ANALYSIS OF BUOYANCY AND ELASTICITY OF INCOME TAXES IN KENYA

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DECLARATION

This project is my original work and has not been presented for a degree in any other University or any other award.

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I confirm that the work reported in this project was carried out by the candidate under my supervision.

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DEDICATION

This project is dedicated to my family for the continued support and positive encouragement that everything is possible with Christ Jesus.

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One person cannot conclusively work on a research project. It takes the effort of many people in their different ways. The gift of life and grace to work on this project was given to me by the Almighty God to whom I am indebted. I am also very thankful to my supervisor Prof. Nelson Wawire for his high professionalism in research methodology and the constant motivation that gave me the push to carry on and to my classmates whose presence offered me the psychological motivation and need to learn, to Consolidated bank, my employer for the time to study.

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ABBREVIATIONS AND ACRONYMS

AIC	Akaike Information Criterion (AIC),
FPE	Final Prediction Error
HQIC	Hannan-Quinn Information Criterion (HQIC)
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KRA	Kenya revenue Authority
OECD	Organization for Economic Cooperation and Development.
SBIC	Schwarz Bayesian Information Criterion (SBIC) and
USA	United States of America
VAT	Value added Tax

OPERATIONAL DEFINITION OF TERMS

Tax: is a mandatory contribution done by individuals and corporate entities to the government and does not bear any direct relationship to the received gain.

Income taxes: are taxes based on income received by individuals.

Tax Buoyancy: Explains the relationship between the changes in the government's tax revenue growth and the changes in the GDP.

Tax elasticity: is the change in tax revenue in response to changes in tax rate after controlling discretionary factors like the 2007 post election violence.

Corporate Income tax: is a tax on the income or capital of corporations or analogous legal entities.

Personal Income tax: is tax levied on income of a person or entity.

ABSTRACT

Kenya, just like many developing countries is currently confronted by huge fiscal deficits, declining external assistance and huge debt service charges that are adversely affecting the country's development process. The tax revenue in Kenya keeps performing poorly and unsteadily. The revenue collected from tax does not match the target which creates budget deficits. Increased spending needs and weakening revenue-raising capacities have together created structural budget deficits that have in turn brought about fiscal crises whenever a recession hits. Therefore, of concern to policymakers is how Kenya can attain revenue stability and be able to sustain public expenditures. To do this, there was need to determine buoyancy and elasticity of income tax revenue. It analyzed the buoyancy and elasticity of corporate and personal income tax in Kenya. The study utilizeddata1963 to 2018.The study used ordinary least square regression model to estimate the coefficients. Adjusting data for discretionary changes determined the elasticity estimates. Specifically, the study established that, corporate income taxes are highly buoyant to changes in the national income. This being the position, it is important to understand this relationship as it has a potential of contributing significantly to government revenue. Also, the study noted that buoyancy of personal income taxes were less than one implying that these taxes are inelastic. It is necessary for the government to put in place guidelines that would widen the tax base. The government should for instance put up measures that can be implemented to ensure that all corporations pay taxes due to them without tax evasion. The government should also create an environment conducive enough to facilitate Gross Domestic Product growth. This way, it will be possible to raise more tax revenue.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Funds are needed in order to smoothly conduct economic and social activities of a nation. Taxation is one of the government's methods of collecting revenue. The authorities use various kinds of taxes and dissimilar tax rates so as to allocate the burden of tax among the population. Income tax, which is a direct tax, is imposed on an income of an individual (Addison & Levin, 2011). The extent of surpluses / deficits in the government budget is one of the main statistics used in evaluating the impact on the economy of government fiscal policy. According to Ariyo 1997, a common characteristic of public sector finance worldwide is the fiscal deficit. However, taxes are not enough to fund expenditure, which resulted in budget deficits continuously (Chipeta, 1998; Wawire, 2003; &Wawire, 2006).

The fiscal structure in Kenya shows that the expenditure of the government and revenue have sustained steady development patterns that shows that expenditure is often beyond revenue (Chipeta, 1998). The spending-income gap creates large fiscal deficits. The tax revenue was not as expected even after tax reforms were undertaken like the formation of KRA. Yet one of the key reasons for undertaking tax reforms was to address issues of inequality and create a sustainable tax system that could generate adequate revenue to finance public expenditure. Poor tax performance can mean insufficient government effort to collect taxes and tax deficiencies, both of which are influenced by various factors, in terms of increasing incomes (Were, 2001).

Kenya and many other countries have in response made necessary efforts in designing systems which are productive and viable in financing as well as sustaining the expenditure of the government shown of giving in to credit and financing of the deficit. In particular in a developing country in which there is a high public fund demand for public spending, revenue mobilization plays a critical role in the implementation of fiscal policy. It is a better mobilizing source than sources like the financing of the deficit and the money creation. As the main source of Kenya's domestic revenue is tax income, both the calculation of buoyancy and tax elasticity in terms of tax structural reform and the management of tax income would be important (Chipeta, 1998).

Revenue tax can change as a result of a range of factors including tax bases, tax rate, changes in tax valuation, and collection. Assessing tax elasticity and bolstering will clarify how tax revenues are sensitive to these changes. To analyze and assess if revenues in the future will suffice to meet the resource requirements without changing rates or bases. Historical fiscal series should be adjusted in order to measure fiscal elasticity and remove tax revenue's impact from budgetary adjustments. If the tax rates and tax bases during the comparison period are not adjusted, the buoyancy and elasticity are the same. Therefore, this document used the time series way of estimating the elasticity and buoyancy of income taxes in Kenya during 1963-2017 against this backdrop.

Conversely, a partitioning strategy often calculates the growth and elasticity of tax revenue. This method splits tax elasticity and stimulus effects into taxes based on income elements and revenues. That is, in respect of the Gross Domestic Product and their respective proxy

sources, the income tax elasticity and the growth rate are calculated. The capability of identifying factors responsible for fast or late growth in revenue is a benefit of using the partitioning method.

1.2 Global and Regional Trends in Tax Revenue

In USA, after the financial and economic crisis that began in late 2008, once again, states with volatile revenue bases experienced severe budget problems. The periodic adjustments in the collection of state taxes by the Census Bureau provide a snapshot of the incidence and variability of revenues. Despite tax increases, the US total revenues have dropped an average of 8.9% (real) between 2008 and 2009, with only 5 States experiencing slight increases. 16 countries recorded a decrease of more than 10 per cent in sales, of which 19.7 percent for Arizona and 16.8 percent for South Carolina were the largest drop in overall collection (Kwak, 2011).

Notwithstanding the downward trend of tax-revenue shares in Africa, domestic taxes have risen significantly since 2004 in resource rich economies (OECD, 2010). Resource tax revenues in 2005 amounted to almost 10 percent of GDP, almost the same as the total aid paid out for sub-Saharan Africa. Revenue mobilization in resource-rich countries has increased on average by about 3 percent a year, and developments in Africa have decreased (Addison & Levin, 2011). Nevertheless, in Latin America, tax efforts are consistently lower than in other developed or transition countries, Bird et al. (2008).

