INCOME TAXES AND ECONOMIC PERFOMANCE IN KENYA

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DECLARATION

I hereby declare that this is my original work and that to the best of my knowledge it has never been presented for the award of any degree in any other university or institution.

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APPROVAL

This MA Thesis has been forwarded for examination with our approval as university supervisors.

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ABBREVIATIONS

AEO	African Economic Outlook
EAC	East African Community
GDP	Gross Domestic Product
GOK	Government of Kenya
IEA	Institute of Economic Affairs
IMF	International Monetary Fund
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PAYE	Pay As You Earn
TMP	Tax Modernization Program
UN	United Nations
VAT	Value Added Tax
VECM	Vector Error Correction Model
WB	World Bank
WDI	World Development Indicators

ABSTRACT

Income tax revenue has been increasing in recent years at a higher proportion than the other taxes in Kenya making it an important factor in economic decision-making. This paper presents empirical evidence on the relationship between income tax and economic performance in Kenya. The paper employed an endogenous growth model to study the relationship between income tax and economic performance in Kenya for the period 1970 to 2012. Other variables included for control are consumption tax, foreign trade, government consumption, and population growth rate. Regression model was estimated using OLS and VECM. Both OLS model and VECM revealed a negative relationship between income tax and economic performance but this relationship was not significant. Consumption tax, foreign trade, and population growth rate do not significantly influence the economic performance. Government consumption positively influences performance of the economy. This paper advocates for increase in efficiency of tax collection. The government should spend the revenue collected on public investment such as infrastructure to increase productivity. This will ensure improved economic performance.

CHAPTER ONE: INTRODUCTION

1.1 Background

Tax is a compulsory contribution to the government, paid by individuals and corporate entities, which does not bear any relationship to the benefit received (Hyman, 1987). In Kenya, tax is a major component of government revenue. For the financial year 2012/2013, taxes financed 62.8 per cent of the total budget (KNBS, 2013). The government uses tax revenue to meet its obligations, which include providing public goods and services such as security and maintenance of law and order. Other than raising revenue, governments levy taxes to achieve economic stability, equitable income distribution, optimal resource allocation, and to promote social welfare. Taxation is an instrument of fiscal policy; governments use taxes to influence an economy's aggregate demand (Truett and Truett, 1987).

In the pre-colonial Kenya, members of the community paid taxes by taking a portion of their produce to the chiefs. Traders passing through the territories were required to pay some tribute to the chief for freedom of passage. Arabs, early settlers on the Kenyan Coast, charged capitation taxes, a tax levied on traders for every slave exported out of the region, and custom duties. The British established their colony and overthrew the Arabs. The British introduced taxes to meet their expenditures. Taxes were in the form of hut and poll tax. Hut tax was charged on every hut. Poll tax was levied on every adult male. Other taxes were introduced to widen tax base and increase revenue; excise tax, income tax, mining tax, custom duty and stamp duties (Waris, 2007).

After attaining independence in 1963, Kenya inherited the tax system that was in place during the colonial period. Some changes were made. People earning low incomes were exempted from paying tax. Pay As You Earn (PAYE) system was introduced, where tax is charged on employment income and deducted at source, then submitted by the employer to the government. Inheritance tax, a tax charged on the property and assets held by an individual at the time of his death, was also introduced. Capital gains tax was charged on sale of property and gain in value of property. Sales tax was tax on consumption targeting some of the manufactured goods. (Aseto, 1980).

There have been continued changes in the country's tax system to improve revenue collection and ease tax burden. Major tax reforms started in the 1980s under the Tax Modernization Programme (TMP). The sales tax was abolished and replaced with Value Added Tax (VAT) in 1990. Capital gains tax was suspended. External tariffs have been harmonized within the East African Community (EAC). Kenya Revenue Authority (KRA) was established in 1995 under an Act of Parliament for the purpose of revenue administration. Marginal tax rates have reduced from as high as 65 percent after independence to 30 per cent currently (KIPPRA, 2006). The major taxes in the current tax system are; income tax, VAT, PAYE, excise and customs duty (KRA, 2007).

1.1.1 Income Taxes

This paper will focus on income taxes. This form of taxes are direct (the impact and incidence of tax is on the same person), and are charged on personal income, profits and capital gains. In Kenya, income taxes comprises of corporation tax, personal income tax and withholding tax. Tax on capital gains was suspended in 1985 (Moyi

and Ronge, 2006). Corporation tax is charged on profits at the rate of 30 per cent for resident companies and 37.5 per cent for non-resident companies (GoK, 2009). Personal income taxes are charged on an individual's income using a graduated scale, with the lowest rate being 10 per cent and the highest 30 per cent.

Income taxes are considered more distortionary hence less preferred to consumption taxes; replacing income tax with consumption tax is likely to increase savings, investment and work effort hence increasing economic growth (Engen and Skinner, 1996). For developing countries revenue from income taxes has been increasing but at a lower rate when compared to indirect taxes and international trade taxes (Bahl and Bird, 2008). This has been attributed to inefficiencies in collection of income taxes. However, in Kenya, the case is different; the share of income taxes in the total tax revenue collection has been increasing compared to that of other taxes as shown below:

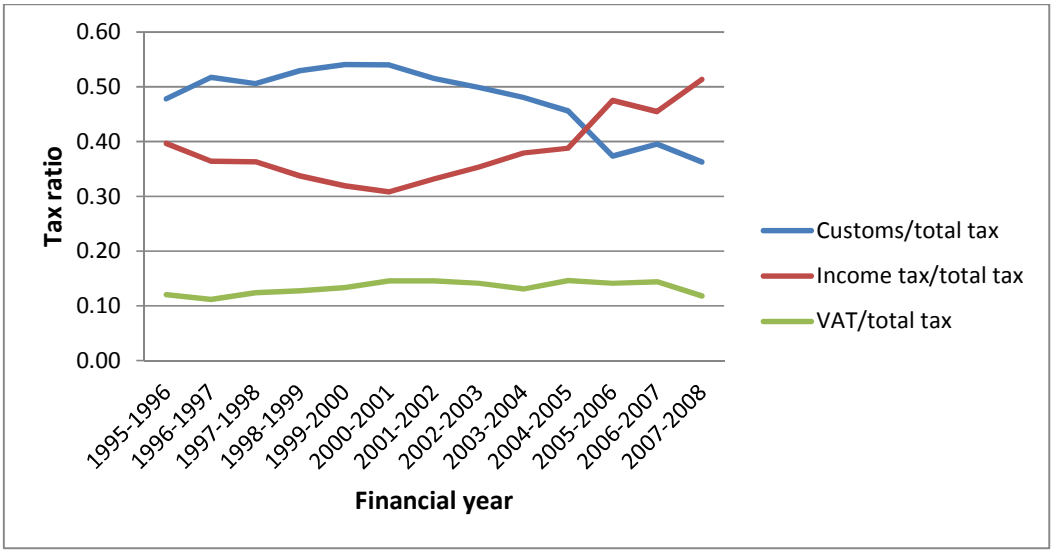

Figure 1: Trend of Tax Ratios
Source: KRA (various years)

From the figure, the contribution of income taxes to total tax revenue collected has continued to rise at a higher rate compared to other types of taxes, it is about 50 per cent of total tax revenue. This can be attributed to the fact that income taxes are easier to administer and they capture the ability to pay. Companies and individuals are required by law to make self-assessments and submit tax to the government at regular intervals. For salaried employees collection is made easier by the PAYE system, where the employer computes and deducts taxes at source and then submits tax deducted to the government (GoK, 2009), thus increasing tax compliance.

The trend of increase in the share of income taxes in total tax revenue in Kenya is similar to that of a few other African countries such as Uganda and South Africa. For Uganda, percentage of income taxes in total tax revenue increased from 24.5 in 2004 to 45.2 per cent in 2011 (WB,2014). That of South Africa has increased steadily from 54.1 per cent in 2004 to 56.4 per cent in 2011 (WB, 2014). This trend is a shift from the what literature has predicted that developing countries are likely to rely more on consumption and trade taxes, and less on income taxes (Bahl and Bird 2008). This makes income tax an important economic variable that cannot be ignored in the formulation of effective public policy.

1.1.2 Economic performance

Economic performance refers to economic growth, labor productivity and welfare of the people (Dedrick et al., 2003). Economic growth is the increase in the total output of the economy, often measured by the growth rate of GDP. Labor productivity is the output per worker. An economy is performing well when there is high economic growth, high productivity of factors of production, and improved social welfare;

Resources will be allocated efficiently. GDP per capita can measure how well an economy is performing. It has been increasing steadily as shown in figure 2:

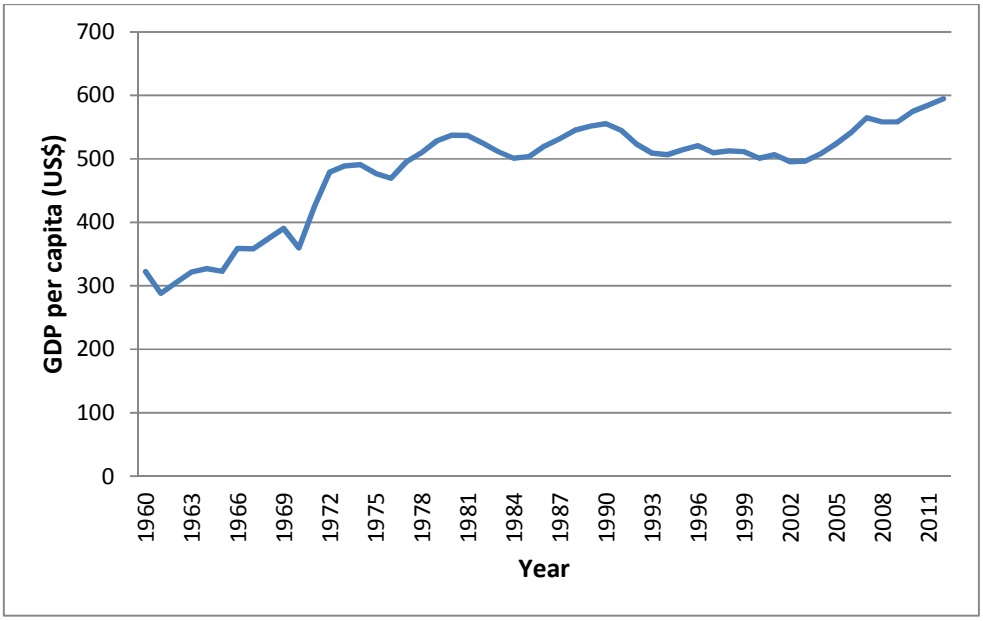

Figure 2: GDP per Capita for Kenya
Source: World Bank (1960-2011)

Kenya's GDP has been growing at an average growth rate of about 5 per cent (for the years 2010, 2011, and 2012, the growth rates have been 5.8, 4.4 and 4.6 per cent respectively, KNBS 2013). The economy is expected to continue growing by 4.7% in 2013 and 5.2% in 2014 (AEO, 2013). Despite the economic growth and increase in GDP per capita, there is a big income gap between the rich and the poor with 10 per cent of Kenya's top households controlling 38 per cent of national income while, the bottom 10 percent controlling 2 per cent of national income (World Bank, 2005). Kenya's long term plan, Vision 2030, aims to see the country economic performance highly improved by the year 2030, with a sustainable growth rate of 10 per cent and high quality of life to all its citizens.

