical research literature on the impact of taxation on economic growth apply long-term economic growth models such as the Solow or AK endogenous growth models. We first look at the traditional growth theories and its limitations to show why endogenous growth models were important for development.

2.2 Theoretical Review.

Several researchers have studied the relationship between fiscal policy and economic growth, and both neoclassical and endogenous growth models provide the theoretical foundations for these studies. (Barro 1990), (King and Rebelo, 1990), (Mendoza, 1997) use endogenous growth models to examine both the positive and normative taxation effects. To test predictions of these models with respect to the structure of both taxation and expenditure, (Bleaney and Gemmell, 1999) classify elements of the government budget into one of four categories: distortionary (taxes on income and property) or non-distortionary (taxes on consumption) taxation, and productive or nonproductive

expenditures. They find that shifting revenue away from distortionary forms of taxation and toward nondistortionary forms has a growth-enhancing effect and switching expenditures from productive toward unproductive forms is growth-retarding.

2.2.1 Exogenous Growth Theory

This theory was typified by (Solow and Swan, 1956). It was based on the production function that had capital and labor that was measured in man-hours as inputs into the production function. It assumed constant returns to scale and also diminishing marginal productivity of both inputs. According to this theory, growth occurs through the accumulation of capital but without any exogenous changes which implies that there would be a limit to this process, (Myles, 2000). The basic production function version of this model is given as;

$$Y_t = f(K_t, A_t L_t) \dots \dots \dots 2.1$$

The aggregate output function can be represented by a Cobb-Douglas aggregate production function in the form

$$Y_t^\alpha = K_t (A_t L_t)^{1-\alpha} \dots \dots \dots 2.2$$

Where $Y_t, K_t, L_t,$ and A_t denotes aggregate output, the capital stock, labor supply and the level of technology, respectively. α is a production parameter. These inputs into the production function have positive and diminishing marginal returns. The capital accumulation per effective labor is given as;

$$K = sf(k_t) - (\eta + g + \delta) \dots \dots \dots 2.3$$

In this model, k is the capital accumulation per effective labor, $sf(k_t)$ is the proportion of output that is saved and finally invested, η is the population rate, g is the technological progress and δ is the capital depreciation rate. According to Solow and

Swan, capital per effective labor accumulates if the proportion of output that is saved is higher than the breakeven investment that is defined as the amount of capital needed to cover depreciation, population growth and the technological progress. In a steady state, capital accumulation per effective labor in the model is constant and hence capital will cease as indicated in the equation below

$$K = 0 = sf(k_t) - (\eta + g + \delta)kt \dots\dots\dots 2.4$$

Solow and Swan indicated that, in the steady state of growth, only a change in the technological progress has any influence on the long-run growth of per-capita output as showed in the subsequent equation below.

$$y = f(k_t) = c = g \dots\dots\dots 2.5$$

Chamley (1986) as cited by Keho (2010) noted that in these exogenous growth theories, fiscal variables such as taxes and public spending can affect the long-run output levels but not the long-run output growth. In their study, they asserted that the steady state output growth is determined by exogenous factors such as population growth and technological progress, while fiscal policy can affect only the transition path of this steady-state.

The limitation of this approach is that the mechanism for growth is exogenous, so preventing the models from explaining the most fundamental factor of what determines the rate of growth. Furthermore, because it is exogenous, the rate of economic growth cannot be affected by policy. As such, exogenous growth models have limited value for exploring the determinants of growth.

2.2.2 Endogenous Growth Theory

This theory was developed in 1980s as a direct response to the shortcomings of the neo-classical growth thinking. The classes of growth models we study are the subject of an important branch of the recent literature on endogenous growth theory. This class of models is driven by the existence of multiple accumulable factors and constant returns to scale (CRS) accumulation technologies. According to the exogenous growth theory, fiscal policy can affect both the level of output and the steady state growth rate in the endogenous theory. This endogenous theory tells us that if taxes are used to fund investment in public goods that will specifically result in external benefits such as infrastructure, education, and public health, the economic growth rate can be influenced positively by taxation (Barro, 1990).

The endogenous growth models we examine predict that the effects of direct and indirect taxes vary depending on assumptions with regard to the households "subjective valuation of their time, the technologies available for accumulation of physical and human capital, and the incidence of income taxes. In general, income taxes are growth-reducing, while growth effects of consumption taxes are ambiguous and depend in particular on the elasticity of labor supply (Mendoza et al, 1997)

Endogenous growth models, fiscal policy can affect both the output level and the steady-state growth rate (Mendoza et al., 1997). The development of the model has opened an avenue through which these growth effects can be explored. These models tell us that 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. However, taxes can have many distortionary effects on growth (Engen and Skinner, 1996). Higher taxes affect the stock of physical capital directly by discouraging investment and lowering the investment rate. If taxes on the earnings of capital rise too high, then the owners of capital will charge higher prices for the use their capital. The usual result from this situation will be greater use of human labor to do the work that machines previously performed. People lose access to new and labor-saving technologies. Consequently, productivity of labor falls, which reduces the rate of economic growth.

