THE RELATIONSHIP BETWEEN TAX REVENUE AND ECONOMIC GROWTH IN KENYA

BY

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DECLARATION

This research project is my original work and has not been presented to any other University for any academic award.

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Declaration by the supervisor

This research project has been submitted for examination with my approval as university supervisor.

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DEDICATION

Dedicated to my family, for their support and encouragement.

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ABSTRACT

The objective of this study was to analyze the relationship between tax revenue and economic growth in Kenya for the period 2002 to 2012. The study applied the concepts of elasticity and buoyancy to examine the relationship between tax revenue and economic growth in Kenya for the period 2002 to 2012. Elasticity and buoyancy coefficients were computed for individual taxes and the tax system as a whole. The elasticity of individual tax taxes was decomposed into tax to base elasticity and base to income elasticity in order to determine the major cause of high or low elasticity. The buoyancy estimates were obtained by regressing the natural logarithms of actual tax revenue against the natural logarithms of gross domestic product. The elasticity estimates were obtained by regressing the natural logarithms of adjusted tax revenue against the natural logarithms of gross domestic product. The adjusted tax revenues were obtained by eliminating the revenue effects of discretionary tax measures from the actual tax revenue series. The proportional adjustment method was used to remove the effects of discretionary tax measures from the actual tax revenue. The study relied on secondary data obtained from various statistical abstracts, economic surveys and budget speeches for the period 2002 to 2012. The study found out that there was a significant relationship between total tax revenue and economic growth in Kenya in the period 2003 to 2012. However, import duties were not responsive to changes in national income while discretionary tax measures implemented during the period failed to increase total tax revenue. It was recommended that there is need to reform the import duty and to redesign the discretionary tax measures to ensure that they are more effective in raising additional tax revenue.

LIST OF ABBREVIATIONS

GDP -Gross domestic product

VAT -Value added tax

DFI - Domestic Factor Incomes

PFC - Private Final Consumption

KRA -Kenya Revenue Authority

LN -Natural Logarithm

AITR -Actual income tax revenue

AIMD -Actual import duty

AEXD -Actual excise duty

AVAT -Actual value added tax

ATTR -Actual total tax revenue

ADITR -Adjusted income tax revenue

ADIMD -Adjusted import duty

ADEXD -Adjusted excise duty

ADVAT -Adjusted value added tax

ADTTR -Adjusted total tax revenue

CHAPTER ONE

INTRODUCTION

1.1 Background

A tax is a compulsory payment levied by the government on both natural and fictitious persons such as companies, to meet the expenditure incurred in providing common benefits to the citizens of a country. Goode (1984) defines taxes as compulsory contributions for which no explicit, reciprocal benefit is provided to the taxpayer. They are intended to force the household or enterprise to surrender purchasing power to the government for its direct utilization or transfer to others. It is viewed as a compulsory levy because those who are taxed have to pay the required sum without expecting any corresponding return inform of goods or services from the government of the day. A tax is therefore an involuntary payment made by individuals or businesses to the government in accordance with the laws of the land.

According to Musgrave and Musgrave (1989) taxes are withdrawn from the private sector without leaving the government with a liability to the payee. Taxes can be described as leakages from the circular flow of income into the public sector. Since businesses and households are the main players in the circular flow of income, it follows that taxes are mainly levied on businesses and households. Taxation therefore involves a transfer of economic resources from the private sector to the government to enable it to acquire the resources that it requires to provide public goods and services to its citizens.

Due (1968) observes that governments have four major potential source of revenue: taxes, charges, borrowing and money creation. However tax revenue is the primary revenue source which represents payment by the community as a whole for public goods and services. Other sources include income from state property and enterprises, proceeds of the sale of government assets, and grants from other governments and international institutions.

Bruce et al (2006) point out that generating sufficient revenue to finance government service delivery is the most important function of a tax system. The government has to provide many goods and services to its citizens such as health, education, defense of the country, maintenance of law and order and management of the economy. The

government therefore requires adequate revenue to finance the provision of these goods and services. In the last 10years, the government of Kenya has committed itself to provision of additional public goods and services such as free primary and secondary education, free maternal health care and laptops for primary schools. This implies that the amount of public expenditure has been increasing overtime and therefore there is urgent need for the government to raise sufficient revenue to meet the expanding public sector requirements.

Chigbu et al (2011) argue that apart from generating revenue, a tax system is also used as a tool of fiscal policy that influence the direction of investment and to regulate the production and consumption of certain goods and services. Brown and Jackson (1986) point out that taxes are also collected by governments for purposes of stabilization, distribution and allocation. The overall level of taxes may be chosen in an attempt to stabilize the level of employment, price level, economic growth or the balance of payments. The government may also try to influence the distribution of income and wealth by varying the tax structure. Taxes may also be selected with a view to influence the allocation of resources in the economy.