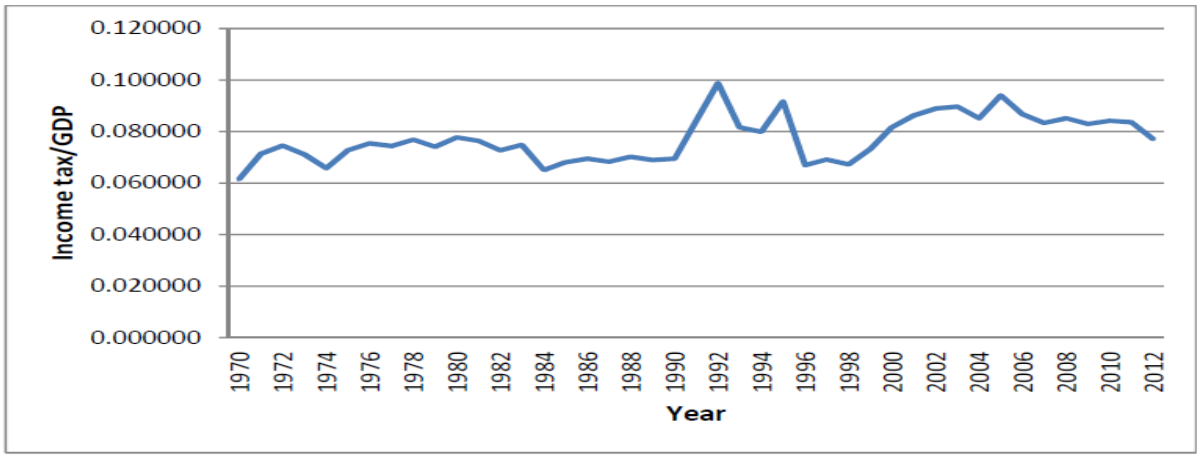
A mixed trend is evident in the collection of taxes in Africa. Many states receive only half of the amount they are supposed to collect while others collect up to 2-3 folds (OECD 2010). The second group includes countries with a significant contribution to resource-related tax revenues. For some resource rich countries it is therefore very sensitive to estimate the fiscal effort whether or not tax revenues related to resources are taken into consideration. It is evident that more than one half (22 out of 42) of the African countries collect more or less what is required by using a tax effort measure which eliminates tax revenues related to resources. This indicates that domestic income mobilization in a number of countries is not limited by taxation but rather by growth in GDP and broader development.

1.3 Trends in Income Tax and Total Tax Revenue in Kenya

In Kenya, income taxes comprise of corporation tax, personal income tax and withholding tax. 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 (Republic of Kenya, 2009). Individual income taxes are steadily applied to a person's income, with the lower 10% and the highest 30%. The replacement of profits tax with the tax on sales would presumably lead to an increase in savings, spending and effort, which will also lead to increased economic growth (Engen & Skinner, 1996). In Kenya, income tax revenue increased at a lower rate, but did not meet the target associated to indirect taxes and global trade taxes (Bahl & Bird, 2008). This is due to inefficiencies in income tax collection. The situation in Kenya is different, however: relative to other countries, the income taxes share in the total revenue collection

is decreased. This is valid although the KRA goal has not yet been achieved-that of raising enough revenue through taxes to finance the expenditure.

The trends in income taxes in Kenya have been fluctuating. This is a worrying situation given the fact that income tax is the largest contributor to tax revenue in Kenya (Maina, 2014). The figure that follows shows the trends in income tax revenue as a ratio of GDP.



Source of data: Republic of Kenya, KNBS (1970-2012)

Figure 1.1: Income tax as a ratio of GDP

The trends in figure 1.1 indicate fluctuating income tax to GDP ratio in Kenya since 1970 to the year 2012. The lowest in the specified period being in the year 1970 and the highest being in 1992. The fluctuations can be attributed to manual filing and administration since it was before the inception of i-tax.

1.4 Statement of the Problem

Weakening revenue-raising capacities and increased spending needs have combined to create budget deficits. From a broader perspective, other studies have consistently pointed

to policymaker's myopic and opportunistic attitude to state finance and the resulting poor fiscal planning and management as the underlying cause of the structural fiscal problems (Behn & Keating, 2005).Kenya, just like many developing countries is currently confronted by huge fiscal deficits, declining external assistance and huge debt service charges that are adversely affecting the country's development process (Wawire 2006). The largest source of revenue in Kenya is Taxation. The non-tax revenue also play an important role in enhancing a sustainable public budget. A good tax management system guarantees a stable income over time (Njoki, 2013).

However, according to Wawire (2006) and Wawire (2016), the income tax revenue continues to perform poorly hence not buoyant and elastic enough. Tax revenues earned do not equate to the planned expenditures. It leads to deficits in the budget. Structural budget deficits were combined with weakening revenue-raising capacity and increased spending requirements (Hovey, 1998; Behn & Keating, 2005). The factors led, in turn, to fiscal crises as a result of recession.

Despite the fact that Kenya has vast opportunities and a huge potential to raise more revenue through taxation, tax reforms in Kenya have failed to achieve substantial increase in income tax revenue. Therefore, of concern to policymakers is how Kenya can attain revenue stability and be capable to sustain her public expenditures- even if the flow of foreign resources runs dry. To do this, there is need to do buoyancy analysis and elasticity estimation of income tax in Kenya hence the study.

1.5 Research Questions

i. What is the buoyancy of corporate income tax in Kenya?

ii. What is the elasticity of Corporate Income tax in Kenya?

iii. What is the buoyancy of personal income tax in Kenya?

iv. What is the elasticity of personal income tax in Kenya?

1.6 The Objectives of the Study

The study's general objective was to analyze the buoyancy and elasticity of income tax in Kenya. The study's specific objectives were to:

i. Analyze the corporate income tax buoyancy in Kenya.

ii. Estimate the corporate income tax elasticity in Kenya.

iii. Analyze the personal income tax buoyancy in Kenya.

iv. Estimate the personal income tax elasticity in Kenya.

1.7 Significance of the Study

The study contributed to existing literature income tax structure in Kenya. The findings are significant for tax payers in a country, to government and the policy makers in formulating tax policies as well as for purposes of planning. The findings offers scholars working on this subject a lot of insights on the topic and areas for further studies. The findings provide a guide to the best fiscal policy to increase tax revenue collection and also add to Kenya's literature on tax buoyancy and elasticity.

1.8 Scope of the Study

Time-series data spanning 55 years collected on an annual basis from the year 1963 to 2018 was used. The period 1963/64 to 2017/18 was preffered because it is long enough to analyze the changes in elasticity and buoyancy of income tax. It is within this period that the government devised its own tax policies.

The economy also grew rapidly up to early 1970s,after which it became more costly than domestic taxes as a result of significant infrastructural expenditure and other social costs. Many major shocks, for example the 1973 and 1979 oil price crises, had far-reaching effects on inflation and fiscal deficits, were encountered during that period. During this time, income tax revenue effects such as commercial liberalisation, privatisation, the program of tax modernisation and the establishment of K.R.A. are captured.It is important because it is in line with the import replacement industrialisation strategy, the birth of the 1970 debt crisis in the Kenya Vison 2030, the adoption of the new Costitution and the 2013 transfer of rights, the Structural Adjustment Program of the 80's, and the liberalization policies of the 1990s and the multi-party Kenya Vison 2030.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the framework and the theory review that explains buoyancy and elasticity of income tax revenues. Also it reviews the empirical studies that have been done in the area globally and locally.

2.2 Theoretical Literature

This part describes relevant theories about taxes. Many theories have been put forward by economists at various times for guiding the country on how equity or justice in taxation can be realized.

2.2.1 Keynesian Theory

Keynes (1936) advocated for intervention of the government in the economy. The Keynesian theory supports the fact that total demand has an effect on economic output. The government can influence overall economic demand through fiscal policies. To order to stimulate the economy and to slow down the economy, he proposed tax cuts. Keynes advocates government intervention to encourage economic activity by rising spending and tax cuts during a recession.

2.2.2 Theory of Optimal Income Taxation

The theory of optimal income taxation suggests the optimal redistributive policy design where the government conditions taxes only on endogenous earnings but not on exogenous

skills. The theory ignores in particular the possible emergence of involuntary unemployment and considers perfect frictionless labor markets, and (Mirrlees, 1971). However, many studies (for example Prescott, 2004; Rogerson, 2006) emphasize on the strong labor market taxation impact on employment and more explicitly on unemployment (Daveri &Tabellini, 2000; & Nickell, Nunziata & Oche, l 2005).