Endogenous growth theory challenges this neoclassical view by proposing channels through which the rate of technological progress, and hence the long-run rate of economic growth, can be influenced by economic factors. It starts from the observation that technological progress takes place through innovations, in the form of new products, processes and markets, many of which are the result of economic activities. Endogenous growth theory has been challenged on empirical grounds, but its proponents have replied with modifications of the theory that make it consistent with the critics' evidence. For example, (Barro and Martin 1992) and (Evans,1996) showed, using data from the second half of the 20th century, that most countries seem to be converging to roughly similar long-run growth rates, whereas endogenous growth theory seems to imply that, because many countries have different policies and institutions, they should have different long-run growth rates.

2.2.3 A-K Theory

Unlike in the Solow theory, the return to capital is no longer diminishing in the A-K theory since capital has been broadly defined into physical and human capital. One of the main advantages of the A-K is that it can explain long-run growth without relying on technical progress and population growth. Here economic growth is determined by the accumulation of both physical and human capital. In this theory, we shall use the production in the Solow theory as

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad 0 < \alpha < 1 \dots \dots \dots 2.6$$

The parameter α being less than one which implies that there is diminishing returns to capital which had important implications of the theory (Whelan, 2005). The simplest models of this theory sets $\alpha = 0$ which gives

$$Y_t = A_t K_t \dots \dots \dots 2.7$$

Taking logs and derivative, the growth rate of output is determined by,

$$\frac{Y_t}{Y_t} = \frac{A_t}{A_t} + \frac{K_t}{K_t} \dots \dots \dots 2.8$$

Capital accumulation is given by

$$K_t = sY_t - \delta k_t \dots \dots \dots 2.9$$

This simple A-K theory shows that getting rid of diminishing marginal returns to capital accumulation has a dramatic effect on the theory's predictions for the sources of growth. The steady-state growth rate depends positively on the savings rate and negatively on the depreciation rate, neither of which had any effect on long-run growth in the Solow model (Karl, 2005).

The economy is always on the balanced growth, however, the main shortcoming of this simple AK model is that when $\alpha=1$, capital is the only factor of production, violating one of Kaldor's facts.

2.2.4 Laffer Curve Theory

Almost every inquiry into optimal taxation and tax structure starts from the Laffer curve which theoretically suggests that there should be an optimal tax rate in the economy, which contributes to the possible maximum taxation income to the public budget. This is the tax rate that every government is yearning to achieve since at this level, the budget income is maximized and the taxes do not impact negatively on the economy, this will allow for the maximum government spending. (Kalendienė, Pukelienė, 2011).

The basic idea behind the Laffer curve is that the relationship between tax rates and tax revenues can have two effects on revenues; the arithmetic effect and economic effect. The arithmetic effect refers to the fact that when tax rates decrease, the tax revenues (expressed per unit of taxable income) will also decrease, conversely when the tax rates increase will cause the tax revenue collected per unit of taxable income to increase. The economic effect, however, leads to a positive yield that lower tax rates have on work, output, and employment and also on the tax base by increasing incentives to increase these activities. In contrast increasing the tax rate will have an economic effect, this will penalize participation in taxed activities. The economic effect will always work in the opposite direction to reverse the arithmetic effect, (Trandafir and Brezeanu, 2011).

Figure 1-1 is a graphic illustration of the concept of the Laffer curve; the exact level of taxation corresponds to specific levels of revenues. At a tax rate of 0 percent, the government would collect no tax revenues, no matter how large the tax base. Likewise, at a tax rate of 100 percent, the government would also collect no tax revenues because no one would be willing to work for an after-tax wage of zero (i.e., there would be no tax base). Between these two extremes there are two tax rates that will collect the same amount of revenue: a high tax rate on a small tax base and a low tax rate on a large tax base. (Laffer, 2004)

One of the issues with the Laffer curve that emanates from this theory is the idea from the upcoming generations of government policy that essentially said lowering taxes were good but raising them were bad. However even if we accept the basic Laffer curve, there is still a point where higher and lower taxes are counterproductive. It is argued that these points have been obscured by the political rhetoric and bogus arguments but the basic idea is that if taxes decreased to all time too low, the government will become bankrupt to the extent that public services cannot be provided such as security and health. On the other hand it is true that if the governments raise taxes too high, then there will be capital flight, investments will move overseas where the burden is low. This Laffer point over two decades have not been defined by economic researchers as it is greatly attributed to the fact that they have been shooting at a moving target.

This study borrows the fact that there is a growth maximizing tax rate as depicted by an inverted U curve and the general argument is that government public goods and services

maximize the productivity of private economic activity when taxes reach and further tax rate hikes are counterproductive.

2.3 Empirical Literature

A number of studies have tried to analyze the relationship between taxes and growth. Results vary across countries, methodologies, fiscal variables involved as well as across time periods within the same country.