1.1.3 Tax and Economic performance

Taxes affect economic performance through their effect on work effort, savings and investments. The output of an economy will increase because of increased productivity. The productivity of an economy will increase when there is investment in both physical and human capital. Investment comes from both the private and public savings. Thus, any factor affecting investment will influence the economic performance (Mintz and Wilson, 2000). Income tax is charged on individual income and corporate profits. High taxes on salaries of worker may discourage work effort and human capital formation. It is also likely to discourage private savings. High taxes on profits discourage investments and entrepreneurial spirit hence reducing economic output. Lower taxes on the other hand may encourage work effort, and increase savings and investment hence improving overall productivity of the economy.

1.2 Problem statement

Taxes play an important role in meeting government expenditure in Kenya; taxes financed 62.6 per cent of the 2013/2014 budget (IEA, 2013). The tax to GDP ratio has increased from 10 per cent in 1963 to 23 per cent in 2008 (KNBS, 1963, 2008). The proportion of income tax to total tax revenue has also continued to increase (KRA 1995/96-2007/08), making it significant in the government's fiscal policy. Income tax is expected to account for 45 per cent of the total projected government revenue for the financial year 2013/14 (IEA, 2013).

The government expenditure continues to grow at a high rate as the economy grows; the Kenyan budget expanded from 1.45 trillion Kenya shillings in the financial year 2012/13 to 1.64 trillion Kenya shillings in 2013/2014, a 12 per cent increase (IEA, 2013). This can be attributed to major changes in institutions as a result of implementation of the new Constitution 2010, and the implementation of Kenya's long term development plan, Vision 2030. To meet the expanding expenditure, tax revenue has to increase at the same rate or even higher, so as to minimize deficits and support development expenditure. Financing public expenditure through taxes reduces debt burden, promotes economic growth and protects sovereignty of a country. As income tax is the major component of total tax revenue, it is important to understand how such an increase is likely to influence economic performance.

Income tax studies in Kenya have remained sparse. Studies done on taxation in Kenya have not covered the effect of income taxes on economic performance. They have mostly covered other areas such as revenue productivity (Njoroge, 1993), tax reforms (KIPPRA, 2004), taxation of the underground economy (KIPPRA, 2007), and indirect taxation (Otieno, 2003). This can be due to the fact that contribution of income tax to total revenue was less compared to that of indirect taxes such as trade taxes. However, this trend has been changing with income tax contributing 51 per cent of total tax revenue for the period 2007/08. The increase in relevance of income taxes to total revenue necessitates more research work to be conducted in this area. Research should make available more materials on income taxes to policy makers and other economic agents for better decision making. This paper shows how income taxes influence the economy, and provides more information on this sensitive subject.

1.3 Research objectives

This paper seeks to determine the relevance of income taxes to the Kenyan economy. The general objective of the paper is to determine how income taxes affect economic performance in Kenya.

The specific objectives are:

i) Investigate the trend of income tax and economic performance

ii) Analyze the relationship between income tax and economic performance

iii) Recommend income tax policy that will improve economic performance in Kenya.

1.4 Research questions

The research questions are as follows:

i) What is the trend of income tax and economic performance?

ii) What is the relationship between income tax and economic performance?

iii) What are the policy implications of the findings from the study?

1.5 Significance of the study

The share of income taxes has been increasing. As the government tries to raise more revenue to meet the expanding expenditure, raising income tax will be central to this. There is also an increasing need for governments to mobilize their own internal resources (IMF, 2011) to meet public expenditure. Collecting more income tax is one way of ensuring this. The study shows how such increase in income taxes is likely to affect the economy. The findings are relevant to the general public who pay the taxes, the government and the policy makers for planning purposes and tax policy formulation. It provides researchers working on this subject with more insight on the

topic and areas for further research. The findings give a guide on the best tax policy for the country to promote growth, and contribute to existing literature on taxation in Kenya.

1.6 Scope

The paper covers a period of 42 years, starting from 1972 to 2012. The variables are measured at a national level. The period covered is extensive and therefore more likely to give accurate results.

1.7 Organization of the paper

The next chapter covers literature review that has been done on the topic; it gives theoretical and empirical literature review followed by an overview of the same. Chapter Three gives the conceptual framework and the methodology used to achieve the research objective. Chapter Four gives the findings after running the regression model. Chapter Five has the conclusion, policy recommendations and suggests areas for future research.

CHAPTER TWO: LITERATURE REVIEW

The impact of fiscal policy on the economy has been an issue of concern for not only economists but also policy makers. Governments use fiscal policy to control the level of activity in the economy. Fiscal policy is the use of taxes and government spending by the state to control the economy (Truett and Truett, 1987). The state uses contractionary fiscal policy (cut in government expenditure and increase in taxes) to reduce the economic activity, whereas expansionary fiscal policy (increase in government expenditure and tax cuts) is used to increase economic activity. In developing countries, governments use fiscal policy to increase rate of investment and employment, achieve economic stability and redistribute income (Jhighan, 2004).

The relationship between taxes and economic performance however remains an issue of debate among scholars, who are far from reaching a consensus. The theoretical and empirical literature is outlined below.

2.1 Theoretical literature

Adam Smith (1776) in *The Wealth of Nations* recognized the important role of taxes in the economy and gave the characteristics of a good tax system (Canons of taxation) as certainty, equity, convenience and economy. Musgrave and Musgrave (1989) defined a good tax structure as one that yields adequate revenue, is equitable, causes minimal distortion and facilitates stabilization and growth. Keynes (1936) advocated for government intervention in the economy. Keynesian economics support the fact that the aggregate demand influences the level of output in the economy. The government through fiscal policies can influence aggregate demand in the economy.

Keynes advocated for tax cuts to stimulate the economy, and tax increase to dampen the economy. During a depression, he advocates for government intervention by increasing government expenditure and tax cuts to stimulate the economy. Monetarists are however opposed to this view and believe that the money in circulation is what determines the level of output in the economy and tax policy is ineffective.

The sources of economic growth have been explained in growth models such as the Neo-classical growth model and endogenous growth models. Effect of taxes on growth has been incorporated in many growth models including Neo-classical economic growth models, which state that growth is not influenced by policy decisions (Renelt, 1991). Solow neo-classical growth model suggests that taxes affect only the level of income but not the rate of economic growth (Solow, 1956). Changes in tax rate will only cause temporary changes, during the period of transition to steady states. Once steady state is achieved, only technical progress will influence economic growth. Endogenous growth models do not support Solow's assumption that growth is only influenced by technical progress (Renelt, 1991). Endogenous growth models allow growth rate to be determined within the model; growth is influenced by economic policy. Therefore, in this growth model, taxes affect the long run growth rate, through accumulation of physical and human capital. Changes in tax policy will influence the economic growth.

According to economic theory, the economy grows through capital formation, which comes from resource mobilization. Taxes on the resources will discourage production, hence capital formation thereby hurting the economy. Taxes affect capacity output

through work effort, private sector savings and private investment (Musgrave and Musgrave, 1989). Mintz and Wilson (2000) find that productivity of factors influence growth. Taxes can reduce this productivity in various ways. Taxes distort economic decisions resulting in inefficient use of resources. Taxes also reduce the incentive to work and to improve work skills. Taxes may also discourage innovations and adoption of new ideas, since more productivity will increase tax liability and people want to reduce their tax liability as much as possible. High taxes may also result in capital flight. Resources will shift from countries with high taxes to lower tax countries. High corporate taxes lower the rate of return thus discouraging investment hence deterring economic growth. High personal income taxes will discourage savings, which will reduce human capital formation hence impeding growth. Leibfritz et al. (1997) support the view that taxes affect economic growth through its distortionary effects on savings, physical and human capital formation and labor supply.

Theoretical literature supports the fact that taxes hurt the economy (Poulson and Kaplan, 2008). Therefore, a state can lower taxes to promote growth. Engen and Skinner (1996) support the fact that lowering taxes has positive effect on growth. However, they note that, tax cuts create a revenue gap and the state has to raise revenue from other sources to fill the gap. Taxes can also be good for the economy if they provide more and better public goods and services to the citizens, thereby increasing productivity hence economic growth (Leibfritz et al., 1997).

2.2 Empirical literature

Empirical literature gives differing views on the effect of taxes on economic performance. Debate on whether taxes impact negatively or positively on the economy remains inconclusive. The direction of their relationship also remains unclear. Most empirical studies on taxation and economic performance are carried out on a cross country level. A few exist on country specific level.

The GDP of an economy is its total output usually a total of consumption, government purchases, investment spending, and net exports, as shown:

$$Y = C + G + I + NX$$

Where, Y is national output/income, C is consumption, G is government purchases, I is investment spending, and NX is net exports. A change in income tax affects national income (Mankiw, 1993). A decrease in taxes has a multiplier effect on income. It raises disposable income, therefore, increases consumption and planned expenditure leading to a greater increase in national income. Income tax can also reduce the multiplier effect of an increase in consumption or government purchases on national income. However, this effect is on the short run.

Scholars have developed models to explain causes of long run growth of an economy. Engen and Skinner (1996) using a model similar to that of Solow (1956) explain how taxes affect economic growth. Economic growth rate is determined by the growth of the output of the economy. Growth of output is determined by the following expression:

$$\dot{y}_i = \alpha_i \dot{k}_i + \beta_i \dot{m}_i + \mu_i$$

Where: $\dot{y}_i$= real GDP growth rate

$\dot{k}_i$ = growth of capital stock

$\dot{m}_i$= growth rate of effective labor force

μ_i = economy's overall productivity growth

α_i = marginal productivity of capital

β_i = output elasticity of labor.