In the labor market, the unemployment model sets the level of employment as the pre-tax wage's decreasing function. Nevertheless, when the extreme margin of work i.e. the hours of work is excluded, decision-making of labor supply raises the marginal tax rate without impacting the amount of the revenue, a shift in fiscal policy decreases pre-tax wages, increasing demand for jobs and reducing unemployment. The salary-employment-demand gap is called this. Such a tax change intuitively leads to a higher cost for employers for the agreed postaxed income. We are thus less willing to grant compensation demands to staff (Lockwood & Manning 1993). In contrast, a changes in taxes which increase taxes while maintaining the marginal tax increases labor costs.

2.2.3 Benefit Theory

As per this theory, government taxes should be levied on the benefit received by individuals. The more profit a person gets from government services, the greater the tax payable. Nevertheless, theory has been highly critiqued. If the State retains ties between revenue obtained and the benefits received. It will be in contravention of the fundamental principle of taxation that a tax is a necessary donation to the government in order to fulfill the public expenditure and provisions. In the case of a tax, there are no direct pro quo.

When we apply the principle in practice then the poor will pay the highest taxes as they benefit more from the government's services and this goes against the justice principle.

2.2.4 Theory of Equal Sacrifice

This principle considers the sacrifice born by the tax payer. The state should see to it that the tax subjects the taxpayers to an equal sacrifice. This aim is realized by introducing the progression principle in the tax system. However, this will only be possible if the government imposed very heavy taxes on a few rich people and leave the general public entirely free of taxes. This is not at all feasible.

2.3 Empirical Literature Review

In the empirical literature, various variables are as determinants tax revenues. The study includes a number of variables, including per capita GDP, the industry composition of exports, the level of trade and financial transparency, the proportion of foreign aid to GDP, informal economic metric and certain institutional factors like the political stability and corruption degree.

Various studies have assessed the GDP impact on tax revenues. Ole (1975) studied the income tax structure elasticity between 1962 and 1973. By adapting to uncommon events, tax revenues are rising on sales. The findings established that the structure of the tax for the period studied was revenue inelastic (0.81). It also suggested that the fiscal system in Kenya was not booming and the nation could therefore need assistance from foreigners in reducing the budget deficit.

Osoro (1993) examined Tanzania tax reforms impact on revenue efficiency. In the analysis, double log form formula and the elasticity of the tax revenues were used for the purposes of proportional adjustment. During the study period 1979 to 1989 the implementation of discretionary modifications was made impossible by the use of dummy technique.

Njoroge (1993) studied tax reform efficiency in Kenya for the period from 1972-1973 to 1990-1991. After adjusting tax revenue for discretionary changes, tax revenue has been regressed on revenue. The total tax structure's income elasticity for the period 1972 to 1981 was found to be 0.67. In conclusion the study did not achieve its goal; therefore, it required a permanent analysis as the economic system changes. In the study the properties of time series were not taken into account and thus could not be relied on.

Drastic changes in the policy scenario Rajan (1996) impact the consistency of determinants of personal income tax. A multivariable linear time series regression equation and consistency in the relationship over time periods evaluated using Chow Test are estimated. The analysis disclosed that the variables such as the literacy rate, public spending per capita, and GDP per capita are well linked and variables such as the population of urban areas, the planned caste showed that the individual personal income tax equation determinants are not stable in the successive governments.

Sobel and Holcombe (1996) brought significant methodological improvements to the estimation of revenue volatility. They developed an estimation model for the income elasticity of tax bases in the short-run using the log changes of the variables as opposed to

the logs as in the standard elasticity model, and applied the model to major tax bases (for instance, individual income, corporate income, grocery, non-food retails and engine fuel use) approximate data from national aggregate time series are given. The results showed that long-term and short-run flexibility for income tax were 1.215 and 1.164, corporate income tax was 0.670 and 3.369, retail sales were 0.660 and 1.229, retail non-food sales were 0.701 and 1.612; motor fuel uses were 0,996 and 0.729. The study revealed that the corporate taxes were the most volatile in the business cycle, while the taxes of engine fuel were the most stable.

Ariyo (1997) evaluated the profitability in the tax system in Nigeria over the period 1970-1990. The study estimated tax flooding and tax revenue elastics. The slope dummy pairings were utilized for the oil buoyancy and the Structural Adjustment Programs (SAP). The study showed that the overall level of production was satisfactory. But the results revealed substantial changes in tax revenue rates from tax sources as a result of reduced management activities in non-oil sources of tax for the duration of the oil buoyancy.

Chipeta (1998) measured the impact of tax reforms on tax yields for Malawi (1970-1994). The study established that the base of taxes increased less quickly than GDP. For the period (1970-1993), Kusi (1998) studied fiscal and income reform in Ghana. The results demonstrated 0.72 pre-reform boostering and 0.71 elasticity for the 1970-1982 era. The post-reform era of 1983-1993 was 1.29 higher and elasticity 1.22 higher. Leading to a conclusion that restructurings had attributed significantly to productivity of tax revenue from 1983-1993.

In estimating the taxes growth and the revenues elasticity in Kenyan tax system, Wawire (2000) used Total GDP. The research reduced tax revenue from diverse sources based on empirical evidence on their tax bases. The study showed that there was no increase in the tax system's revenues. Nevertheless, other significant drivers of tax revenue are omitted from the scope of the report. For example, exceptional circumstances may affect the efficiency of tax revenues. It was also problematic to determine that tolls and bases paid more to the exchequer since they never broke down tax revenue information by origin. The time series properties of data were never looked into.

The principles of tax buoyancies and elasticity were used by Muriithi and Moyi (2003) to decide whether fiscal reforms in Kenya had the goal of developing taxation policies that responded to changes in national income by yielding individual taxes. The findings established that reforms in tax positively affected the overall structure of the tax as well as management systems for individual tax. The study established notwithstanding the positive results, VAT reforms did not respond to incomes changes. However, it did not make statistical sense subjecting VAT to regression model alone because it had been around for 15 years only. The difference is that, according to the current study, average financial GDP and average tax incomes GDP are separated and average figures are used in place of the annual figures. This is because the estimates for tax revenue begin on the basis of the fiscal year on 1 July and GDP start on the calendar year on 1st January Wawire, (2003).

In a study of North Carolina's tax system, Wagner (2006) examined the composition of the state's revenue and the long- and short-run elasticity of various revenue sources. Based on the estimates. The conclusion was that more reliance on the individual income tax will

enhance the state's revenue-raising capacity over the long run but may add to the cyclical variability of the state's revenue. While relying lightly on the corporate income tax and a lot of reliance on taxes from motor fuel will enhance both the long-run and short-run stability. Pointing out that in response to economic downturns, policymakers often adopt pro-cyclical fiscal measures like spending cuts and tax increases in an attempt to meet the requirement of a balanced budget, Wagner discussed the rainy-day funds role and savings in justifying the revenue impacts of economic downturns, and argued that such funds should be guided by strict rules for deposits as well as withdrawals.

Wawire (2016) analyzed the income tax productivity in Kenya. From the study income tax system was found to be growth inelastic regardless of the efforts taken by KRA to ensure tax compliance by initiating compulsory Personal Identification Number acquisition and compulsory tax returns filing by government employees. The study used time-series data from documents generated by the government which might not have been consistent throughout the period creating biasness in the coefficients.