Skinner (1987) tested the impact of government taxation and expenditure on aggregate output growth for sub-Saharan Africa over the period 1965 - 1982. A theoretical model derived showed that the impact of tax distortions on output growth is usually negative. The model was tested using a pooled cross-section time-series data and that taxes levied on personal and corporate income reduce economic growth, while sales and excise taxes have no significant effect on economic growth.

Barro (1990) presented a strong evidence in favor of the view that higher taxes are growth-impeding using a data set covering a large cross-section of both poor and rich countries. His results have been confirmed in other studies while in others, they have rejected. For example, studies such as (Engen and Skinner, 1992) (Kormendi and Meguire, 1995), (Cashin, 1995) and (Engen and Skinner, 1996) found evidence indicating that economic growth is retarded by taxation while others such as (Katz et al. 1983), (Koester and Kormendi, 1989), and (Mendoza et al. 1997) do not detect any significant effect of taxation on economic growth.

Levine and Renelt (1992) and also fail to find a robust cross-country link between a variety of fiscal policy indicators and long-run growth rates. The finding that the

aggregate tax rate has no significant impact on economic growth probably arises from the two opposing effects of taxes. On the one hand, the negative effect arises from the distortions to choice and disincentive effects. This holds in particular when taxes are used for transfer payments. On the other hand, if the collected taxes are used to fund investment in public goods, the economic growth rate could be positively influenced by taxation. The negative effect of taxation is then offset by the positive production effect of higher spending on public services (Helms, 1985). There is evidence (Engen and Skinner, 1992), (Keho, 2009) that tax rates are strongly correlated with public spending. Since some kinds of public expenditure are growth enhancing, the coefficient on tax rates captures both the negative impact of taxation and the positive effect of public spending on growth, and by that turns out to be statistically insignificant.

Scully (1991) estimated that, for US, the optimal level of federal, state and local government expenditure/ taxation when all were combined was around 19 to 23%. The scully model estimated a growth maximizing tax rate for the years 1997-1994 at an average 19.7% of GDP for the New Zealand in a study by (Caragata, 1998). Also (Mackness, 1990) estimated the optimum size of a tax rate for Canada at around 20 to 30% of the GDP. (Mavrov, 2007) found the optimum ratio for the government expenditures as percentage of GDP in Bulgaria to be 21.4%. In all of these studies, they found out that the optimum tax rate is much lower than the actual tax rate in those countries.

(Wang and Yip, 1992) show that there several research has been carried out in Kenya on the effects of taxes. In a study of the United states, (Yamarik, 2000) finds that when

used cointegration analysis suggested by Johansen and Juselius and applied the seemingly unrelated regression equations (SURE) approach to determine tax components. The results presented long run relationship between tax revenues and three economic indicators.

Lee and Gordon (2005) using cross-country data for the period 1970 to 1997, and controlling for country effects, find that corporate tax is negatively correlated with economic growth. They also find that an increase in corporate tax tends to decrease economic growth rates. Corporate tax tends to discourage investments as it reduces profits.

Bouet and Roy (2012) also working on sector specific research, 'Trade protection and tax evasion', for Kenya, Mauritius and Nigeria, find positive elasticities for evasion with respect to relatively higher tax tariffs. In the same strand as the other Kenya studies, higher tax tariffs tend to provide disincentives here too, however, the result in this case is evasion of taxes, resulting in lower revenues for the state rather than the intended purpose of increased revenue. The above studies demonstrate the importance of taxes on specific sectors and show how taxes can create disincentives in these sectors. However, there is need for research that shows effects of direct taxes on economic growth.

The research takes a theoretical approach to analyse the effects of consumption tax, wage tax and capital tax on economic growth. Data on Kenya is used to look at how different rates of the three types of taxes affect economic growth. We find that the income elasticity of capital matters and that generally at higher levels of the income elasticity of capital, an increase in wage tax and consumption tax lowers the level of

capital at steady state. On the other hand, when the income elasticity of capital is relatively low, an increase in taxes on wages and consumption raises the level of capital at steady state. (Awiti, 2010).

Arnold (2008) using data from 21 OECD countries covering the period 1970 -2005 suggested that income taxes are associated with significantly lower economic growth rates than taxes on consumption and property. A similar study by (Vartia, 2008) analyzed the effects of tax policies on investment and productivity for a set of OECD countries using industry-level data. He found that both corporate and personal income taxes have a negative effect on productivity. These effects were stronger in industries that were more profitable. Similar findings were reported by (Schwellnus and Arnold, 2008). They showed that corporate taxes reduce investment through an increase in the user cost of capital.

2.4 Overview of literature

The majority of the empirical studies reviewed above on taxation and growth have a common limitation as they are only based on linear models where taxes enter the growth rate equations in a linear fashion. As suggested by (Barro, 1990), they do not account for the non-linearity in the tax-growth nexus. As a result they failed to derive any optimal level of tax rate beyond which taxes are growth retarding.