An increase in capital stock and labor force will increase economic growth. Countries that are highly taxed may experience lower values of α and ß, which will tend to impede economic growth.

Researches on the effect of specific taxes on the economy also exist. Djankov et al. (2010) investigates the effect of corporate taxes on investment and entrepreneurship using panel data for 85 countries. The authors find that effective corporate tax rates have a significant negative correlation to investment, foreign direct investment and entrepreneurship. The corporate taxes are correlated to investment in the manufacturing sector but not in services sector. High corporate taxes will therefore reduce investment hence lowering productivity adversely affecting economic growth. These finds are similar to those of a study by Lee and Gordon (2005), who find corporate taxes to be negatively correlated with economic growth. Low corporate taxes encourage entrepreneurial activity hence promoting economic growth.

Poulson and Kaplan (2008) investigate the impact of state income taxes on economic growth in the United States. The period of study was from 1964 to 2004. Their model is an endogenous growth model of a linear form. They regress relative growth rate on

relative marginal tax rate, relative regressivity, income tax dummy, relative per capita personal income in the initial year, and regional dummy. They find that high marginal tax rate create a disincentive to work and invest hence lower economic growth. Their findings also suggest that all taxes have a significant negative effect on economic growth, but the impact income tax is more than that of other taxes. States with more regressive tax system have higher growth rates than those with more progressive tax systems.

Easterly and Rebelo (1993a) using a panel data of 28 countries for the period 1970-1988, in an empirical study on fiscal policy and economic growth, find no solid evidence that taxes affect growth. The authors find it difficult to isolate effects of taxes on growth from those of government expenditure. Other findings are that poor countries rely heavily on international trade taxes, while developed countries rely on income taxes. Easterly and Rebelo (1993b), point out that from growth theories income taxes impact negatively on economic expansion; income taxes directly influence economic growth.

Plosser (1992) finds a negative correlation between the level of taxes on income and profits as a share of GDP, and growth of real per capita GDP. Taxes on income and profits depress economic growth. The study was conducted on 24 OECD countries for the period 1960-1989. Manas-Anton (1986) examines the interrelationship between output growth and the reliance of the tax system on income taxes in developing countries. The author uses cross country to estimate multiple regressions containing determinants of growth. The regressions showed that the ratio of income taxes to total tax revenue and the output growth rate are negatively related, but this does not hold

for all specifications, hence negative relationship between growth rates and the reliance of a country on income taxes cannot be asserted with confidence. Skinner (1988) investigates the effect of government spending and taxation on output growth, using data from 31 African countries for the period 1965 to 1982. The author finds that income, corporate, and import taxes will lead to greater reductions in the growth of output than export and sales taxes.

King and Rebelo (1990) use a simple endogenous model to show the effect of income taxes on growth. They find that, an increase in income tax by 10 percent causes a drop in economic growth by 2 percent. High income taxes will lower the rate of return, which reduce the rate of capital accumulation thus lowering long run growth rates. Engen and Skinner (1992) using data for 107 countries for the period 1970-1985, find that fiscal policy can be both good and bad for growth. The distortionary effects of taxes hurt economic growth, while public goods and infrastructure promote economic development. Their empirical results reveal a significant and negative impact of fiscal policy on output growth rates in the short-term and the long-term. They also point out that taxes on labor income may impact output growth differently from corporate, interest and trade taxes. The effect of labor tax on output growth depends on labor supply elasticity in the short term; in the long run the effect is ambiguous.

Engen and Skinner (1996) have suggested that replacing the income tax with a consumption tax, can increase work effort, savings and investment, thus boosting economic growth. They show that increase in taxes rates in the US are accompanied by a decline in economic growth rate. Their empirical estimation reveals a negative relationship between taxes and growth, which is not very strong, but they note that the

small effect can make large cumulative impact on the economy. Cashin (1995) investigate the impact of government spending and taxes on economic growth using an endogenous growth model, using panel data for the period 1971-1988, for 23 developed countries. The author finds that distortionary taxes hamper growth while provision of public capital and transfer payments promote growth. Leibfritz et al. (1997) using a cross country analysis for OECD countries, over a period of 35 years, find that an increase in the average tax rate by 10 percent reduced growth rate by 0.5 per cent. Using simulation they find that reduction in corporate taxes has the largest impact on output, reduction in labor taxes increase employment while consumption taxes have the least effect.

Bahl and Bird (2008) analyze the characteristics of tax policy in developing countries for the past 30 years using cross country data. They find that, for the developing economies, revenue from international trade taxes has declined due to opening up of the economy, and personal income taxes have been playing a limited role due to existence of large informal sector that is difficult to tax. They propose that governments should not overtax to ensure that variables such as savings, investment and work effort that promote growth are not adversely affected. Having a broad tax base, that encompasses both income and consumption taxes, is good for the economy.

A study by Chang (2006) use an intertemporal optimizing growth model to examine whether relative wealth induced status determines how consumption tax affects growth. The finding was that, when individuals care about their relative wealth, an increase in consumption tax will increase capital growth and consumption hence improving economy's long run growth rate.

Slemrod (1995) carries out a cross country study on government involvement, prosperity and economic growth. The author finds a strong positive association between taxes and economic performance in the developed countries. This is demonstrated this using time-series data for real GDP per capita and the ratio of taxes at all levels of government to GDP, for the period 1929-1992 for the United States.

Among the OECD countries, there is no obvious correlation for either tax or expenditure and prosperity. However, there is a positive correlation when high-tax OECD countries and the rest of the world are included in the sample. Slemrod also shows a significant negative partial association between growth and a measure of government involvement, by comparing tax-to-GDP ratio and the ratio of government expenditures to GDP with growth for OECD countries. The author concludes that, there is not much persuasive evidence to show whether government involvement influence the economic performance either positively or negatively.

Mendoza et al. (1996) examine the effect of tax policy on growth using endogenous growth model. They find that changes in the tax policy relating to private investment are economically and statistically significant, but are not sufficiently strong to influence growth. This study supports Harbeger (1964) who, using a growth-accounting framework, shows that changes of both direct and indirect taxes have negligible effects on growth of output. This is because taxes have negligible effects on the growth of labor supply and on labor's income share thus savings and investment are not large enough to support economic growth.

The IMF studies (Goode, 1984) analyze the relationship between taxes and economic performance. The main variables in their model are tax ratio and per capita income. Tax ratio is the ratio of total taxes to GDP. Openness of the economy and economic structure are included for control. Openness of the economy is measured by the level of foreign trade; it is the total of imports and exports expressed as a ratio of GDP. The economic structure is measured by the relative size of agriculture and mining sector. The IMF studies are cross country studies. When the developing countries are taken together with developing countries, the per capital income is found to be positively related to the tax ratio, with a high correlation coefficient ($R^2 = 0.61,\ n = 72$). However, when the developing countries are taken separately, the correlation between tax ratios and per capita income is weak and doubtful, (Goode, 1984). The effect of per capita income on tax ratio is positive but doubtful for developing countries. Openness of the economy has a positive impact on taxes, while agriculture has a negative relationship to taxes because it is hard to tax and sensitive sector.

Studies on taxation in Kenya have covered aspects like tax performance, indirect taxes and revenue productivity among others, but a few have touched on taxes and growth. A study by Wawire (1991) on tax performance in Kenya analyzes tax ratios, tax effort indices, tax ratio buoyancy, and per capita income elasticities of various tax ratios. The findings were that tax ratios increase with per capita income, volume of international trade, economic activity such as manufacturing and mining. The author concludes that tax ratio is greatly determined by the economic structure. Otieno (2003) analyzes the impact of indirect taxes on economic growth in Kenya using a simplified endogenous growth model. The uses time series data for the period 1970 –

2000. The results confirm that indirect taxes cause distortion in market decisions and consequently impact negatively on the economy.

Gachanja (2012) did a study on economic growth and taxes in Kenya, using time series data for the period 1971-2010. The study reveals a positive relationship between the economic growth and taxes. All the taxes (income tax, import duty, excise duty, sales tax and VAT) show a positive correlation to GDP, with income tax having the highest effect. Gachanja (2012) also tests for the direction of causation of the variables using Granger Causality test, and finds reversal causality between economic growth and excise tax, and a unidirectional relationship between income taxes and economic growth, and economic growth and VAT. Gachanja (2012) points out that different uses of tax revenue affect growth differently. The model however fails to capture variables other than taxes that influence GDP, such as government expenditure and investment.

2.3 Overview of Literature

The debate on the impact of taxes on the economy has gone on through the years without reaching a consensus. While most theoretical literature identify fiscal policy particularly taxes as a driver of economic growth and development (Musgrave and Musgrave, 1989), the existing empirical literature fails to give a definite direction on how taxes influence the economy. The direction of causation of taxes and growth is not clear. Endogenous growth models have been used to study how taxes influence growth, on a cross country level. Most of the empirical studies reveal that taxes adversely affect the economy. A few studies have isolated the impact of income taxes on the economy such as the study by Poulson and Kaplan (2008) which found income

tax having a significant negative impact on economic growth. Other studies covered the effect of income taxes together with other taxes, on the economy. Studies by Easterly and Rebelo (1993b), Plosser (1992), King and Rebelo (1990), and Engen and Skinner (1992) find a negative relationship between income taxes and growth. Lee and Gordon (2005) find a negative relationship between corporation taxes and growth. Manas-Anton (1986) and Engen and Skinner (1996) find a weak negative correlation between income tax and growth. Gachanja (2012) finds a positive relationship between income tax and GDP. According to Skinner (1988) and Poulson and Kaplan (2008), income taxes will lead to larger reductions in growth than other taxes.

Empirical studies reveal positive, negative or weak correlation between taxes and growth. Gachanja (2012) found a positive relationship between taxes and growth. According to Chang (2006) consumption tax will increase economic growth when individuals care about their wealth induced status. The negative relationship between taxes and economic growth has been supported by many authors: Manas-Anton (1986), King and Rebelo (1990), Plosser (1992), Engen and Skinner (1992), Cashin (1995). However, Slemrod (1995) finds a positive correlation, no correlation and also a negative correlation. Mendoza et al. (1996) support Harbeger's neutrality which proposes that tax policy has no impact on the economic growth. Evidence supports that taxes have an impact on the economy; high taxes are bad for economic growth with corporate taxes having the highest impact followed by individual income taxes, and consumption and property taxes having less impact. McBridge (2012) attributes this to the fact that economic growth is a result of production, innovation, and risk-taking.