According to Karran (1985) the tax revenue raised by the government depends to a large extent on the state of the economy; therefore the relationship between tax revenue and economic growth is an issue of great importance. Economic growth entails an increase in gross domestic product overtime and is mainly linked to tax revenue through its effect on tax base. If tax revenues are not sufficient to meet expenditure needs, the government must resort to borrowing, printing money, selling assets, or slowing down the implementation of development programs. All these actions generally hurt the economy, especially the poorest segment of the society.

Beardshaw et al (2001) define economic growth as an increase in the overall output of an economy over a given period of time; the overall output of an economy is also called national product. Growth of an economy in a given year is measured by the change in national output as a percentage of the national output achieved in the previous year. The term national product is used to describe the total of all the output of goods and services

produced by an economy over a specific period of time and is also known as national income.

There are several different measures of national product but the most commonly used measure is Gross Domestic Product. According to Case and Fair (2007) gross domestic product refers to the market value of all final goods and services produced within the country over a given period of time by factors of production located within that country. Gross domestic product is normally expressed in terms of current prices as well as constant prices. Gross domestic product measured at current market prices is called nominal gross domestic product while gross domestic product measured at constant prices is called real gross domestic product. Real gross domestic product is nominal gross domestic product adjusted for price changes by deflating the nominal gross domestic product figures by the amount of inflation that has taken place. Inflation is measured by means of index numbers and the most commonly used index is the consumer price index.

1.1.1Kenya's tax structure

The major sources of tax revenue for Kenyan government are income tax, value added tax, excise tax, and customs duties. According to the Kenya Income Tax Act, income tax is a direct tax charged on incomes of individuals from employment, self employment, profits from business entities, incomes such as rent income, dividends, interests, pensions, royalties, income from management or professional fees, and others. Taxes on income represent the dominant source of tax revenue for the government in Kenya. In 2009/2010 financial year, taxes on income accounted for 47 percent of total tax revenue. The composition of the tax structure in 2009/2010 financial year is shown in table 1.1 below.

Table 1.1: Composition of Tax Revenue for2009/10

Source of tax revenue	Percentage of tax revenue
Income Tax	47
Value Added Tax	28
Excise Duty	16
Import Duty	9

Source: Kenya Revenue Authority Website

The main components of income tax in Kenya are the corporate taxes and personal income taxes. Corporation tax is a form of income tax that is levied on corporate bodies such as limited companies, Trusts and Cooperatives. Resident companies are taxable at a rate of 30% while nonresident companies are taxable at the rate of 37.5% on taxable income. The rates have remained unchanged since the year 2002.

Personal income tax follows a graduated rate structure. The personal income tax schedule has five tax brackets with the lowest marginal tax rate being 10%, and the top marginal tax rate being 30%. Tax brackets and tax rates have remained relatively unchanged since the year 2002.

Hyman(2010) points out that some excise taxes are designed to raise revenue, while others are intended to discourage particular consumption activities. Excise duty which is an indirect tax levied on selected goods and services in Kenya is a very important source of revenue to the government which is also used to discourage the consumption of harmful products such as tobacco and alcohol. The main products that are subject to excise duty in Kenya are cigarettes, beer, wines and spirits and mineral water.

The main components of customs duties are import duties and export duties. Customs duties are applicable when importing or exporting certain goods and services. Customs duties are not only used for generating revenue but also to facilitate trade and protect or promote domestic manufacturing industry.

Value added tax is an indirect tax levied on the consumption of goods and services and it is charged at each stage of production and distribution chain up to the retail stage. Value added is also levied on imported taxable goods and services. According to Kenya revenue authority, the standard rate of value added tax in Kenya is 16%. Zero rated supplies include the export of goods and services while exempt supplies include financial services by banks and most agricultural produce in its unprocessed or preserved state.

1.1.2 Performance of the economy

Mwega and Ndungu (2002) observe that Kenya experienced good economic performance in the 1960's and early 1970's while the years between the late 1970's and late 1980's

were characterized by persistently low growth. In the 1990's, the introduction of competitive politics created uncertainty in the country leading to further decline in economic performance.

After the year 2002 there was substantial improvement in the growth of the Kenyan economy. Peaceful national elections in December 2002 and a smooth transition of power to the new government marked the beginning of a new era of positive economic growth. Economic growth rates of real gross domestic product for 2001 to 2011 are shown in table 1.2 below.

Table 1.2: Growth of Gross Domestic Product for 2001 to 2011

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Growth rate(%)	-0.2	1.2	0.2	2.9	5.1	5.9	6.3	7	1.5	2.7	5.8	4.4

Source: Statistical Abstracts

In the year 2003, the government developed the economic recovery strategy for wealth and employment creation action plan, whose policies contributed to recovery of the Kenyan economy. During the period 2003-2007 the economy grew at increasing rate of growth, registering the highest growth of 7% in 2007. However the steady growth was interrupted in the year 2008 by post-election violence which reduced the growth rate to 1.5%. The lowest growth rate during the period 2003-2011 was 1.5% in 2008 while the highest was 7% in 2007.