Bruce, Fox, and Tuttle (2006) came up with a fresh perspective to the issue by analyzing cross-state fluctuations in general sales and individual income tax bases ' long-term revenue elasticity. Their study is distinguished from previous ones in that it uses actual tax bases or revenues, not proxy measures. It attempts to explain disparities in the growth rates in long-run as a function of structural features of the state taxes, demographic, political and economic structures. From this analysis, it was found that public and private pension

exemptions have adverse effects on the long-run income elasticity of individual income tax revenues.

Gupta (2007) studied sales output in many developed countries. The study found that a number of structural factors, such as per capita GDP and open trade, are important and strong factors that affect income. The impact of external debt on revenue mobilization was also dissected. The results indicated that the relationship between agricultural share and income output was strongly negative and significant. A 1 percent increase in farming share could, it was calculated, significantly reduce revenue output, as opposed to debt. The study found out that corruption affected revenue performance among the institutional factors negatively and significantly. Other effective factors included political and economic stability but only across certain specifications. Likewise, nations that emphasized taxation of income, profits and capital gains did better. Structural factors in all income groups were found to be important when analyzing the sub-samples based on revenue level.

Not only do supply factors matter, they also have a major impact on evaluating fiscal effort on demand factors such as organizational performance (Bird et al., 2008). Their goal was to uphold the rule of law and keep bribery under control as a legal and sensitive government. It was a requirement for a more effective fiscal collection effort. Chaud and Moene (1997) argued that fiscal corruption is an underlying factor in a number of developing countries ' weak revenue output. It is strongly shown that measures to reduce bribery could significantly increase tax revenue (Gupta, 2007). As Bird et al. have indicated, (2008) it may not take longer or harder to strengthen structures such as voices

or accountabilities and reductions in bribery than improving supply-side factors. Nonetheless, in countries with poor institutions, how to efficiently handle tax revenues is an active area of research in itself and needs more attention.

2.4 Overview of Literature

The literature review indicates that a lot of studies have been conducted on buoyancy and elasticity tax. However, the main focus has been on the general tax revenue. The studies conducted in Kenya, have mostly covered other areas such as revenue productivity (Njoroge, 1993), tax reforms (KIPPRA, 2004), taxation of the underground economy (KIPPRA, 2007), determinants of VAT tax (Wawire, 2011) and indirect taxation (Otieno, 2003) as well as determinants of tax revenue as a whole (Wawire, 2006) thus presenting a research gap upon which the current study will aim to fill. The reason for less concentration on income tax 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 2014/2015.

Further work into this field is needed in order to increase the impact of sales taxes on total revenue. Work will make further income tax materials available to politicians and other financial players for better decision making. So that targets are met, this study aimed at the analysis of buoyancy and elasticity of income taxes in Kenya with an aim of availing more findings that can aid in adjusting tax collection mechanisms. This was to fill the existing research gaps presented by the various studies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents and discusses the methodology that was be used. It covers the theoretical framework, models specifications, variables definition and measurements, types and source of the data, procedures for collecting data, time series properties and data analysis.

3.2 Research Design

An explanatory research design was utilized in explaining how external indebtedness, government expenditure on agricultural activities, imports growth and government expenditure on devolution are related to income tax revenue.

3.3 Theoretical Framework

The common and most significant empirical issue in functional public sector economics is estimating the likely tax receipts behavior visa v is the tax base changes. Tax elasticity is mathematically expressed as,:

$$E_{TY} = \frac{\Delta T}{\Delta Y} = \frac{\Delta T}{T} * \frac{Y}{\Delta Y} = \frac{\Delta T}{\Delta Y} * \frac{Y}{T} \quad \text{.....(3.1)}$$

Where T=tax revenue, Y=GDP and E_{ty}= tax income elasticity

So as to consider tax system elastic, the incremental tax revenue ratio needs to be more than average national income ratio given that there is no change in structures of the tax. According to Ghai, 1996 determined the ratio of average tax rate to the elasticity of the income of a certain tax. For an elastic tax, the marginal rate is more than the average tax rate, because the average tax base share remains constant in national income. The tax elasticity becomes constant where the marginal tax rate is the same as the average tax rate and when the marginal rate of tax is below the average tax rate, it becomes inelastic. Therefore, the income tax may be inelastic with a progressive rate structure, and the income tax may be elastic if the marginal portion of the national tax base reaches the average rate.

Ordinarily, the total tax revenue elasticity to revenue is presented in a single value, but the weighted average amount of tax elasticity, which responds to changes in income in different ways, on the actual basis, of the general elasticity of a tax system. This means we must start by examining the individual elasticities in order to assess the overall tax elasticities. The elasticities were defined as follows, Jenkins (2000):

Income Elasticity

$$ET_{ty} = \frac{\Delta T_t}{\Delta Y} * \frac{Y}{T_t} \quad \text{..... (3.2)}$$

Elasticity of Income=change in tax divided by change income multiplied by income divided by tax for a period t

Elasticity of the K^{th} individual tax to income

$$ET_{ky} = \frac{\Delta T_k}{\Delta Y} * \frac{Y}{T_k} \quad \text{..... (3.3)}$$

Elasticity of the K[th] individual to tax base

$$ET_k\beta_k = \frac{\Delta T_k}{\Delta \beta_k} * \frac{\beta_k}{T_k} \quad \text{.....(3.4)}$$

Elasticity of the Kth individual base to income

$$E\beta_{ky} = \frac{\Delta \beta_k}{\Delta Y} * \frac{Y}{\beta_k} \quad \text{..... .....(3.5)}$$

Where T_t is the adjusted total revenue from tax, Y is the income i.e. GDP, B_k is base of k^{th} tax, T_k is revenue from k^{th} tax. Given these definitions for elasticity, then in an n taxes' system it follows that:

$$ETty = \frac{\Delta Tt}{\Delta Y} * \frac{Y}{T_t} = \frac{T_1}{T_t}\left\{\frac{\Delta T_1}{\Delta Y} * \frac{Y}{T_1}\right\} + \frac{T_1}{T_2}\left\{\frac{\Delta T_2}{\Delta Y} * \frac{Y}{T_2}\right\} + \ldots + \frac{T_n}{T_t}\left\{\frac{\Delta T_n}{\Delta Y} * \frac{Y}{T_n}\right\} \ldots 3.6$$

where *1*, *2* and *n* in subscripts stand for various individual taxes which are expressed as a total tax revenue ratio indicated by the subscript *t* for giving the individual tax weight. Any individual tax elasticity in regard to income may be disintegrated into the product of the tax-to-base elasticity and the base-to-income elasticity. Arithmetically

$$E_{T_k Y} = \left(\frac{\Delta T_k}{\Delta B_k} \times \frac{B_k}{T_k}\right)\left(\frac{\Delta B_k}{\Delta Y} \times \frac{Y}{B_k}\right) \qquad (3.7)$$

The tax elasticity calculation eliminates the discretionary policy changes impact. Tax elasticity is most important in determining that taxes are naturally elastic. An flexible tax

system makes an increasing proportion of net increases in income for the public sector. With an inelastic tax system, increased government spending is either funded by a higher supply of money with all the inflation and balance problems involved or by annual upswing in existing tax rates.