Studies done on taxation in Kenya have not focused on its impact on the economic performance. Most studies have dealt with tax reforms, revenue productivity and specific taxes such as sales and excise tax (Osoro, 1993; Njoroge, 1993; Gatuku, 2011; Oketch, 1993; Mwanamaka, 1997). A study by Gachanja (2012) focused on the effect of all taxes on growth in Kenya. There is no study that has isolated the impact of income taxes on economic performance in Kenya. The income tax to total tax revenue ratio has continued to increase compared to other taxes, making it a significant variable in economic decision-making. Studies on income tax are important to policy makers and other economic agents. This paper adds to the existing stock of knowledge and tries to fill the information gap, by exploring the effect of income taxes on the Kenyan economy.

CHAPTER THREE: METHODOLOGY

This chapter specifies the model used to analyze the relationship between income taxes and economic performance. The study utilizes economic theory and econometric models to define this relationship. This chapter lays out the regression equation, the type of data, the statistical methods used and limitations of the study.

3.1 Theoretical Framework

Different kinds of models have been developed to explain the sources of growth. These can be categorized into two broad categories: the exogenous and endogenous growth models. The neo-classical models such as Harrod-Domar growth model and Solow growth models are exogenous growth models. They have many exogenous parameters used to determine both the steady-state capital stock and the long-run economic growth rate such as savings rate, depreciation rate, population growth rate and the rate of technological progress. The endogenous growth models were developed to overcome this problem where some parameters were exogenously determined. Endogenous growth models allow key determinants of growth to be determined within the model.

Endogenous growth models allow policy to determine economic growth. The model introduces effects of externalities, imperfect competition, the absence of diminishing returns, and public policy on capital in the growth process. The basic structure for the growth regression is to regress the per capita GDP growth rates on a set of standard variables that have been found to be robust in earlier studies; initial income, educational attainment, and the population growth rate (Barro, 1991). The control

variables include the share of investment in GDP, terms of trade, fiscal policy, and quality of bureaucracy (Levine and Renelt, 1992).

3.2 Model Specification

Lee and Gordon (2005) in their cross-country study on how tax structure impacts on growth use an endogenous growth model specified as follows. The study covers the period 1970-1997.

$$GR_i = \beta_0 + \beta_1\tau_i + \beta_2 t_i + \beta_3 s_i + X\gamma + e_i$$

GR_i is an annual growth rate of GDP per capita from 1970 to 1997, τ_i is the top statutory corporate tax rate in the 1980s, t_i is a representative personal income tax rate, s_i is the consumption tax rate, and $X\gamma$ is a control vector. The control vector includes the log of GDP per capita, government expenditures over GDP, the primary school enrollment rate, a measure of trade openness, the average tariff rate, an index for corruption and the quality of the bureaucracy, the average inflation rate and the annual rate of population growth. They find that corporate taxes affect growth negatively. Other taxes do not significantly impact on economic growth.

This paper used a model similar to the one used by Lee and Gordon (2005). Economic performance is the dependent variable, measured by the growth rate of the GDP per capita. The independent variable is income taxes. Other variables for control are included such as consumption taxes, foreign trade, government consumption, and population growth. The conceptual framework of the model is as follows:

GDP per capita growth rate = f (income taxes, consumption taxes, foreign trade, government consumption, population growth)

The main variables are real GDP per capita growth rate and income taxes. GDP per capita measures the amount of national output attributable to each individual in the economy. It measures productivity per person. It is also considered a measure of standards of living; a higher the GDP per capita indicates higher the standards of living while low GDP per capita coincides with high levels of poverty. In our case, GDP per capita growth rate follows an endogenous growth model: it is dependent on both physical and human capital accumulation, and other externalities that may cause a spillover effects on growth such as tax policy and trade openness.

Income tax includes PAYE, corporation tax and withholding tax. It determines the level of capital accumulation through its impact on incentive to work and invest, thereby impacting on the national output. It is expected to affect economic performance negatively since high taxes discourage productivity (Poulson and Kaplan, 2008). Low income tax on the other hand will encourage entrepreneurship, increase incentive to work and to improve human skills thereby increasing the overall productivity of the economy.

Consumption taxes, foreign trade, government consumption and population growth are control variables. These variables have significant impact on the economic performance as indicated by previous studies on economic growth (Barro (1991), Frankel and Romer (1995), Sachs and Warner (1995), Barro(1996)), hence the need to incorporate them in the model.

Consumption tax is a total of VAT or sales tax and excise duty. It is expected to negatively affect economic activity since they lower savings, hence reduce capital formation (Otieno, 2003). The volume of foreign trade is measured by the total of exports and imports. An increase in foreign trade is an indication of increased economic activity hence it is expected to positively affect economic performance (Lee and Gordon, 2005).

Barro (1991) found government consumption to be inversely related to growth and investment. He attributed this to the fact that government expenditure on consumption has no direct impact on private productivity but rather a distortionary effect through taxation and transfer programs. Population growth on the other hand positively relates to growth; as population grows labor increases hence productivity thus the expected positive relationship with economic performance (Goode, 1984).

The linear functional form is outlined below:

$$GR_i = \propto_0 + \propto_1 IT + \propto_2 CT + \propto_3 FT + \propto_4 G + \propto_5 PP + e_i$$

Where,

GR_i *= annual growth rate of GDP per capita (%)*

IT = Income tax ratio to GDP

CT= Consumption tax ratio to GDP

FT= Foreign trade, determined as the ratio of total of exports and imports to GDP

G = Government consumption, determined as a percentage of GDP

PP= Population growth rate

e_i *= Error term*

Table 1: Variable definition and hypothesized relationship

Variable	Measurement	Expected sign and literature source
Economic performance (GR_i)	Annual growth rate of GDP per capita (%)	Dependent variable
Income Tax (*IT*)	Income tax ratio to GDP	-ve (Poulson and Kaplan, 2008)
Consumption tax (*CT*)	Consumption tax ratio to GDP	-ve (Otieno, 2003)
Foreign trade (*FT*)	ratio of total of exports and imports to GDP	+ve (Lee and Gordon, 2008)
Government Consumption (*G*)	Government consumption as a percentage of GDP	-ve (Barro, 1991)
Population growth (*PP*)	Population growth rate	+ve (Goode, 1984)

The model is linear. The parameters of the model will be estimated using ordinary least squares (OLS). OLS minimizes the sum squared errors and yields best linear unbiased estimators.

3.3 Data type, sources, and analysis

The study relied entirely on secondary sources of data. The specific data sources are Statistical Abstracts (Kenya National Bureau of Statistics), World Development Indicators from the World Bank database and data from Kenya Revenue Authority. The study covers the period starting from 1970 to 2012.

Classical Linear Regression Model is used. The data used is time series data. A number of tests were conducted on the model to check whether the model is correctly specified, reliable for prediction and to ensure the regression is not spurious.

3.3.1 Statistical Tests

The use of time series data made it necessary to test for stationarity. Presence of stationarity may result in spurious or inconsistent regression. A series is stationary if its mean and variance are independent of time, and it is integrated of order zero, $I(0)$. A non-stationary series has time dependent mean and variance, and its order of integration is one or higher. Presence of stationarity indicates long run relationship between the dependent variable and regressor. Augmented Dickey Fuller (ADF) test was used to test for stationarity. The test utilizes the order of integration; if order of integration is zero the series is stationary, if it is one or higher, the series is non-stationary. A non-stationary series has one or more unit roots. Non-stationary series are differenced to make them stationary.

Once the series is stationary, the parameters were estimated using OLS. Probability values were used to check the significance of the coefficients of independent variables and F-test to test the overall significance of independent variables.

Co-integration test was conducted on non-stationary series to know if there are any cointegrated equations. Cointegration avoids spurious and inconsistent regression while dealing with non-stationary series. It checks the nature of long run relationship in a non-stationary series. When two non-stationary series are combined to form a stationary series, they are said to be co-integrated. Cointegration enables us to utilize the estimated long run parameters to estimate short run equilibrium relationships. Johansen Cointegration test was used to test for co-integration. This test identifies if there exists a long run relationship between economic performance and income tax. If the series is co-integrated, estimation is done in a Vector Error correction Model

(VECM). According to Engle and Granger (1987), a co-integrated series is best represented by an error correction specification (Engle-Granger representation Theorem). A VECM shows long-term trend of the variables, and how the trend reacts to any disturbances in the short run.

3.4 Limitations of the study

There were data inconsistencies as the study relied on data from different secondary sources. However great care was exercised to ensure the data was reliable in estimating the model. This was done by ensuring that data to measure one variable was obtained from one single source for the entire period under study, and using ratios for consistency.

CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter presents the trend of main variables, summary and discussion of the findings of the study.

4.1 Trend in Kenya

The main variables are economic growth (GR) measured by the GDP per capita growth rate; and income tax (IT) measured as a ratio of the GDP. The trends of the variables are as illustrated below:

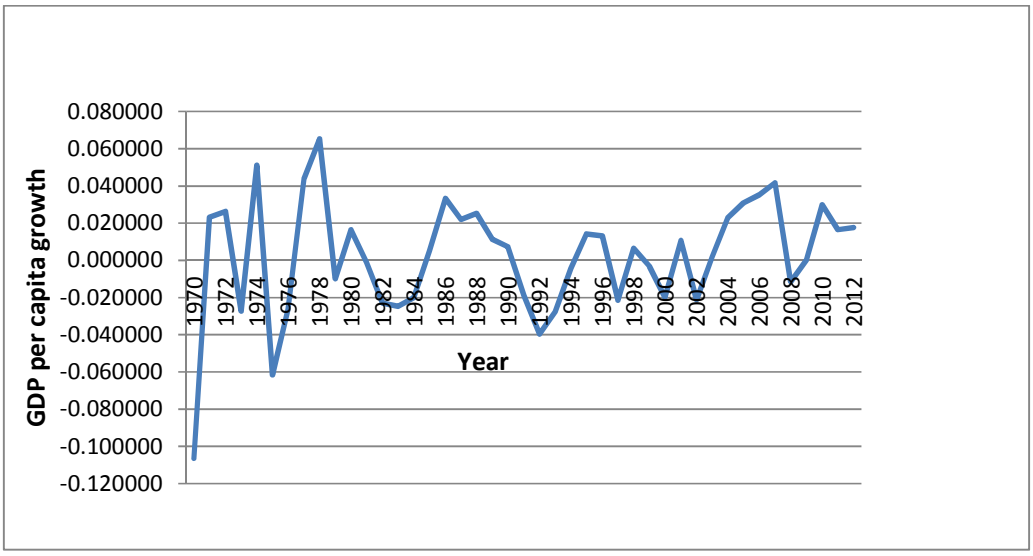

Figure 3: GDP per capita growth rate
Source: World Bank, World Development Indicators (1970-2012)

From the diagram, it can be observed that the growth rate of GDP per capita has been fluctuating, with the highest being achieved in the year 2007 and the lowest in 1978.