Also some of the empirical works have also looked at the effects of different types of taxes on growth, positing that is not only the level of taxes that matters but also the way in which different tax instruments are structured and blended to generate revenues

It is also evident from the strand of literature that these studies do not exist in African countries and specifically Kenya that are seriously devoted to estimating an optimal tax rate. The empirical works that have been conducted in these countries have only been devoted to studying the growth effects of taxes and therefore have not taken time to investigate the growth maximizing tax rate. This study wishes to aid in contributing literature by examining the case of Kenya.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the econometric methods and models that were explored in order to arrive at the tax rate that optimizes economic growth level in Kenya. The study also endeavored to estimate the effect of tax rate and economic growth overtime.

3.2 Research design

Quality research examination should contain strong evidence in the form of data that is relevant to a question or a problem. In most time series research, non-experimental design is preferred to experimental research design. The study is sought to analyze the relationship between and economic growth and optimal tax rate in Kenya. Time series data and non-experimental research design was adopted in this study engaging the quantitative data. Regression analysis was used to capture the effect of tax rate on economic growth and the optimal tax rate that optimizes economic growth in an attempt to answer the research questions posed in chapter one. The study used data for the period 1990 to 2013 for the variables under study.

3.3 Theoretical Framework

This study adopted and adapted to Scully, (1996, 2003) parsimonious model in which taxation is directly related to the optimal size of the government provided that all spending are financed through the tax revenues. A balanced budget assumption is made is such a way that

$$G = \tau Y$$

Where G denotes the real government expenditure, real government revenue and τ is the total tax rate. The share of output left to the non-government that is $(1-\tau)Y$, is used to produce private goods. Both public and private goods are used to produce national output following a Cobb-Douglas production function:

$$Y_t = \alpha(G_t)^\beta((1 - \tau)Y_t)^\delta \dots\dots\dots 3.1$$

Growth rate:

$$1 + Gr_t = Y_t/Y_{t-1} = \alpha(G_t)^\beta(1 - \tau)^\delta(Y_t)^\delta \dots\dots\dots 3.2$$

$$\text{Hence } 1 + Gr_t = Y_t = \alpha(G_t)^\beta(1 - \tau)^\delta(Y_t)^\delta(Y_{t-1})^{-1} \dots\dots\dots 3.3$$

$$Y_t = \alpha(\tau Y_t)^\beta((1 - \tau)Y_t)^\delta \dots\dots\dots 3.4$$

Where α , β and δ are the basic parameters.

Y_t = Real GDP at current Period

Y_{t-1} = Real GDP at previous Period

G_t = Real Government expenditure at the current period

Gr_t = Economic growth rate at current period

3.4 Model specification

This study will adopt two models which will ensure that the two objectives are achieved.

3.4.1 Model on the effect of tax rate on economic growth

The study uses the Scully (1991) model that has endogenous non-linear and constant returns to scale Cobb-Douglas. It also assumes a two-sector economy i.e. the government sector and non-government sector and a balanced budget approach.

Cobb- Douglas production function (equation 3.1) in log form is therefore given as,

$$\ln Y_t = \alpha + \beta \ln G_t + \delta \ln(1 - \tau) - \ln Y_{t-1} + \mu \dots \dots \dots 3.5$$

This model is to be estimated through an OLS so as to establish the effect of tax rates on economic growth.

3.4.2 The tax rate that maximizes economic growth

Simplifying equation 3.4

$$Y_t = \alpha (\tau)^\beta (Y_t)^{\beta+\delta} ((1 - \tau)^\delta) \dots \dots \dots 3.6$$

$$1 + G_t = Y_t = \alpha (\tau)^\beta (Y_t)^{\beta+\delta} ((1 - \tau)^\delta (\tau)^\beta (Y_{t-1})^{-1}) \dots \dots \dots 3.7$$

Constant returns to scale $\delta + \beta = 1$

Therefore:

$$Y_t = \alpha (\tau)^\beta ((1 - \tau)^\delta (Y_t) (Y_{t-1})^{-1}) \dots \dots \dots 3.8$$

Logarithm form of 3.8

$$\ln Y_t = \alpha + \beta \ln \tau + \delta \ln(1 - \tau) - \ln Y_{t-1} + \mu \dots \dots \dots 3.9$$

Differentiate $\ln Y_t$ with respect to τ

$$\frac{\partial \ln Y_t}{\partial \tau} = \beta (\tau)^{-1} + \delta (1 - \tau)^{-1} (-1) \dots \dots \dots 4.0$$

$$\frac{\beta}{\tau} = \frac{\delta}{(1 - \tau)} \dots \dots \dots 4.1$$

$$\frac{(1 - \tau)}{\tau} = \frac{\delta}{\beta} \dots \dots \dots 4.2$$

$$\tau = \frac{\beta}{\beta + \delta} \dots \dots \dots 4.3$$

Equation 4.3 therefore yields the optimum rate that would maximize economic growth.