The tax system buoyancy is typically assessed by the comparative changes in total tax revenue with respect to the relative changes in countrywide income. It may be expressed as:

$\beta_{TY} = \frac{\Delta T}{\Delta Y} \times \frac{Y}{T_t}$ ……(3.8)

where *T* is total tax revenue, *Y* is income/GDP. The global buoyancy can be disintegrated into buoyancy of individual tax as:

$$\beta_{TY} = \frac{T_1}{T_2}\beta T_1 Y + \frac{T_2}{T_t}\beta T_2 Y + \ldots \frac{T_n}{T_t}\beta T_n Y \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.9)$$

Where:

$T_t = T_1 + T_2 + \ldots + T_n$ and *n* is the number of taxes. The buoyancy is a weighted individual tax (Sohato, 1961) and utilized in obtaining the tax revenue elasticity with respect to *tax-to-base* and *base-to-income* as:

Tax to base elasticity

$$= \frac{\boldsymbol{\Delta T}}{\boldsymbol{\Delta \beta}} * \frac{\boldsymbol{\beta}}{\boldsymbol{T}}$$

and base to income elasticity

$$= \frac{\Delta\beta}{\Delta Y} * \frac{Y}{\beta}$$

Thus buoyancy becomes

$$\beta_{\mathbf{TY}} = \{ \frac{\mathbf{\Delta T}}{\mathbf{\Delta}\beta} * \frac{\beta}{\mathbf{T}} \} * \{ \frac{\mathbf{\Delta}\beta}{\mathbf{\Delta Y}} * \frac{\mathbf{Y}}{\beta} \} \quad \text{.....(3.10)}$$

3.4 Model Specification

According to research by Ole (1975), Osoro (1993;1995), Ariyo (1997) Wawire (2000), Muriithi and Moyi (2003) Wawire (2003;2006); the procedure for approximating tax buoyancy can be specified in equation (3.11) in the Cobb-Douglas function of the form

$$T = a^{\alpha} Y^{\beta} \varrho^{v} \quad \text{..... (3.11)}$$

Where

T=Tax revenue

Y=Income

α=Constant term

e=Natural number

β=Buoyancy coefficient and

μ=Error term

The equation was linearized by taking logarithms and introducing k to yield the following specification

$$LnTk = \alpha k + \beta k LnY + \mu k \quad \text{.....(3.12)}$$

For personal income tax, the estimating equation becomes

$$LnTpk = \alpha pk + \beta pk LnY + \mu pk \quad \text{.....(3.13)}$$

Where p is personal income tax.

For corporate income tax, the estimating equation becomes

$$LnTck = \alpha ck + \beta ck LnY + \mu ck \quad \text{.....(3.14)}$$

Where c is corporate income tax Y is the GDP and Bpk and Bck are buoyancies.

In estimating the built in tax system elasticity, historical data for tax revenue need to be sophisticated for excluding changes in revenue which are attributed to measures of discretionary. It is usually done in Kusi(1998) and Osoro(1993) to make the proportional change for clearing the (HtSTD). PAA requires the utilization of fiscal return estimates as a result of discretionary changes. It is not only difficult to obtain such data but also questionable for their reliability because the actual discretionary results can differ greatly from the changes in the bud

This study adopted the unadjusted historical time series data (HTSTD) with time trends and dummy variables combined as proxies for discretionary measures of tax as in Singer (1965) and Artus (1974).The estimating equation for elasticity becomes:

$$LogTR = log\alpha + \beta_1 logYT + \beta_2 logY_{t-1} + \sum_{i=1}^{k} \beta_{3i} D_i + \varepsilon_t \quad \text{.....(3.15)}$$

Where TR denotes tax revenue for the k^{th} tax, β is the elasticity and D is the dummy variable which takes a value of 1 for measures of discretionary tax and 0 if otherwise

3.5 Definition and Measurement of Variables

Variable	Measurement
Income Tax Revenue (TR)	Summation of total income tax revenue measured in Kenya shillings
Personal Income Tax (TRp)	Summation of personal income tax measured in Kenya shillings.
Corporate Income Tax (TRc)	Summation of corporate income tax measured in Kenya shillings.
Gross Domestic Product (GDP)	Value of products and services manufactured in a country over a span of one year, whether produced by foreigners or citizens. Measured in Kshs
Dummy variable (D)	Adjusts for discretionary measures. Takes the value 1 for discretionary tax measures and 0 otherwise

3.6 Data Type and Source

The data for period of the study (1963-2018) was obtained from KNBS, KRA, CBK and World Bank. Dependent and independent variables have both been converted to real values from their nominal values. The conversion of GDP time series data was achieved through the division of nominal GDP deflator values where 1963 was the base year.

3.7 Time Series Properties

3.7.1 Time Series Analysis Procedure

Since the data used is time series, Stationarity test was conducted.

3.7.2 Test for Stationarity

Time series information is constant when the mean, variance and covariance of time are not variables of overtime. Non-stationary data contributes to artificial regression because of the average and variance interpretation (Dimitrova, 2005). Another set of observations is generated by varying series using different operators. For instance, the first-differenced values are given as: $\Delta Xt = Xt - Xt{-}1$. If there are no differences in a series, it is either I(0) or it is integrated in sequence 0. But if a series is standard, it is called I(1) or an integrated series of order 1 after a first differential. The study checked for the existence of a unit root in the variables using Augmented Dickey-Fuller (ADF) test.

3.7.3 Lag length Selection Procedure

The study identified optimal lag length for analysis before conducting the Johansen cointegration test (Simiyu, 2015). The Akaike Information Criterion (AIC) was used in selecting the lag length, information selection criteria and making sure that the residuals are white noise as recommended by Ivanov et al. (2005). The decision rule was choosing the model with lowest information criteria value.

3.7.4 Cointegration Test

Once the series is set on rates or the first difference, the technique used by Johansen is used to evaluate whether a cointegrating vector occurs in the variables (Johansen, 1988). The study established whether the non-stationary variables were cointegrated. Variables differencing for achieving stationarity resulted to long-run properties loss. The concept of co-integration shows that if two or more non-stationary variables have a long-term relationship, deviations of the long-term run are stationary.

3.8 Data Analysis

The tax revenue model study was applied to estimate buoyancy and elasticity. Data was analyzed using STATA statistical software version 13. The individual regression coefficients were taken as the buoyancy and elasticity estimates. In estimating model parameters utilizing OLS method, the equation was linearized by taking variables logarithms in the model. Buoyancy was estimated without adjusting for discretionary changes. In discretionary changes adjustment, dummy variable method was used. The coefficient was taken as a measure of the tax elasticity.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the empirical findings of the current study. The chapter gives a detailed analysis of the buoyancy of corporate income tax, elasticity of corporate Income tax, buoyancy of personal income tax and the elasticity of personal income tax in Kenya.

4.2 Descriptive Statistics

This section presents the variables descriptive statistics that were used in the study. They include mean, median, variance and the standard deviations. Accompanying these statistics is the Jarque-Bera test statistics that gives information on data distribution. Specifically, the test aims to establish normality of the data. The following table shows descriptive statistics.

Table 4.1: Descriptive statistics

	GDP(million) KES	**Corporate tax(million) KES**	**Income tax(million) KES**	**GDP_1(millions) KES**
Mean	1266594.	60835.72	75564.24	1107576.
Median	209884.0	8186.000	15644.70	183562.5
Skewness	2.177255	1.615051	1.525162	2.234917
Kurtosis	7.034648	4.188978	4.219334	7.483198

Source of data; Computed by author from KNBS data set

From the descriptive statistics, it can be seen that, the mean value for the GDP in Kenya was approximately Ksh 1266594 million for the given time period. This observation can be explained by lower values of national income registered in the early years after the independence. The lower values for the corporate and the income tax can be explained by a similar reason that, both taxes were low in the early years as the country had not organized effective tax system.

Kurtosis and skewness values have been used in different ways in identifying some of the potential problems in a data set. In the current data, the test statistics indicate that, the data for the variables was positively skewed. The study went ahead to find out whether the data was normally distributed. The results are as can be seen in Table 4.2.

Table 4.2: Normality Test

	GDP (million)	Corporate tax (million)	Income tax (million)	GDP_1 (millions)
Jarque-bera	82.227	27.644	25.179	93.516
Probability	0.000000	0.000001	0.000003	0.000000

Source of data: Own computation

The null hypothesis is formulated to state that, the data is normally distributed. To reject or not to reject this hypothesis, comparison is made between the calculated probability values with 5 percent level of significance. From the table, the calculated values are less

than 0.05. The study therefore rejected the null hypothesis that the data was normally distributed.