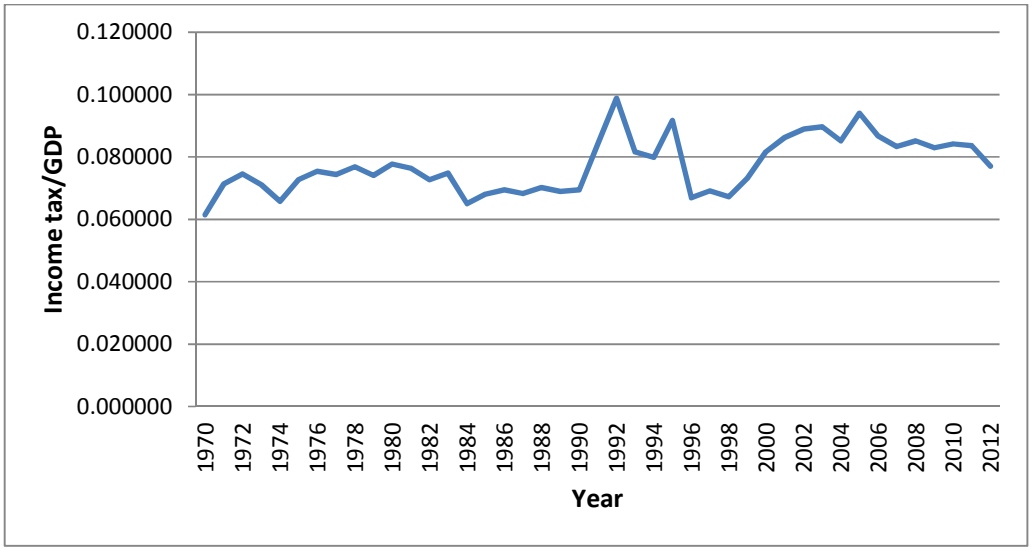

Figure 4: Income tax as a ratio of GDP
Source: Gok, KNBS (1970-2012)

The income tax ratio to GDP has been rising steadily with a few fluctuations. It has been ranging around 8 per cent. The fluctuations can be attributed to economic shocks such as the 1973 oil shock, the post election violence in 2007. The economic shock cause a decline in economic activity, which means businesses make little or no profits hence less income available for taxation. The economy takes time to recover hence the fluctuating trend of income taxes.

4.2 Descriptive Statistics

The model has six variables. The dependent variable is economic performance which is measured ad the GDP per capita growth rate. The independent variables are income tax, consumption tax, foreign trade, government consumption and population growth rate. The descriptive statistics for the variables is as follows:

Table 2: Descriptive statistics

```
. sum  gdppercapitagrowth income_tax constax xmgdp govt ppg
```

Variable	Obs	Mean	Std. Dev.	Min	Max
gdppercapi~h	43	.0024141	.0313803	-.106503	.06529
income_tax	43	.0771911	.0086891	.061421	.098793
constax	43	.069133	.0188348	.025965	.099356
xmgdp	43	.6044653	.0739507	.477028	.745734
govt	43	.1726617	.013258	.1448	.198034
ppg	43	.0326141	.0049675	.026138	.038972

The variables are defined as follows:

gdp per capi = GDP per capita growth rate
income_tax = income tax as a ratio of GDP
constax = consumption tax as a ratio of GDP
xmgdp = total of exports and imports as a ratio of GDP (foreign trade)
govt = government consumption
ppg = population growth rate

There are 43 observations in our data, starting from the year 1970 to 2012. The variables have small standard deviations. The mean of the growth rate of GDP per capita is 0.2 per cent, with a minimum of negative 10 percent in the year 1970 and the maximum of 6.5 per cent in the year 1978. The ratio of income tax to GDP has mean of 7.7 per cent with a minimum of 6.1 per cent in the year 1970 and a maximum of 9.8 per cent in 1992.

4.3 Pre-estimation Tests

4.3.1. Unit root test

Augmented Dickey Fuller test was conducted to check whether the variables have a unit root. The null hypothesis it that there is a unit root. The alternative hypothesis is that there is no unit root. If the absolute value of test statistic is higher than the absolute value of the critical value we reject null, therefore there will be no unit root, which means the variable is stationary. If the absolute value of test statistic value is lower than the absolute value of the critical value we do not reject null, therefore there

will be a unit root, which means the variable is non-stationary. The natural log of GDP per capita growth rate was stationary at level. All the other variables were non-stationary at level at 99 per cent confidence level. To make them stationary they were differenced once. After first difference, natural log of income tax, consumption tax, foreign trade and government expenditure became stationary. The natural log of population growth rate was differenced twice to make it stationary.

4.3.2. Johansen Cointegration test

Johansen cointegration test was carried out to test the presence of a long run relationship among variables. The test has two test statistics; Trace statistic and Max-Eigen statistic. We test the null hypothesis that there is no cointegration (see appendix). Trace test indicates two cointegrating equations at 5 per cent level. Max-Eigen test also indicates presence of two cointegrating equations at 5 per cent level. The results indicate presence of two cointegrating equations. There is presence of a long run relationship. This means that Vector Error Correction Model (VECM) can be used to estimate the model.

4.4 Regression Model

OLS is used to run regression model. The natural log of GDP per capita growth rate (*LNGDP*) is regressed on the natural log of the first difference of income tax variable (*LNINCOME_TAX1*), consumption tax *(LNCONSTAX1*), foreign trade *(LN_X_M_GDP1*) and government expenditure (*LNGOVT1*), and the natural log of the second difference the population growth variable (*LNPPG2*). The differencing was done to make the variables stationary. The results are follows:

Table 3: Estimation of Regression Model

Dependent Variable: LNGDP
Method: Least Squares
Sample (adjusted): 1972 - 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001467	0.001662	0.882368	0.3836
LNINCOME_TAX1	-0.046059	0.044462	-1.035915	0.3073
LNCONSTAX1	0.028457	0.023785	1.196460	0.2396
LN_X_M__GDP1	0.046635	0.040334	1.156223	0.2554
LNGOVT1	0.190652	0.082281	2.317095	0.0265
LNPPG2	0.332531	0.641151	0.518646	0.6073

R-squared	0.283540	Mean dependent var	0.001824
Adjusted R-squared	0.181189	S.D. dependent var	0.011632
S.E. of regression	0.010525	Akaike info criterion	-6.135600
Sum squared resid	0.003877	Schwarz criterion	-5.884833
Log likelihood	131.7798	Hannan-Quinn criter.	-6.044284
F-statistic	2.770263	Durbin-Watson stat	1.353303
Prob(F-statistic)	0.032809		

Income tax has a negative relationship with the GDP per capital growth rate. From the results, a unit increase in income tax to GDP ratio is likely to reduce the growth rate of GDP per capita by 4.6 per cent. This negative relationship is however not significant. The results are different from what was predicted in Chapter Three. We expected an adverse significant relationship between the main variables (Poulson and Kaplan, 2008, Lee and Gordon, 2005). From the literature, income tax reduces capital formation and productivity hence adversely affecting the economy (Musgrave and Musgrave, 1989). The results of a non-significant negative relationship between income tax and economic performance can be attributed to how the economic performance was measured. Different studies measure variables differently. This study chose to measure economic performance through GDP per capita growth rate, different from most studies which have used GDP (Gachanja, 2012),, GDP per capita (Goode, 1984), and GDP growth rate (Engen and Skinner, 1996) among others. This

measure of economic performance was chosen to capture all the aspects of economic performance; total output, labor productivity and welfare of the people.

The findings of weak negative correlation between income tax and economic performance concur with those of a few other studies (Manas-Anton ,1986; Easterly and Rebelo, 1993a). Easterly and Rebelo (1993a) attribute the weak correlation to the fact that it is difficult to isolate the effect of tax policy on growth. The results are similar to those of Harbeger (1964) who concluded that tax policy is not strong enough to influence growth.

Consumption tax has a positive correlation with economic performance. This relationship is however not significant in this study. Literature predicted a negative relationship; consumption tax is an indirect tax, which causes distortion in market decisions and consequently impact negatively on the economy (Otieno, 2003; Gachanja, 2012). The positive relationship can be explained by the fact that, consumption tax will encourage savings hence capital formation and thus improving the economy's long run growth rate (Chang, 2006). This study supports the monetarists' view that policy such as tax policy is ineffective in determining the economic performance.

Foreign trade, which is measured as a ratio of the total of exports and imports to GDP, will positively affect economic performance in the model estimated though this effect is not significant. Literature indicates that high volume of foreign trade corresponds with a high level of economic activity, which is good for the economy (Lee and Gordon, 2005). However, the results of this study are different and indicate that the

volume of trade does not significantly influence economic performance. The different results can be explained by the fact that the economic performance was measured by GDP per capita growth rate and not the GDP growth rate which is directly, reflects the level of economic activity.

The estimated model indicates that government consumption is good for the economy. This is different from the predicted negative relationship. Barro (1991) suggested that government consumption has no direct impact on private productivity but rather a distortionary effect hence negatively affecting the economy. In this study, there is a significant positive relationship. This means that government consumption improves the economic performance. Consumption on public investment such as infrastructure and social amenities is likely to improve welfare of the people and the overall economic performance.

The variable for population growth was also analyzed to show its effect on economic performance. The results show a positive relationship, though not significant. Goode (1984) suggests a positive relationship since population growth is associated with more labor thus increased productivity. An increase in population will lead to improved economic performance. Our results however are different from priori specification, and indicate that population growth does not significantly influence economic performance.

All the independent variables are statistically significant in explaining the dependent variable. The overall f-statistic is 3.2 per cent. Therefore, we reject the null hypothesis that the coefficient of independent variables is zero. This means the independent

variables explain the dependent variable. They explain 28 per cent of variations in the dependent variable. Standard errors for coefficients are small. Durbin-Watson statistic is 1.35, which is close to 2, and indicates absence of autocorrelation.

The data was also used to fit a Vector Error Correction Model (VECM). Johansen cointegration test showed that there were two cointegrated equations, which allows fitting of a VECM. The cointegrated equations show how the time series adjust from disequilibrium. Negative error correction terms are desirable, and they mean that disequilibrium will correct itself. If the error correction term is positive, it means the series is explosive and not reasonable. Deviations in income tax, consumption tax, government expenditure, and population growth rate are significant in determining the long run relationship, while deviations in the foreign trade are not.