Kennedy (2000) and Hill (2008) point out that the Scully model may produce spurious estimates of an optimal tax rate because the production function specification ignores the contribution of earlier periods' capital goods to output. To be derived from a simple endogenous growth model, the Scully model requires that the rate of depreciation of capital goods is 100% per year, that is, capital goods are entirely used up in the process of annual production. In his reply to this criticism, 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 demonstrates that incorporating factors inputs into the model does not change the analytical results.

3.5 Definition and measurement of variables

Table 3- 1: Definition of variables

Abbreviation	Variable	Description	Measurement
G	Government expenditure	This is all government consumption, investment and transfer payments	Yearly rate
Gr	Growth rate	This a measure of economic growth from one period to another in percentage terms	Yearly rate
Y_t	Real GDP	It represents the total dollar value of all goods and services produced over a specific time period	Yearly rate
τ	Tax rate	Tax imposed by the government and to an individual or a corporation	Ratio of tax revenues to nominal GDP
G_t	Real government Expenditure	Yearly, current prices	Yearly rate

3.6 Data Collection Methodology

The empirical analysis uses annual data over the period 1990 - 2013. The data was drawn from different sources that is the Kenya National Bureau of Statistics (Economic Survey) and the world development indicators of the World Bank.

3.7 Diagnostic tests

Various diagnostic tests were performed to check the reliability of the model;

Unit root tests: This study was conducted the test using the ADF test after Dickey and Fuller, 1979. The PP (Phillip and Perron, 1988) test was also be used to test for the stationarity of the variables. The two methods ensured that the results obtained are accurate.

Co-integration Tests: In this study both the Engel & Granger and Johansen-Juselius (JJ) cointegration tests was conducted. The two methods are to be engaged so as to ensure the accuracy of the results.

Error Correction Mechanisms (ECM) Tests: Once the variables were found to be co integrated, Vector Error Correction Model (VECM) was also used. Indeed VECM is special type of restricted VAR, is introduced to correct a disequilibrium that may shock the whole system.

Test for multicollinearity: The study also tested for multicollinearity between the variables used using e-views. The presence of multicollinearity will violate the BLUE assumptions of OLS model.

Test for autocorrelation: Durbin Watson and Breusch-Godfrey LM test was used to test for presence of autocorrelation. For Durbin-Watson statistic, an estimate of 2.00 means that residuals are not auto correlated. For the Breusch-Godfrey LM test, the null hypothesis of no serial correlation (autocorrelation) will be assumed and tested at 5 per cent level of significance.

3.8 Data Analysis

This study conducted the various tests in an attempt to respond properly to the research questions. The data collected was analyzed using the relevant econometric software.

The data collected was edited and sorted for completeness and accuracy. Data was also analyzed and presented in line with the objectives of the study. To answer objective one, equation 3.5 will be estimated. β and δ was used to make inference

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

In this chapter, the results of the study are reported. First, the results of the time series property tests are presented then the empirical results by objectives.

4.2 Unit root test

The OLS regression test was conducted only after the non-stationary data is differentiated into stationary. Unit root test tests whether a time series variable is non-stationary using an autoregressive model. Unit root tests were conducted on each time series using ADF test and the results are as reported in table 4.1

Table 4- 1: Unit root tests

VARIABLE	Difference	ADF TEST STATISTIC	ADF CRITICAL VALUES AT 5% SIGNIFICANCE LEVEL	CONCLUSION
GDP	Level D1	-2.9818 -3.73065	-2.9190 -2.8925	Stationary Series
Government Expenditure	Level D1	-0.0221 -10.9333	-2.8923 -2.8925	Stationary Series
Aggregate non-tax component of GDP	Level D1	-2.7168 -3.5311	-2.8951 -2.8922	Stationary Series
Tax rate	Level D1	-1.0794 -9.996	-2.8925 -2.8925	Stationary Series
Lagged value for the GDP	Level D1	-2.7550 -3.4234	-2.8951 -2.9202	Stationary Series

Source: Computations on research data

From the results presented in table 4.1, it is clear that all the variables were stationary at first difference.

4.3 Diagnostic tests on estimated models

After identifying a time series model, the goodness-of-fit of the model, validity and reliability of the assumptions were checked using the following diagnostic tests;

4.3.1 Heteroscedasticity

Heteroscedasticity test is a residual diagnostic test done only on an estimated model. It is therefore important that a description of model estimation is done before presenting results of diagnostic tests. Heteroscedasticity has long been recognized as a potential problem in Cobb Douglas equations. The semi-log has been used to reduce the occurrence of heteroscedasticity and also allow for interdependence among variables. This study used the autoregressive conditional heteroscedasticity (ARCH) test and the results are as shown in table 4- 2 and table 4- 3.