There are a number of techniques that can be used by an analyst in data transformation as one of the ways of addressing the problem of non-normality. One of the methods that can be used is log transformation of the data. This was preferred for the case of the current study as the regression analysis to be used requires the variables to be in log form. Below are the results.

Table 4.3: Normality Test on Transformed Data Set

	GDP (million) KES	Corporate tax (million) KES	Income tax(million) KES	GDP_1 (millions)
Jarque-Bera	4.008	4.214	3.901	67.174
Probability	0.135	0.122	0.142	0.155

From table 4.3, it can be seen that after logarithmic transformation of the data set, the calculated probabilities were greater than 0.05. Meaning, the study failed to reject the null hypothesis which stated that, the data set was normally distributed.

4.3 Time Series Properties of the Variables of the Study

To answer the objectives, the current study relied on time series data between 1963 and 2018. In order to use this data for the purpose of analysis, it was important to check for the stationarity as most time series data suffer from the problem of non-stationarity. This test

specifically aims at finding the presence of unit root in various data sets. Using data that have a unit root results in a spurious regression results. Specifically, this implies that, the regression results have significant t- statistics and a high coefficient of determination. Although this is the case, the study results have no economic meaning. The study used Augmented Dickey Fuller (ADF) test to check for the presence of a unit root.

4.3.1 Test for Unit Root

One of the classical linear regression model assumptions is that, all the variables used in a model, both the dependent and independent variables are stationary. In the study, the test of unit root was carried out using the ADF test. To determine the number of optimal lags to be used in the ADF test, Schwarz Information Criterion (SIC) was used.

To reject or not to reject the null hypothesis, the study compared the ADF statistics with the other critical values as can be seen in Table Ain the appendix. If the ADF value was greater than the critical values, the null hypothesis was rejected and conclusion was that, there was no presence of a unit root and therefore the data was stationary.

Alternatively, the same decision was made by comparing the probability values. Since the study was undertaken at 95 percent confidence interval, the level of significance was 5 percent. The implication here was that, if the probability value calculated was greater than 5 percent, the null hypothesis was not rejected. The conclusion in this case was that, there was the presence of a unit root and therefore the series was not stationary.

From the study results in table 4.4, GDP and personal income taxes were not stationary. However, after the first difference, the variables became stationary.

Table 4.4: Test for unit root

Variables	ADF	Probability	Decision
Log of GDP	-2.467	0.343	Non stationary
DLog of GDP	-6.430	0.000	Stationary
Log GDPt-1	-53.903	0.0001	Stationary
Log of Corporate tax	-3.422	0.050	Stationary
Log of Income tax	-1.510	0.814	Non stationary
DLincometax	-7.234	0.000	Stationary

4.3.2 Cointegration Results

Since two variables that were used in the regression equation were integrated of order one, it was necessary to find out whether the two variables were cointegrated. The results are presented in table 4.5.

Table 4.5: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.321006	29.74981	12.32090	0.0000
At most 1 *	0.151071	8.844105	4.129906	0.0035

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Table 4.6: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.321006	20.90570	11.22480	0.0008
At most 1 *	0.151071	8.844105	4.129906	0.0035

The study results indicated that, there were two co integrating equations. This implies that, there was linear combination between the two variables in the long run. This observation was important as it ensured that the regression results are not spurious.

4.4 Buoyancy of Personal Income Tax

To obtain the buoyancy of the income tax and the corporate tax, the study regressed the natural logarithm of the specific tax against the natural logarithm of the current and previous levels of national income. The results of the regression process are produced in the table 4.7.

Table 4.7: Buoyancy of Personal Income Tax

Dependent variable; L income tax			
Variable	Coefficient	T value	P> |z|
Log GDPt	0.932***	26.304	0.000
Log GDPt-1	0.0589**	2.016	0.049
Constant	-1.111	-13.545	0.000
R-squared =0.988636			

Source of Data; computed by author

From the table, it can be seen that, personal income tax had a buoyancy of 0.932 with respect to current level of national income. This may be interpreted to mean that, a one percent change in national income increases personal income tax reserves by 0.932 holding the other factors constant.

It can be argued that, although income taxes are not highly buoyant with respect to national income, increasing proportions of personal income tax was transferred to the government in form of taxes. The results of the current study are consistent to the study findings conducted by Mburu (2011). The study found that, personal income taxes were highly buoyant to changes in the national income.

From the table, it can also be seen that, the buoyancy of personal income tax with respect to previous levels of national income is about 0.058. The implication is that, a one percent increase in income in the previous period increases personal income tax by 0.058 percent

if other factors are held constant. A test of significance was also conducted to test whether buoyancy of log of income tax with respect to the previous levels of national income was significantly less than one.

Since the calculated probability value is less than the critical value at 95 per cent confidence interval, the study concluded that, the buoyancy value of 0.058 is less than one. This means that personal income taxes were not buoyant with respect to previous levels of national income.

The coefficient of determination was about 0.989 implying that, about 98.86 percent of the variations personal income tax can be explained by both the current and previous levels of national income.

Table 4.8: Buoyancy of Corporate Income tax

Dependent Variable: Log Corporate Tax			
Variable	Coefficient	t- value	P> |z|
DLogGDPt	1.444**	2.641	0.011
GDPt-1	1.051***	54.039	0.000
Constant	-1.694	-15.828	0.000
R-squared	0.983		

Source Computed by author

From the table 4.8, it can be seen that, corporate tax had a buoyancy of 1.443with respect to current national income. This was done by comparing the calculated p value with the critical p-value at 5 percent significance level. The study tested the null hypothesis that, the coefficient of corporate income was not different from one. Since the calculated p-value was less than 5 percent at 95 percent confidence interval, the study rejected the null hypothesis and concluded that, the coefficient was statistically different from one. The corporate tax was therefore highly buoyant with respect to the current level of national income.

The study results further indicated that, the buoyancy of corporate tax with respect to previous levels of national income was 1.05. The study conducted test to find out whether buoyancy of corporate tax with respect to the previous levels of logs of national income was significantly greater than one. The null hypothesis stated that, the coefficient of corporate tax was not significantly different from one. To reject or not the hypothesis, the study compared the calculated P-value with the critical value at 5 percent level of significance. Since the critical P-value was more than the calculated P-value the study rejected null hypothesis. This implied that, the coefficient of previous levels of income was different from zero significantly. The conclusion in this case was that, corporate tax was highly buoyant with respect to previous values of national income.

The coefficient of determination was about 0.391 implying that, about 39.15 percent of the changes in the log of corporate tax could be described by both the current and previous levels of income.

4.5 Elasticity of Income and Corporate Taxes

Elasticity of income tax represents proportionate change in the personal income from a percentage change in any of the independent variables. In this case, the two independent variables used are, current and previous levels of national income. To obtain the elasticity, the study estimated a regression of logarithm of personal income tax against both current and previous levels of national income.

For the case of elasticity, the study aimed to find out the effect of various policies on both the income and corporate tax. To achieve this objective, the study introduced a dummy variable which assumed two values. The dummy assumed a value of 1 for a presence of discretionary changes and 0 otherwise for the various years under consideration. This is consistent with various study findings on tax buoyancy and elasticity (See; Wawire, 2003;2006; 2016 Osoro, 1993; Ariyo, 1997; Muriithi and Moyi, 2003).