The VECM model has 90 coefficients though not all of them are significant (see appendix). At 95 per cent confidence level, income tax is significantly influenced by the foreign trade and population growth rate in the long run. Income tax is also significantly determined by its own lag and that of consumption tax in the long run at 90 per cent confidence level. Consumption tax is significantly influenced by income tax. Consumption tax significantly affects the long run growth rate of GDP per capita negatively, at 90 per cent confidence level. The effect of both the differenced and lagged income tax variable on GDP per capita growth rate is negative though not significant due to the high probability values. The results confirm those found in the OLS parameters estimation. Therefore, it can be concluded that income tax does not have a significant impact on the growth rate of GDP per capita.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This is the final chapter of the paper. It summarizes the findings, draws conclusions from the study, offers policy recommendations, and suggests areas for further research.

5.1 Summary of Findings

The objective of this research was to show how income tax influences the economic performance. The objective was achieved by running a regression with economic performance as the dependent variable and the independent variables were income tax, consumption tax, foreign trade, government consumption, and population growth rate. Economic performance was measured by the GDP per capita growth rate, while income tax, consumption tax, foreign trade, government consumption were measured as ratios of GDP.

OLS parameters were estimated. From the results, income tax has a negative effect on economic performance though this effect is not significant. Consumption tax and foreign trade have a positive relationship with the economic performance, but it is not significant. Government consumption was found to have a significant positive correlation with economic performance. Population growth rate was found to affect economic performance positively, but this relationship was not significant.

The regression was also fitted in VECM. Johansen cointegration test revealed presence of long run relationship among the variables. In the VECM, it appears there is long run relationship among variables used, but no significant relationship between income tax and GDP per capita growth rate. Income tax influences the economic performances negatively, but this relationship is weak and not statistically significant. The VECM and OLS gave similar result of a negative correlation that was not significant. This means there is no significant relationship between income tax and economic performance in Kenya.

5.2 Conclusions

The income tax ratio to total revenue has been increasing at a higher rate compared to other taxes such as consumption taxes. The regression results show a negative effect of income taxes on the Kenyan economy, though not significant. Consumption tax has a positive effect on the economy that is not one significant. Taxes are an important element of the economy, and governments cannot run without them. This study however, shows that the effect of taxes on the economy, whether income tax or consumption tax, are not large enough to influence the economic performance.

Foreign trade and population growth rate are not significant determinants of the how well the economy is doing. Government consumption was the only variable with a significant positive effect on economic performance. This was attributed to the fact that, expenditure by government on public investment increases productivity and leads to improved economic performance. Government spending also has a multiplier effect on the national income, thereby improving economic performance. The Kenyan government has been investing heavily in infrastructure such as construction of roads

and rail transport. This is likely to help improve the economic performance of the country.

5.3 Recommendations

The findings of this study indicate that income tax is not significant determinant of economic performance. Consumption tax is also not an important determinant of how well an economy is doing. However, mobilizing internal revenue to finance expenditure is good for the economy (IMF, 2011). The government should increase efficiency in revenue collection. The revenue administrators (KRA) should also raise public awareness about taxes to increase compliance levels. They should also broaden the tax base to increase revenue collection. A broad tax base that includes both income tax and consumption tax is good for the economy (Chang, 2006). UN (2008) also advocates for broader tax base, lower tax rates and closing tax loopholes by developing countries to enhance revenue collection.

The study also proposes that government expenditure is good for the economy. Therefore, to improve economic performance the government should spend more. Taxes collected can be used to provide more public goods and services, which enhance productivity and hence economic growth (Leibfritz et al., 1997). Expenditure on public investments like infrastructure, education institutions and health facilities will improve productivity, increase national output and thus improve the economic performance.

When making tax policies, policy makers in Kenya should consider expenditure needs of the people, alternative sources of finance, effect of taxes on other economic variables, administration capabilities, and political acceptability of the program (Goode, 1984). Changes in tax policy could have far-reaching effects that may not have been captured in this study, such as capital flight and political instability. Thus, proper care needs to be exercised when making such decisions to ensure that the expected outcome is achieved.

5.4 Areas for future research

Studies focusing on income tax in the country are scarce, and this should motivate researchers to do more work in this field. The paper suggests areas for further inquiry such as improvement on the model specification to increase its explanatory power. Further checks for robustness of the model can be conducted. Different measure of economic performance can be applied to check whether the results remain the same. Further research can be conducted on the same subject to support or improve the findings of this study. Research can also be conducted to show how income tax affects the various aspects of economic performance such as labor productivity, social welfare and income distribution separately. The subject of income tax is quite wide and the avenues for research in this subject are limitless. More researchers are therefore urged to do more work in this field of research.

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APPENDICES

Appendix 1: Test Results

a) ADF Test Results

Table 4: Augmented Dickey Fuller (ADF) Test

ADF Test results

	At level		**1st difference**		**2nd difference**	
Variable	**test statistic**	**Prob**	**test statistic**	**Prob**	**test statistic**	**Prob**
LNGDP	-7.2223	0.0000				
LNINCOME_TAX	-3.3575	0.0184	-7.6647	0.0000		
LNCONSTAX	-2.6440	0.0925	-6.9353	0.0000		
LN_X_M__GDP	-2.8661	0.0580	-7.5597	0.0000		
LNGOVT	-2.1732	0.2187	-6.4216	0.0000		
LNPPG	-1.5077	0.5193	-1.7814	0.3839	-5.2878	0.0001
critical values: 1%	-3.5966		-3.6105		-3.6105	
5%	-2.9332		-2.9390		-2.9390	
10%	-2.6049		-2.6079		-2.6079	

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Where, LNGDP = the natural log of GDP per capita growth rate.

LNINCOME_TAX = natural log of income tax

LNCONSTAX = natural log of consumption tax

LN_X_M__GDP = natural log of foreign trade

LNGOVT = natural log government expenditure

LNPPG = natural log of population growth rate

b) Johansen Cointegration Test Results

Table 5: Johansen cointegration Test

Sample (adjusted): 1972 2012
Included observations: 41 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDP LNCONSTAX LN_X_M__GDP LNGOVT LNINCOME_TAX LNPPG
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.767287	149.1889	95.75366	0.0000
At most 1 *	0.655247	89.41302	69.81889	0.0006
At most 2	0.383171	45.75098	47.85613	0.0778
At most 3	0.321929	25.94128	29.79707	0.1305
At most 4	0.160388	10.01263	15.49471	0.2798
At most 5	0.067042	2.845182	3.841466	0.0916

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.767287	59.77592	40.07757	0.0001
At most 1 *	0.655247	43.66204	33.87687	0.0025
At most 2	0.383171	19.80971	27.58434	0.3544
At most 3	0.321929	15.92865	21.13162	0.2291
At most 4	0.160388	7.167444	14.26460	0.4695
At most 5	0.067042	2.845182	3.841466	0.0916

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

Appendix II: VECM Model

The Vector Error Correction Es**timate**s results from E-views are given below

Table 6: Vector Error Correction Estimates

Date: 08/04/14 Time: 18:56
Sample (adjusted): 1973 2012
Included observations: 40 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2
LNGDP(-1)	1.000000	0.000000
LN_X_M__GDP(-1)	0.000000	1.000000
LNCONSTAX(-1)	-0.046837 (0.01281) [-3.65513]	-1.124246 (0.12831) [-8.76191]
LNGOVT(-1)	-0.079699 (0.06814) [-1.16959]	5.838886 (0.68234) [8.55717]
LNINCOME_TAX(-1)	-0.029257 (0.05103) [-0.57336]	-1.056788 (0.51095) [-2.06829]
LNPPG(-1)	0.030687 (0.03756) [0.81709]	-1.582060 (0.37606) [-4.20691]
C	-0.104065	-0.157631

Error Correction:	D(LNGDP)	D(LN_X_M__GDP)	D(LNCONSTAX)	D(LNGOVT)	D(LNINCOME_TAX)	D(LNPPG)
CointEq1	-0.083618 (0.51137) [-0.16352]	-0.459660 (1.62522) [-0.28283]	8.148431 (2.74922) [2.96390]	2.211669 (0.69247) [3.19391]	0.063949 (1.27992) [0.04996]	-0.018911 (0.03453) [-0.54768]
CointEq2	-0.026350 (0.03702)	0.124791 (0.11767)	-0.204970 (0.19905)	-0.220832 (0.05014)	0.038739 (0.09267)	0.007386 (0.00250)

	[-0.71168]	[1.06050]	[-1.02973]	[-4.40458]	[0.41803]	[2.95442]
D(LNGDP(-1))	-0.240016	-0.610812	-5.500347	-0.922129	0.309096	0.035808
	(0.33398)	(1.06146)	(1.79557)	(0.45226)	(0.83594)	(0.02255)
	[-0.71865]	[-0.57544]	[-3.06328]	[-2.03892]	[0.36976]	[1.58783]
D(LNGDP(-2))	-0.220921	-0.430870	-3.140310	-0.468501	-0.615399	0.006262
	(0.23259)	(0.73922)	(1.25046)	(0.31496)	(0.58216)	(0.01571)
	[-0.94983]	[-0.58287]	[-2.51132]	[-1.48749]	[-1.05709]	[0.39870]
D(LN_X_M__GDP(-1))	-0.015324	-0.288435	-0.087040	0.095712	0.177727	-0.010333
	(0.06227)	(0.19792)	(0.33480)	(0.08433)	(0.15587)	(0.00420)
	[-0.24607]	[-1.45734]	[-0.25998]	[1.13499]	[1.14023]	[-2.45730]
D(LN_X_M__GDP(-2))	-0.047598	-0.145363	0.176594	0.062745	0.436417	-0.007380
	(0.06206)	(0.19723)	(0.33363)	(0.08403)	(0.15532)	(0.00419)
	[-0.76702]	[-0.73704]	[0.52932]	[0.74667]	[2.80974]	[-1.76132]
D(LNCONSTAX(-1))	-0.071403	-0.057051	-0.336941	-0.089322	-0.183582	0.003029
	(0.03936)	(0.12511)	(0.21163)	(0.05330)	(0.09853)	(0.00266)
	[-1.81394]	[-0.45602]	[-1.59214]	[-1.67570]	[-1.86330]	[1.13957]
D(LNCONSTAX(-2))	0.014600	-0.101647	-0.130099	-0.006866	-0.015056	0.004494
	(0.03637)	(0.11560)	(0.19555)	(0.04926)	(0.09104)	(0.00246)
	[0.40138]	[-0.87927]	[-0.66528]	[-0.13939]	[-0.16537]	[1.82992]
D(LNGOVT(-1))	-0.059123	-0.410651	0.518513	0.424717	0.017067	-0.014146
	(0.15770)	(0.50121)	(0.84785)	(0.21355)	(0.39473)	(0.01065)
	[-0.37490]	[-0.81931]	[0.61156]	[1.98880]	[0.04324]	[-1.32841]
D(LNGOVT(-2))	0.071830	-0.694651	0.275760	0.385410	0.226742	-0.007726
	(0.15211)	(0.48345)	(0.81780)	(0.20599)	(0.38073)	(0.01027)
	[0.47221]	[-1.43687]	[0.33720]	[1.87106]	[0.59554]	[-0.75219]
D(LNINCOME_TAX(-1))	0.003949	0.128427	-0.488526	-0.281490	-0.383291	-0.008073
	(0.07286)	(0.23157)	(0.39173)	(0.09867)	(0.18237)	(0.00492)
	[0.05420]	[0.55459]	[-1.24711]	[-2.85294]	[-2.10171]	[-1.64094]