Table 4- 2: ARCH test (Equation 3.5)

F-statistic	0.227437	Probability	0.6346
Obs*R-squared	0.231856	Probability	0.6102

Source: Computations on research data

Considering the Obs*R-squared values of 0.2319 with a p- value of 0.6102 hence fail reject the null hypothesis at 5% significant level and conclude the variance of the error term is constant, that is there is no Heteroscedasticity .

Table 4- 3: ARCH test (Equation 3.9)

F-statistic	1.386	Probability	0.0532
Obs*R-squared	1.825	Probability	0.0598

Source: Computations on research data

Considering the Obs*R-squared values of 1.825 with a p- value of 0.0598 hence fail reject the null hypothesis at 5% significant level and conclude there is no ARCH, hence no Heteroscedasticity .

4.3.2 Testing for normally distributed errors

The normality tests is important to perform as it determines whether a data set is well-modeled by a normal distribution and it computes on how likely it is for a random variable underlying the data set to be normally distributed. This study used the Jarque-Bera test for normality. The Jarque–Bera test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution. The results are as shown in table 4- 4 and table 4- 5.

Table 4- 4: Joint significance of variables (Equation 3.5)

F-statistic	5945.592	Probability	0.154
Chi-square	41619.14	Probability	0.3640

Source: Computations on research data

The resulting p-value of 0.154 is greater than significance level of 0.05, this suggests that residuals are normally distributed.

Table 4- 5: Joint significance of variables (Equation 3.9)

F-statistic	5512.492	Probability	0.2230
Chi-square	41619.14	Probability	0.0600

Source: Computations on research data

The resulting p-value of 0.2230 is greater than the significance level of 0.05, which implies failure to reject the null hypothesis and concluded that residuals are normally distributed.

4.3.3 Test for Auto correlation

In time series data, autocorrelation is a problem where correlation exists between the errors in different time periods. If the autocorrelation exist, then it needs to be corrected

This study utilized the Breusch–Godfrey-Bertolo test which is used to assess the validity of some of the modelling assumptions inherent in applying regression-like models to observed data series. In particular, it tests for the presence of serial dependence that has not been included in a proposed model structure and which, if present, would mean that OLS is no longer an efficient linear estimator, standard errors are incorrect and generally overstated, and estimates are biased and inconsistent leading to incorrect conclusions drawn from other tests. The results are as shown in table 4- 6 and table 4- 7.

Table 4- 6: Test on auto correlation Breusch–Godfrey test (Equation 3.5)

F-Statistic	12.58394	Probability	0.005109
Obs*R-squared	0.93221	Probability	0.00598

Source: Computations on research data

Considering the Obs*R-squared values of 0.93221 with a p- value of 0.0598 hence fail to reject the null hypothesis at 5% significant level and conclude that there is no presence of serial correlation.

Table 4- 7: Test on auto correlation Breusch–Godfrey test (Equation 3.9)

F-Statistic	13.5856	Probability	0.009109
Obs*R-squared	0.89521	Probability	0.009389

Source: Computations on research data

Considering the Obs*R-squared values of 0.89521 with a p- value of 0.009109 hence fail reject the null hypothesis at 5% significant level and conclude that there is no presence of serial correlation.

4.3.4 Misspecification Test

The test is designed to detect omitted variables and incorrect functional form. This stud will use the Ramsey Regression Equation Specification Error Test (RESET) test which is a general specification test for the linear regression model. It tests whether non-linear combinations of the fitted values help explain the response variable and if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is mis-specified. The results are as shown in Table 4- 8 and Table 4-9.

Table 4- 8: Ramsey Reset Test (Equation 3.5)

F-Statistic	7.962886	Probability	0.05716
Likelihood ratio	15.63597	Probability	0.05462

Source: Computations on research data

Considering the F-Statistic values of 7.9629 with a p- value of 0.057809 hence fail reject the null hypothesis at 5% significant level and conclude that there is no presence of serial correlation hence the estimated model is stable with no specification error.

Table 4- 9: Ramsey Reset Test (Equation 3.9)

F-Statistic	35.50729	Probability	0.07809
Likelihood ratio	55.61295	Probability	0.066502

Source: Computations on research data

Considering the F-Statistic values of 35.5072 with a p- value of 0.07809 hence fail reject the null hypothesis at 5% significant level and conclude that there is no presence of serial correlation hence the estimated model is stable with no specification error.

4.4 Empirical results

4.4.1 Effect of Tax rate on economic growth in Kenya

Regressing the dependent variable against the independent variables and the results are as shown in Table 4- 10.