Table 4.9: Elasticity of Income

Dependent Variable: Income Tax Revenue			
Variable	Coefficient	t- statistics	P> |z|
LogGDPt	1.018***	59.430	0.000
LogDGDPt-1	-0.0142**	-2.303	0.025
Dummy	-1.241	-14.136	0.000
R-squared = 0.988877			

Source; Computed by author

The study findings implied that, a one percentage increase in the national income increases personal income tax revenue by 1.018 percent ceterus paribus. The national income coefficient was statistically significant at 1 percent level. This is an indication that, national output is an important variable affecting personal income taxes in Kenya. The results further imply that, the tax system led to a 1.018tax revenue changes because of national output changes.

In general, this may be interpreted to mean that, the personal income taxes are elastic to changes in the national output. The results of the current study are consistent to those of a study conducted by Muriithi and Moyi, (2003). The study found out that, personal income taxes are elastic to both the current and previous levels of national income.

The coefficient of GDP in the discretionary changes was negative implying that personal income taxes and the policy reforms were negatively related. A one percent change in the GDP reduced the personal income taxes by 0.014 percent if other factors are held constant. The implication in this case is that, tax system reduced tax revenue because of discretionary policy measures changes for every in GDP percent change.

These findings are inconsistent to Wawire (2014) and Moyi (2006) on the policy measures effect on the tax revenues. The two studies found out that, policy measures had a positive effect on total tax revenues in the country. However, the current study focused on specific tax represented by the income personal tax.

A good way to explain the discrepancy in the findings is difference in estimation procedures and the type of tax used in the analysis. Moyi (2006) for example focused on estimating the actual amount of tax that was generated as a result of the policy as compared to the current study that has introduced dummy variable to capture the effect of the discretionary change.

Table 4.10: Elasticity of corporate tax

Dependent Variable: Corporate Tax Revenue			
Variable	Coefficient	t-statistics	P> |z|
Log GDP	1.09***	55.77	0.00
Log DGDP	-0.028**	-4.002	0.0002
Constant	-1.8364	-18.338	0.0000
R-squared	0.986		

Source; computed by author

The study results found out that, a one percentage change in the national income increased personal income taxes by 1.090398 percent if other factors are held constant. The coefficient of national income was significant statistically in affecting personal income taxes at all the three significance levels as can be viewed from the probability value.

The statistical significance of the national output coefficient is an indication that the variable is important in affecting personal income taxes in Kenya. The results further imply

that, the tax system led to a 1.09tax revenue change because of national output changes over the period under investigation.

Since the coefficient is greater than one, this may be interpreted to mean that, the corporate taxes are elastic to changes in the national income. The results of the current study are consistent to those of a study conducted by Ariyo, A. (1997) and Wawire (2006) on the effect of national income on the tax system. Specifically, Wawire found a positive effect of the national income on total taxes in the country but inelastic system. Ariyo (1997) found similar results for the case of Nigeria.

Conversely, the GDP in the policy reform coefficient was negative in its effect on the corporate taxes in the country. This is interpreted to mean that personal income taxes and the policy reforms were negatively related. A one percent change in the GDP reduced the personal income taxes by 0.028percent if other factors are held constant. The implication in this case is that, tax system reduced tax revenue because of discretionary policy measures changes for every 1% variations in the GDP.

These findings are inconsistent to Gillani (1986) on the effect of policy measures on the tax revenues for the case of Pakistan. The study found out that, policy measures had a positive effect on total tax revenues in the country. However, the current study focused on specific tax represented by the income personal tax.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter gives the summary and conclusions deduced from the study findings. The policy implications and further research areas are also suggested.

5.2 Summary of the Study

The tax revenue in Kenya keeps performing poorly and unsteadily. The revenue collected from tax does not match the target which creates budget deficits. Increased spending needs and weakening revenue-raising capacities have together created structural budget deficits that in turn have brought about fiscal crises whenever a recession hits. Therefore, of concern to policymakers is how Kenya can attain revenue stability and be able to sustain public expenditures. To do this, there was need to determine buoyancy and elasticity of income tax revenue. The overall study objective was to examine the corporate income tax buoyancy, Corporate Income tax elasticity, personal income tax buoyancy and the personal income tax elasticity in Kenya. To accomplish this objective, the study relied on time series data between 1963 and 2018. This period was deemed sufficient enough to observe all the dynamics of the mentioned taxes. The study collected data from different sources like KNBS and other documents such as the national budget. The national budget was particularly important in identifying various policies on tax.

To achieve the objectives, the study first carried out diagnostic tests on the data set. The study began by conducting the normality tests and found out that, the variables were not

normally distributed. This conclusion was advised by the probability value of the Jarque-Bera statistics. For this reason, the data was transformed first into logarithm. Further tests on normality confirmed that this transformation was important in making the data to be normally distributed.

The study went further to conduct stationarity tests such as the test of unit root. This was necessary as most time series data suffer from the problem of on stationarity. Using data that is not stationary produces spurious results. This implies that, although the variables coefficients are significant, the outcomes do not make any economic sense.

The test of unit root was carried out using ADF test. From the study results, GDP and personal income taxes were not stationary. However, after the first difference, the variables became stationary. The implication in this case is that, the two variables were integrated of order one.

The study further conducted cointegration test to find out whether there was a longrun relationship between the two variables that had a unit root. The results indicated that, in the longrun, the two variables were cointegrated.

The regression results indicated that, buoyancy for income tax was 0.932 with respect to current level of national income. This means that the income tax system is inelastic. The study results further implied that, buoyancy of income tax with respect to previous levels of national income was even more inelastic.

Corporate income tax with respect to current national income. The test statistic revealed that corporate income tax was highly buoyant with respect to the current level of national income. The study results further indicated that, the buoyancy of corporate income tax with respect to previous levels of national income was 1.051 which was elastic. The study concluded that, corporate tax was highly buoyant with respect to previous values of national income.

For the case of elasticity, the study aimed at analyzing the effect of various discretionary changes on both the income and corporate income tax. To achieve this objective, the study introduced a dummy variable which assumed two values. The dummy assumed a value of 1 for a presence of discretionary changes and 0 otherwise for the various years under consideration.

For both the personal income taxes and corporate income taxes, the study found out that, there was a positive relationship between the national income and the specific taxes. The study also found out that, the taxes were highly inelastic to the current value of national income. However, tax and the discretionary changes were negatively related.

5.3 Conclusion

The study found out that, national income is a very important variable affecting both personal income and corporate income taxes in Kenya. Specifically, the study established that, corporate income taxes are highly buoyant to changes in the national income. This being the position, it is important to understand this relationship as it has a potential of

contributing significantly to government revenue. Although personal income taxes were not highly buoyant

5.4 Policy Implications

From the results, the study noted that, buoyancy of the personal income taxes and corporate taxes was less than one. It is important for the government to put in place measures that would widen the tax base. The government should for example look for measures that can be implemented to make it easy for the businesses in the informal sector to pay taxes.

Since the personal and corporate income taxes were inelastic to changes in GDP, it is important that the government creates an enabling environment that would facilitate growth of the national output. This would contribute significantly to government revenue.