D(LNINCOME_TAX(-2))	-0.068547	0.272831	-0.657065	-0.218012	-0.321966	-0.011725
	(0.07108)	(0.22590)	(0.38214)	(0.09625)	(0.17791)	(0.00480)
	[-0.96438]	[1.20774]	[-1.71945]	[-2.26504]	[-1.80975]	[-2.44291]
D(LNPPG(-1))	-0.989422	0.380191	-3.693931	1.544674	6.715334	1.712523
	(0.96161)	(3.05618)	(5.16984)	(1.30216)	(2.40686)	(0.06493)
	[-1.02892]	[0.12440]	[-0.71452]	[1.18624]	[2.79008]	[26.3747]
D(LNPPG(-2))	1.537783	0.082209	10.10753	1.722587	-6.376940	-0.893495
	(1.03403)	(3.28635)	(5.55920)	(1.40023)	(2.58813)	(0.06982)
	[1.48717]	[0.02502]	[1.81816]	[1.23021]	[-2.46392]	[-12.7970]
C	0.002506	0.006518	0.041716	0.012642	0.006084	-0.000573
	(0.00308)	(0.00978)	(0.01655)	(0.00417)	(0.00771)	(0.00021)
	[0.81404]	[0.66621]	[2.52054]	[3.03262]	[0.78954]	[-2.75574]
R-squared	0.480831	0.424364	0.485591	0.552017	0.513352	0.989980
Adj. R-squared	0.190097	0.102008	0.197521	0.301147	0.240829	0.984369
Sum sq. resids	0.004759	0.048068	0.137547	0.008726	0.029813	2.17E-05
S.E. equation	0.013797	0.043849	0.074175	0.018683	0.034533	0.000932
F-statistic	1.653850	1.316444	1.685673	2.200410	1.883701	176.4328
Log likelihood	123.9754	77.72288	56.69585	111.8485	87.27658	231.7870
Akaike AIC	-5.448770	-3.136144	-2.084793	-4.842424	-3.613829	-10.83935
Schwarz SC	-4.815440	-2.502814	-1.451463	-4.209094	-2.980499	-10.20602
Mean dependent	-9.24E-05	0.002831	0.011598	0.000678	0.000356	-0.003131
S.D. dependent	0.015331	0.046272	0.082802	0.022349	0.039633	0.007451

Determinant resid covariance (dof adj.)	9.86E-23
Determinant resid covariance	5.87E-24
Log likelihood	729.2846
Akaike information criterion	-31.36423
Schwarz criterion	-27.05759

D(LNGDP) = C(1)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(2)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(3)*D(LNGDP(-1)) + C(4)*D(LNGDP(-2)) + C(5)*D(LN_X_M__GDP(-1)) + C(6)*D(LN_X_M__GDP(-2)) + C(7)*D(LNCONSTAX(-1)) + C(8)*D(LNCONSTAX(-2)) + C(9)*D(LNGOVT(-1)) + C(10)*D(LNGOVT(-2)) + C(11)*D(LNINCOME_TAX(-1)) + C(12)*D(LNINCOME_TAX(-2)) + C(13)*D(LNPPG(-1)) + C(14)*D(LNPPG(-2)) + C(15)

D(LN_X_M__GDP) = C(16)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(17)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(18)*D(LNGDP(-1)) + C(19)*D(LNGDP(-2)) + C(20)*D(LN_X_M__GDP(-1)) + C(21)*D(LN_X_M__GDP(-2)) + C(22)*D(LNCONSTAX(-1)) + C(23)*D(LNCONSTAX(-2)) + C(24)*D(LNGOVT(-1)) + C(25)*D(LNGOVT(-2)) + C(26)*D(LNINCOME_TAX(-1)) + C(27)*D(LNINCOME_TAX(-2)) + C(28)*D(LNPPG(-1)) + C(29)*D(LNPPG(-2)) + C(30)

D(LNCONSTAX) = C(31)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(32)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(33)*D(LNGDP(-1)) + C(34)*D(LNGDP(-2)) + C(35)*D(LN_X_M__GDP(-1)) + C(36)*D(LN_X_M__GDP(-2)) + C(37)*D(LNCONSTAX(-1)) + C(38)*D(LNCONSTAX(-2)) + C(39)*D(LNGOVT(-1)) + C(40)*D(LNGOVT(-2)) + C(41)*D(LNINCOME_TAX(-1)) + C(42)*D(LNINCOME_TAX(-2)) + C(43)*D(LNPPG(-1)) + C(44)*D(LNPPG(-2)) + C(45)

D(LNGOVT) = C(46)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(47)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(48)*D(LNGDP(-1)) + C(49)*D(LNGDP(-2)) + C(50)*D(LN_X_M__GDP(-1)) + C(51)*D(LN_X_M__GDP(-2)) + C(52)*D(LNCONSTAX(-1)) + C(53)*D(LNCONSTAX(-2)) + C(54)*D(LNGOVT(-1)) + C(55)*D(LNGOVT(-2)) + C(56)*D(LNINCOME_TAX(-1)) + C(57)*D(LNINCOME_TAX(-2)) + C(58)*D(LNPPG(-1)) + C(59)*D(LNPPG(-2)) + C(60)

D(LNINCOME_TAX) = C(61)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(62)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(63)*D(LNGDP(-1)) + C(64)*D(LNGDP(-2)) + C(65)*D(LN_X_M__GDP(-1)) + C(66)*D(LN_X_M__GDP(-2)) + C(67)*D(LNCONSTAX(-1)) + C(68)*D(LNCONSTAX(-2)) + C(69)*D(LNGOVT(-1)) + C(70)*D(LNGOVT(-2)) + C(71)*D(LNINCOME_TAX(-1)) + C(72)*D(LNINCOME_TAX(-2)) + C(73)*D(LNPPG(-1)) + C(74)*D(LNPPG(-2)) + C(75)

D(LNPPG) = C(76)*(LNGDP(-1) - 0.0468366812601*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(77)*(LN_X_M__GDP(-1) - 1.12424629411*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(78)*D(LNGDP(-1)) + C(79)*D(LNGDP(-2)) + C(80)*D(LN_X_M__GDP(-1)) + C(81)*D(LN_X_M__GDP(-2)) + C(82)*D(LNCONSTAX(-1)) + C(83)*D(LNCONSTAX(-2)) + C(84)*D(LNGOVT(-1)) + C(85)*D(LNGOVT(-2)) + C(86)*D(LNINCOME_TAX(-1)) + C(87)*D(LNINCOME_TAX(-2)) + C(88)*D(LNPPG(-1)) + C(89)*D(LNPPG(-2)) + C(90)

PROBABILITIES

System: UNTITLED
Estimation Method: Least Squares
Date: 08/04/14 Time: 19:11
Sample: 1973 2012
Included observations: 40
Total system (balanced) observations 240

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.083618	0.511366	-0.163518	0.8703
C(2)	-0.026350	0.037025	-0.711675	0.4778
C(3)	-0.240016	0.333983	-0.718646	0.4735
C(4)	-0.220921	0.232590	-0.949829	0.3437
C(5)	-0.015324	0.062274	-0.246066	0.8060
C(6)	-0.047598	0.062056	-0.767019	0.4443
C(7)	-0.071403	0.039364	-1.813937	0.0717
C(8)	0.014600	0.036374	0.401380	0.6887
C(9)	-0.059123	0.157704	-0.374900	0.7083
C(10)	0.071830	0.152114	0.472212	0.6375
C(11)	0.003949	0.072863	0.054196	0.9569
C(12)	-0.068547	0.071079	-0.964375	0.3364
C(13)	-0.989422	0.961609	-1.028922	0.3052
C(14)	1.537783	1.034032	1.487172	0.1391
C(15)	0.002506	0.003078	0.814045	0.4169
C(16)	-0.459660	1.625219	-0.282830	0.7777
C(17)	0.124791	0.117672	1.060500	0.2906
C(18)	-0.610812	1.061463	-0.575444	0.5659
C(19)	-0.430870	0.739217	-0.582873	0.5609
C(20)	-0.288435	0.197919	-1.457335	0.1471
C(21)	-0.145363	0.197226	-0.737039	0.4623
C(22)	-0.057051	0.125105	-0.456024	0.6490
C(23)	-0.101647	0.115603	-0.879270	0.3807
C(24)	-0.410651	0.501213	-0.819313	0.4139
C(25)	-0.694651	0.483449	-1.436866	0.1528
C(26)	0.128427	0.231572	0.554589	0.5800
C(27)	0.272831	0.225902	1.207743	0.2290
C(28)	0.380191	3.056181	0.124401	0.9012
C(29)	0.082209	3.286354	0.025015	0.9801
C(30)	0.006518	0.009784	0.666213	0.5063
C(31)	8.148431	2.749223	2.963904	0.0035
C(32)	-0.204970	0.199053	-1.029726	0.3048
C(33)	-5.500347	1.795572	-3.063283	0.0026
C(34)	-3.140310	1.250461	-2.511323	0.0131
C(35)	-0.087040	0.334801	-0.259976	0.7952
C(36)	0.176594	0.333627	0.529316	0.5974
C(37)	-0.336941	0.211628	-1.592139	0.1135
C(38)	-0.130099	0.195555	-0.665279	0.5069
C(39)	0.518513	0.847854	0.611559	0.5418
C(40)	0.275760	0.817802	0.337197	0.7364
C(41)	-0.488526	0.391727	-1.247108	0.2143
C(42)	-0.657065	0.382136	-1.719455	0.0876
C(43)	-3.693931	5.169840	-0.714516	0.4760
C(44)	10.10753	5.559201	1.818163	0.0710
C(45)	0.041716	0.016551	2.520538	0.0128
C(46)	2.211669	0.692465	3.193906	0.0017
C(47)	-0.220832	0.050137	-4.404583	0.0000
C(48)	-0.922129	0.452263	-2.038924	0.0432
C(49)	-0.468501	0.314962	-1.487485	0.1390
C(50)	0.095712	0.084329	1.134989	0.2582
C(51)	0.062745	0.084033	0.746674	0.4564