Table 4- 10: Empirical results (Equation 3.5)

Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.000445	0.001391	0.319936	0.0000
Government Expenditure	-0.001374	0.014804	-0.092780	0.02359
Tax rate	0.0979361	0.016498	59.36172	0.0000
Lagged value for the GDP	-0.001399	0.016258	-0.086069	0.0009
Adjusted R-squared	0.845680	Prob(F-statistic)		0.0000
Durbin-Watson stat	1.872485	F-statistic		101.2581

Source: Computations on research data

The F value is 101.2581 with a p-value of 0.000; indicate that the fitness of samples data to the model is meaningful statistically. The regression shows the significance effect of the independent variables on the dependent variable; thus the null hypothesis is rejected. The Durbin Watson value of 1.8724 depicts non-serial

autocorrelation. Evaluating the model, the semi-log provides the best fit with the highest R^2 statistics of 84.65%. Both the explanatory and predictive performance of the model is good as indicated adjusted R^2 statistics of 84.57. The adjusted R^2 of (0.8457) reveals that about 84.57 % of the total variation in the dependent variable GDP is explained by the independent variables while the remaining 15.43% is taken care by the error term (μ).

The results in Table 4- 10 shows that the coefficients of all the independent variables; Government, tax rate and the level of GDP in the previous year are statistically significant at 5% level of significance. This shows that the three variables are important in explaining the growth of GDP realized in a particular year. Tax rate (0.09794) with a positive sign which indicates that the theoretical statement is true such that higher tax rate have a positive effect on the GDP. By implication, this means that for every one unit increase in tax rate leads 9.8% in GDP *ceteris paribus*. The evidence on the effect of tax rate and economic growth remained inconclusive as (Engen and Skinner, 1996) found evidence indicating that economic growth is retarded by taxation while others such as (Koester and Kormendi, 1989), and (Mendoza et al. 1997) do not detect any significant effect of taxation on economic growth. The finding above are in consistent with Keho (2008) with which implies that there is a positive relationship between tax rate and GDP.

Government expenditure has a negative effect on GDP, the higher the government expenditure the lower the GDP rate and vice versa. Thus a unit increase in the government expenditure leads to 0.14% unit reduction in the Gross Domestic Product (GDP) *ceteris paribus*. The finding is consistent with (Hamzah, 2011) in his study on the association between government expenditure and economic growth in

Malaysia which showed that the total government development expenditure has a negative and weak correlation with economic growth.

GDP for the previous year has a negative effect on GDP, the higher GDP for the previous period the lower the GDP. Thus a unit increase in the the GDP for the perious period leads to 0.14% unit reduction in the Gross Domestic Product (GDP) *ceteris paribus*. Based on model, the GDP (expressed in natural log form) is a positive function tax rate and a negative function of government expenditure and GDP at previous Period.

4.4.2 Tax rate that Optimize Economic growth in Kenya

The second objective of the study was to determine the tax rate that optimizes economic growth which was achieved by the output shown in Table 4-11.

Table 4- 11: Empirical results (Equation 3.9)

Dependent Variable: GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.000206	0.000005	0.412021	0.4681
Tax rate	0.17308	0.000688	251.7295	0.0000
Aggregate of non-tax component	0.82606	0.000857	963.6084	0.0000
Lagged value for the GDP	-0.000648	0.000610	-0.106219	0.0033
Adjusted R-squared	0.915680	Prob(F-statistic)		0.000000
Durbin-Watson stat	2.0000	F-statistic		1050.2581

Source: Computations on research data

In terms of goodness of fit of the model, the indicator to measure the goodness of fit is by looking at the adjusted R square. This study finds that the model is good and fit because the adjusted R square are 0.91568. In overall, we can explain that the GDP

performed very well because there is a 91.57% variation of dependent variables is determined by the variation of independent variables. In other words, the variances of the independent variables successfully explain the variance of dependent variable. Looking at the p value of F at Table 4.11. the p value is 0.0000, and significant. The Durbin Watson value of 2.0 depicts non-serial autocorrelation

The results in Table 4- 11 shows that the coefficients of all the independent variables; Aggregate of non-tax component, tax rate and the level of GDP in the previous year are statistically significant. This shows that the three variables are important in explaining the growth of GDP realized in a particular year. Tax rate (0.17308) with a positive sign which indicates that the theoretical statement is true such that higher tax rate have a positive effect on the GDP. By implication, this means that for every one unit increase in tax rate leads 17.308% in GDP *ceteris paribus*.

Aggregate of non-tax component has a positive effect on GDP, the higher the Aggregate of non-tax component the lower the GDP rate and vice versa. Thus a unit increase in the Aggregate of non-tax component leads to 82.61% unit reduction in the Gross Domestic Product (GDP) *ceteris paribus*. GDP for the previous year has a negative effect on GDP, the higher GDP for the previous period the lower the GDP. Thus a unit increase in the the GDP for the perious period leads to 0.07% unit reduction in the Gross Domestic Product (GDP) *ceteris paribus*.

Hence

$$\ln Y_t = 0.17308 \ln \tau + 0.82606 \ln (1 - \tau) - 0.000648 \ln Y_{t-1} + \mu$$

The coefficients of the model were therefore used to calculate the optimal growth maximizing tax rate by solving the equation 4.3 in chapter 3:

$$\tau = \frac{\beta}{\beta + \delta} = \frac{0.173}{0.173 + 0.826} * 100 = 17.3\%$$

According to the model the optimum tax rate is 17.3 per cent. Examining the historical data, the tax rates are below 17%. 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. The optimum rate calculation is consistent with the findings of Scully with rates between 19 and 23 per cent for the United States and New Zealand. It is also consistent with the findings of Mavrov (2007) with an optimum ratio for government expenditure as percentage of GDP of 21.42 per cent in Bulgaria.