5.5 Areas of Further Research

The following areas are recommended for further research

i. Examination of income tax compliance in informal sectors using primary data
ii. Detailed investigation of income revenue sources in county governments

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APPENDICES

Table A1: Raw data

Year	Corporate tax	Income tax	GDP	GDP_1
1963	280	267.6	6441	1
1964	213	269.2	7120	6441
1965	254.6	317.8	7139	7120
1966	321.5	375.8	8224	7139
1967	354	476.6	8751	8224
1968	352	502.4	9595	8751
1969	320	632.8	10416	9595
1970	367	809.2	11499	10416
1971	456	937.2	12845	11499
1972	543	1069	13776	12845
1973	586	1124.8	15790	13776
1974	654	1531.4	18776	15790
1975	693	1796.8	21140	18776
1976	1026	2149.4	25562	21140
1977	1076	2846.8	32699	25562
1978	1098	3021.4	35601	32699
1979	2010	3437	39543	35601
1980	2043	3951.6	44648	39543
1981	2065	3993.4	51641	44648
1982	2087	4624.6	58214	51641
1983	2576	5023	66218	58214
1984	2976	6019.4	72550	66218
1985	3276	7162.4	100831	72550
1986	3894	7714.6	117472	100831
1987	2875	9089.6	131169	117472
1988	3187	10240.4	151194	131169

1989	3476	11983	171589	151194
1990	5698	14261.6	195536	171589
1991	10674	17027.8	224232	195536
1992	15986	19970.4	264475	224232
1993	18956	36767.2	333616	264475
1994	23765	43505.84	400700	333616
1995	28764	48082.32	465654	400700
1996	29850	48375.02	687998	465654
1997	30996	55577.9	770312	687998
1998	33084	55234.9	850808	770312
1999	32677	53316.99	906928	850808
2000	36445	53428.93	967838	906928
2001	34891	55861.95	1020020	967838
2002	37696	70140.28	1035370	1020020
2003	35425	77409.73	1138060	1035370
2004	33853	99312.47	1286460	1138060
2005	38343	114629.1	1467240	1286460
2006	56894	130719	1632424	1467240
2007	172610	165078	1825960	1632424
2008	203850	194155	2099798	1825960
2009	237190	228168	2863690	2099798
2010	272263	268291	3104300	2863690
2011	154134	174774	3294026	3104300
2012	173238	199847	3444066	3294026
2013	199717	249872	3640157	3444066
2014	228785	279775	5402647	3640157
2015	279834	286166	6284185	5402647
2016	288454	336596	7022963	6284185
2017	289962	350630	8144373	7022963
2018	363707	413257	8904984	8144373

Table A2: Transformed Data

Year	L income tax	LGDP	LGDP_1	D	DGDP	ldgdp
1963	2.427486	3.808953	0	0	0	0
1964	2.430075	3.85248	3.808953	0	0	0
1965	2.502154	3.853637	3.85248	0	0	0
1966	2.574957	3.915083	3.853637	0	0	0
1967	2.678154	3.942058	3.915083	0	0	0
1968	2.70105	3.982045	3.942058	0	0	0
1969	2.801266	4.017701	3.982045	0	0	0
1970	2.908056	4.06066	4.017701	0	0	0
1971	2.971832	4.108734	4.06066	0	0	0
1972	3.028978	4.139123	4.108734	0	0	0
1973	3.051075	4.198382	4.139123	0	0	0
1974	3.185089	4.273603	4.198382	0	0	0
1975	3.2545	4.325105	4.273603	0	0	0
1976	3.332317	4.407595	4.325105	0	0	0
1977	3.454357	4.514534	4.407595	0	0	0
1978	3.480208	4.551462	4.514534	0	0	0
1979	3.53618	4.59707	4.551462	0	0	0
1980	3.596773	4.649802	4.59707	0	0	0
1981	3.601343	4.712995	4.649802	0	0	0
1982	3.665074	4.765027	4.712995	0	0	0
1983	3.700963	4.820976	4.765027	0	0	0
1984	3.779553	4.860637	4.820976	0	0	0
1985	3.855059	5.003594	4.860637	0	0	0
1986	3.887313	5.069934	5.003594	0	0	0
1987	3.958545	5.117831	5.069934	0	0	0
1988	4.010317	5.179535	5.117831	0	0	0
1989	4.078566	5.234489	5.179535	1	171589	5.234489
1990	4.154168	5.291227	5.234489	1	195536	5.291227

1991	4.231159	5.350698	5.291227	0	0	0
1992	4.300387	5.422385	5.350698	0	0	0
1993	4.565461	5.523247	5.422385	0	0	0
1994	4.638548	5.602819	5.523247	0	0	0
1995	4.681985	5.668063	5.602819	0	0	0
1996	4.684621	5.837587	5.668063	0	0	0
1997	4.744902	5.886667	5.837587	1	770312	5.886667
1998	4.742214	5.929832	5.886667	1	850808	5.929832
1999	4.726866	5.957573	5.929832	0	0	0
2000	4.727776	5.985803	5.957573	1	967838	5.985803
2001	4.747116	6.008609	5.985803	1	1020020	6.008609
2002	4.845967	6.015096	6.008609	0	0	0
2003	4.888796	6.056165	6.015096	1	1138060	6.056165
2004	4.997004	6.109396	6.056165	1	1286460	6.109396
2005	5.059295	6.166501	6.109396	1	1467240	6.166501
2006	5.116339	6.212833	6.166501	0	0	0
2007	5.217689	6.261491	6.212833	0	0	0
2008	5.288149	6.322178	6.261491	0	0	0
2009	5.358255	6.456926	6.322178	0	0	0
2010	5.428606	6.491964	6.456926	0	0	0
2011	5.242477	6.517727	6.491964	0	0	0
2012	5.300698	6.537071	6.517727	1	3444066	6.537071
2013	5.397718	6.56112	6.537071	1	3640157	6.56112
2014	5.446809	6.732607	6.56112	0	0	0
2015	5.456618	6.798249	6.732607	0	0	0
2016	5.527109	6.84652	6.798249	1	7022963	6.84652
2017	5.544849	6.910858	6.84652	1	8144373	6.910858
2018	5.61622	6.949633	6.910858	1	8904984	6.949633

Table A3: Descriptive Statistics

	CORPORATE_TAX	GDP	INCOME_TAX	GDP_1
Mean	60835.72	1266594.	75564.24	1107576.
Median	8186.000	209884.0	15644.70	183562.5
Maximum	363707.0	8904984.	413257.0	8144373.
Minimum	213.0000	6441.000	267.6000	1.000000
Std. Dev.	98690.40	2130007.	108266.1	1865351.
Skewness	1.615051	2.177255	1.525162	2.234917
Kurtosis	4.188978	7.034648	4.219334	7.483198
Jarque-Bera	27.64354	82.22699	25.17958	93.51644
Probability	0.000001	0.000000	0.000003	0.000000
Sum	3406800.	70929263	4231598.	62024280

Table A4: Descriptive Statistics on Transformed Data

	LGDP	LCORPORATE_TAX	LINCOMETAX	LGDP_1
Mean	5.328105	3.929794	4.163019	5.204005
Median	5.320962	3.892025	4.192663	5.262858
Maximum	6.949633	5.560752	5.616220	6.910858
Minimum	3.808953	2.328380	2.427486	0.000000
Std. Dev.	0.977522	1.034222	0.981015	1.186685
Skewness	-0.014258	0.047867	-0.205507	-1.397620
Kurtosis	1.689553	1.659547	1.774057	7.579893
Jarque-Bera	4.008865	4.213950	3.901024	67.17384
Probability	0.134737	0.121605	0.142201	0.000000
Sum	298.3739	220.0685	233.1290	291.4243

Table A5: Unit Root Test

Null Hypothesis: LGDP has a unit root

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP(-1)	-0.166133	0.067353	-2.466587	0.0170
C	0.653200	0.244181	2.675063	0.0100
@TREND(1963)	0.010149	0.004040	2.511900	0.0152
R-squared	0.113154	Mean dependent var		0.057103
Adjusted R-squared	0.079045	S.D. dependent var		0.034189
S.E. of regression	0.032810	Akaike info criterion		-3.943144
Sum squared resid	0.055979	Schwarz criterion		-3.833653
Log likelihood	111.4365	Hannan-Quinn criter.		-3.900803
F-statistic	3.317385	Durbin-Watson stat		1.700848

Table A6:Cointegration Results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.321006	29.74981	12.32090	0.0000
At most 1 *	0.151071	8.844105	4.129906	0.0035