C(52)	-0.089322	0.053304	-1.675703	0.0959
C(53)	-0.006866	0.049256	-0.139392	0.8893
C(54)	0.424717	0.213555	1.988798	0.0485
C(55)	0.385410	0.205985	1.871055	0.0633
C(56)	-0.281490	0.098667	-2.852936	0.0049
C(57)	-0.218012	0.096251	-2.265035	0.0249
C(58)	1.544674	1.302162	1.186237	0.2374
C(59)	1.722587	1.400233	1.230215	0.2205
C(60)	0.012642	0.004169	3.032620	0.0029
C(61)	0.063949	1.279923	0.049963	0.9602
C(62)	0.038739	0.092671	0.418027	0.6765
C(63)	0.309096	0.835943	0.369757	0.7121
C(64)	-0.615399	0.582162	-1.057092	0.2922
C(65)	0.177727	0.155869	1.140229	0.2560
C(66)	0.436417	0.155323	2.809743	0.0056
C(67)	-0.183582	0.098525	-1.863295	0.0644
C(68)	-0.015056	0.091042	-0.165370	0.8689
C(69)	0.017067	0.394725	0.043238	0.9656
C(70)	0.226742	0.380735	0.595539	0.5524
C(71)	-0.383291	0.182372	-2.101705	0.0373
C(72)	-0.321966	0.177906	-1.809750	0.0723
C(73)	6.715334	2.406861	2.790080	0.0060
C(74)	-6.376940	2.588131	-2.463917	0.0149
C(75)	0.006084	0.007705	0.789538	0.4310
C(76)	-0.018911	0.034529	-0.547683	0.5847
C(77)	0.007386	0.002500	2.954418	0.0036
C(78)	0.035808	0.022551	1.587828	0.1144
C(79)	0.006262	0.015705	0.398700	0.6907
C(80)	-0.010333	0.004205	-2.457304	0.0151
C(81)	-0.007380	0.004190	-1.761319	0.0802
C(82)	0.003029	0.002658	1.139570	0.2563
C(83)	0.004494	0.002456	1.829917	0.0692
C(84)	-0.014146	0.010649	-1.328407	0.1861
C(85)	-0.007726	0.010271	-0.752191	0.4531
C(86)	-0.008073	0.004920	-1.640938	0.1029
C(87)	-0.011725	0.004799	-2.442911	0.0157
C(88)	1.712523	0.064931	26.37471	0.0000
C(89)	-0.893495	0.069821	-12.79699	0.0000
C(90)	-0.000573	0.000208	-2.755740	0.0066

Determinant residual covariance	5.87E-24

Equation: D(LNGDP) = C(1)*(LNGDP(-1) - 0.0468366812601 *LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.0292568943903*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) - 0.104065305181) + C(2)*(LN_X_M__GDP(-1) - 1.12424629411 *LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553 *LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039) + C(3)*D(LNGDP(-1)) + C(4)*D(LNGDP(-2)) + C(5)*D(LN_X_M__GDP(-1)) + C(6)*D(LN_X_M__GDP(-2)) + C(7)*D(LNCONSTAX(-1)) + C(8) *D(LNCONSTAX(-2)) + C(9)*D(LNGOVT(-1)) + C(10)*D(LNGOVT(-2)) + C(11)*D(LNINCOME_TAX(-1)) + C(12)*D(LNINCOME_TAX(-2)) + C(13) *D(LNPPG(-1)) + C(14)*D(LNPPG(-2)) + C(15)

Observations: 40

R-squared	0.480831	Mean dependent var	-9.24E-05
Adjusted R-squared	0.190097	S.D. dependent var	0.015331
S.E. of regression	0.013797	Sum squared resid	0.004759
Durbin-Watson stat	1.828888		

Equation: D(LN_X_M__GDP) = C(16)*(LNGDP(-1) - 0.0468366812601

*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.029256894390
3*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) -
0.104065305181) + C(17)*(LN_X_M__GDP(-1) - 1.12424629411
*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553
*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039)
+ C(18)*D(LNGDP(-1)) + C(19)*D(LNGDP(-2)) + C(20)
*D(LN_X_M__GDP(-1)) + C(21)*D(LN_X_M__GDP(-2)) + C(22)
*D(LNCONSTAX(-1)) + C(23)*D(LNCONSTAX(-2)) + C(24)*D(LNGOVT(
-1)) + C(25)*D(LNGOVT(-2)) + C(26)*D(LNINCOME_TAX(-1)) + C(27)
*D(LNINCOME_TAX(-2)) + C(28)*D(LNPPG(-1)) + C(29)*D(LNPPG(-2))
+ C(30)

Observations: 40

R-squared	0.424364	Mean dependent var	0.002831
Adjusted R-squared	0.102008	S.D. dependent var	0.046272
S.E. of regression	0.043849	Sum squared resid	0.048068
Durbin-Watson stat	2.241004		

Equation: D(LNCONSTAX) = C(31)*(LNGDP(-1) - 0.0468366812601
*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.029256894390
3*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) -
0.104065305181) + C(32)*(LN_X_M__GDP(-1) - 1.12424629411
*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553
*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039)
+ C(33)*D(LNGDP(-1)) + C(34)*D(LNGDP(-2)) + C(35)
*D(LN_X_M__GDP(-1)) + C(36)*D(LN_X_M__GDP(-2)) + C(37)
*D(LNCONSTAX(-1)) + C(38)*D(LNCONSTAX(-2)) + C(39)*D(LNGOVT(
-1)) + C(40)*D(LNGOVT(-2)) + C(41)*D(LNINCOME_TAX(-1)) + C(42)
*D(LNINCOME_TAX(-2)) + C(43)*D(LNPPG(-1)) + C(44)*D(LNPPG(-2))
+ C(45)

Observations: 40

R-squared	0.485591	Mean dependent var	0.011598
Adjusted R-squared	0.197521	S.D. dependent var	0.082802
S.E. of regression	0.074175	Sum squared resid	0.137547
Durbin-Watson stat	1.999454		

Equation: D(LNGOVT) = C(46)*(LNGDP(-1) - 0.0468366812601
*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.029256894390
3*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) -
0.104065305181) + C(47)*(LN_X_M__GDP(-1) - 1.12424629411
*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553
*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039)
+ C(48)*D(LNGDP(-1)) + C(49)*D(LNGDP(-2)) + C(50)
*D(LN_X_M__GDP(-1)) + C(51)*D(LN_X_M__GDP(-2)) + C(52)
*D(LNCONSTAX(-1)) + C(53)*D(LNCONSTAX(-2)) + C(54)*D(LNGOVT(
-1)) + C(55)*D(LNGOVT(-2)) + C(56)*D(LNINCOME_TAX(-1)) + C(57)
*D(LNINCOME_TAX(-2)) + C(58)*D(LNPPG(-1)) + C(59)*D(LNPPG(-2))
+ C(60)

Observations: 40

R-squared	0.552017	Mean dependent var	0.000678
Adjusted R-squared	0.301147	S.D. dependent var	0.022349
S.E. of regression	0.018683	Sum squared resid	0.008726
Durbin-Watson stat	2.109094		

Equation: D(LNINCOME_TAX) = C(61)*(LNGDP(-1) - 0.0468366812601
*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.029256894390
3*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) -
0.104065305181) + C(62)*(LN_X_M__GDP(-1) - 1.12424629411
*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553
*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039)
+ C(63)*D(LNGDP(-1)) + C(64)*D(LNGDP(-2)) + C(65)
*D(LN_X_M__GDP(-1)) + C(66)*D(LN_X_M__GDP(-2)) + C(67)

*D(LNCONSTAX(-1)) + C(68)*D(LNCONSTAX(-2)) + C(69)*D(LNGOVT(
-1)) + C(70)*D(LNGOVT(-2)) + C(71)*D(LNINCOME_TAX(-1)) + C(72)
*D(LNINCOME_TAX(-2)) + C(73)*D(LNPPG(-1)) + C(74)*D(LNPPG(-2))
+ C(75)

Observations: 40

R-squared	0.513352	Mean dependent var	0.000356
Adjusted R-squared	0.240829	S.D. dependent var	0.039633
S.E. of regression	0.034533	Sum squared resid	0.029813
Durbin-Watson stat	1.906042		

Equation: D(LNPPG) = C(76)*(LNGDP(-1) - 0.0468366812601
*LNCONSTAX(-1) - 0.0796992113665*LNGOVT(-1) - 0.029256894390
3*LNINCOME_TAX(-1) + 0.0306866716388*LNPPG(-1) -
0.104065305181) + C(77)*(LN_X_M__GDP(-1) - 1.12424629411
*LNCONSTAX(-1) + 5.838885761*LNGOVT(-1) - 1.05678808553
*LNINCOME_TAX(-1) - 1.58206009385*LNPPG(-1) - 0.157631204039)
+ C(78)*D(LNGDP(-1)) + C(79)*D(LNGDP(-2)) + C(80)
*D(LN_X_M__GDP(-1)) + C(81)*D(LN_X_M__GDP(-2)) + C(82)
*D(LNCONSTAX(-1)) + C(83)*D(LNCONSTAX(-2)) + C(84)*D(LNGOVT(
-1)) + C(85)*D(LNGOVT(-2)) + C(86)*D(LNINCOME_TAX(-1)) + C(87)
*D(LNINCOME_TAX(-2)) + C(88)*D(LNPPG(-1)) + C(89)*D(LNPPG(-2))
+ C(90)

Observations: 40

R-squared	0.989980	Mean dependent var	-0.003131
Adjusted R-squared	0.984369	S.D. dependent var	0.007451
S.E. of regression	0.000932	Sum squared resid	2.17E-05
Durbin-Watson stat	2.041133		