CHAPTER FIVE

SUMMARY CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter comprises of the summary, conclusions and policy recommendations arising out of the section on data analysis

5.2 Summary and Conclusions

The first objective of the study is to determine the effects of tax rate on economic growth. The study conducted diagnostic tests for all the variables. To achieve the first objective of the study, time series data for the period 1990 to 2013 was collected and the multiple regression analysis was performed using four main variables which included real GDP, tax rate, government expenditure, Real GDP at previous period. The estimated model showed that coefficients of the independent variables were significant and of the expected sign. That is, the GDP for the previous year and government expenditure have a negative effect on GDP, while tax rate has a positive effect on GDP. It therefore evident that the tax rate affects economic growth and hence a major driver of economic growth.

The second objective of the study is to determine the tax rate that optimize economic growth and therefore the optimal tax rate derived from the equation 4.3 in chapter 4 is 17.3 % of GDP. It is much greater than the actual tax rate. 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. 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. Due to the fact that increase in taxes

is 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. Furthermore, government should try to return taxes back to the public in an efficient manner. 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.

Many studies have shown that there is a negative relationship between government tax rate and economic growth after a certain point of tax level in the economy is reached. As the core function of the government is to provide public goods and services, ensure social safety net for vulnerable households, facilitate private economic activity, correct negative externality in the market and establish the rule of law. However, an oversized government is likely to be detrimental to economic growth.

5.3 Policy Recommendations

As there is a large share of potential resources that is not being collected by the tax system, a credible strategy should look for ways to improve the tax 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.

The findings supports the supply side approach, indicating that the tax rate have impact on economic growth. It is evident that expansionary tax tends to harm economic growth. Policy makers should consider adjusting the tax rates to return to their optimum

level. Economists are recognizing the great importance of getting tax policy right. As the overall tax burden has important consequences for the rate at which an economy grows, governments should ask whether the tax laws work against economic prosperity. In this paper, we have modelled the relationship between the level of taxation and the rate of economic growth and estimated the growth-maximizing tax rate.

5.4 Areas of further studies

Our study suggests some promising topics for future research. First, it would be useful to examine the growth effect of different taxes in order to identify taxes that are more harmful to economic growth and those that are not. It might also be worthwhile to investigate the effects of different types of taxes on GDP. This can shed light on the ways tax changes affect the aggregate economic growth. Second, an additional promising direction concerns the optimal structure of tax for the economy. Third, another interesting topic of research would be to investigate the impact of fiscal policy on the relative size of the hidden economy. It is widely agreed that underground economic activity in the form of tax evasion poses a serious threat for effectiveness of fiscal policy.

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APPENDIX

Appendix 1: Raw data

Fiscal Year	Tax revenue (% of GDP)	Tax revenue (million US\$)	GDP (current million US\$)	GDP growth (annual %)	Government expenditure (K £ million)
	τ	τ	Yt	Gr	Gt
1990	16.28	1395.578042	8572.35	4.2	4072.88
1991	17.6	1436.605484	8151.48	1.4	4411.47
1992	18.4	1511.074967	8209.13	-0.8	4424.60
1993	15.0	860.7910512	5751.79	0.4	5836.00
1994	14.9	1067.60677	7148.15	2.6	9007.71
1995	20.5	1853.983488	9046.33	4.4	9205.55
1996	15.8	1908.976467	12045.86	4.1	9170.36
1997	16.1	2106.678154	13115.77	0.5	10147.80
1998	15.1	2122.476465	14094.00	3.3	13616.00
1999	16.2	2083.279062	12896.01	2.3	12137.10
2000	16.8	2138.456945	12705.36	0.6	13503.41
2001	17.8	2315.635597	12986.01	3.8	14392.00
2002	17.3	2273.849697	13147.74	0.5	15385.74
2003	15.8	2349.812301	14904.52	2.9	15203.17
2004	17.0	2731.832652	16095.34	5.1	19427.60
2005	18.7	3498.451556	18737.90	5.9	21435.96
2006	15.1	3910.362382	25825.52	6.3	21629.56
2007	15.2	4845.470156	31958.20	7.0	25442.28
2008	16.0	5730.160837	35895.15	0.2	32904.02
2009	15.5	5755.079708	37021.51	3.3	38650.28
2010	15.7	6293.292052	40000.14	8.4	39468.03
2011	15.9	6690.609384	41954.99	6.1	47811.31
2012	15.9	8004.312993	50334.70	4.5	51233.16
2013	16	8838.888992	55243.06	5.7	76975.67

Source: Economic Survey (KNBS) and World Development Indicators (World Bank)