1.2 Research Problem

Karran (1985) observes that there is a positive relationship between tax revenue and economic growth. Economic growth entails an increase in gross domestic product overtime and is mainly linked to tax revenue through its effect on tax base. Tax revenues increase with economic growth based on the assumption that tax bases grow as gross domestic product increases. Mustafa (2000) observes that as the economy grows, more people and companies will be deriving higher income and would therefore be liable to pay higher taxes. Ulbrich (2003) asserts that a tax system need to provide revenue growth

that keeps pace with real income growth because demand for public goods and services as a compliment to private consumption can be expected to increase as the standard of living rises. Wilford (1965) observed that increase in demand for public goods and services requires that tax revenues rise more rapidly than income to meet increased expenditure needs. It is therefore important to determine whether tax revenue grows in tandem with growth in gross domestic product. This can be done by estimating the coefficients of buoyancy and elasticity of the tax system. Mansfied (1972) recognized that individual taxes that define a tax system have widely divergent responses to changes in economic growth income. Kenya's tax system comprises four individual taxes: Income tax, Value added tax, Excise tax, and Customs duty. It is therefore necessary to examine the responsiveness of individual taxes to changes in economic growth.

According to Mutua (2012), the largest contributors of tax revenue over the last decade are income tax at 40 percent followed by value added tax at 28percent %. Excise and Customs duties contributed 21percentand 11 percent respectively. In 2009/2010 financial year, income tax, value added tax, excise duties and import duty accounted for 47%, 28%, 16% and 9% of total tax revenue respectively. The absolute figures do not provide any information about the relationship between tax revenue and economic growth and therefore, it becomes imperative to study the relationship using the concepts of elasticity and buoyancy. Kotut and Menjo (2011) evaluated the tax system in Kenya by applying the concepts of tax buoyancy and tax elasticity for the period 1986 to 2009. The elasticity estimates for individual taxes were as follows: income tax 0.12, value added tax 0.53, excise duties 0.05, and import duties 0.52.The buoyancy estimates for individual taxes were as follows: income tax 0.59, value added tax 0.87, excise duties 0.53, and import duty 1.57. They concluded that import duty was the most buoyant tax while value added tax was the most elastic tax. The results also showed that the buoyancy of the whole tax system was 0.525 while the elasticity was 0.509 for the period 2005 to 2009.They concluded that the Kenyan tax system is neither income elastic nor buoyant and that all major tax components in Kenya are inelastic This study will provide revised estimates of tax elasticity and tax buoyancy by examining the responsiveness of tax revenue to economic growth in the period 2002 to 2012.

In the last 10 years, Kenya has enjoyed impressive rates of economic growth. The country has also experienced substantial growth in the level of public expenditure on one hand and increased borrowing on the other hand pointing to the inability of the tax system to supply the revenues that are required to meet growing public expenditure. From a low budget of 310.8 billion in 2002/2003 financial year; government budget increased to 1459 billion in 2012/2013 financial year which represent a 470% increase over the last 10 years. Tax revenue remains the major source of government revenue in Kenya and it accounts for over 80% of total government revenue. Tax revenue increased from 180.7 billion in 2002/2003 financial year to 720 billion in 2011/2012 financial year. Despite the increase in tax revenue the government continues to borrow heavily from the domestic as well as the international market raising public debt from 630 billion as at 1st January 2003 to 1.8 trillion as at 30th June 2013. It is evident that the government is not in a position to rely solely on tax revenue to support all of its expenditure requirements.

Empirical studies that have been conducted on the relationship between tax revenue and economic growth in Kenya focus on the effects of tax reforms that were introduced in Kenya through the tax modernization programme in 1986. For example, Kieleko (2006) examined the tax system over the period 1986 to 2003, while Kotut and Menjo (2011) examined the tax system over the period 1986 to 2009. The studies therefore do not provide information about the Kenya's tax system for the most recent period, especially the last decade which has been characterized by increasing government expenditure and tax revenue, and positive economic growth. This study fills the knowledge gap by examining the relationship between tax revenue and economic growth for the period 2002 to 2012. In order to achieve this, the study seeks to answer the question: what were the elasticities and buoyancies of the entire tax system and of the individual taxes over the 2002 to 2012 period?

1.3Objective of the Study

The objective of this study was to examine the relationship between tax revenue and economic growth in Kenya.

1.4 Value of the study

The result of the study will be useful to policy makers as it will provide information that they can use to evaluate the productivity of the Kenya's tax system over the last 10 years. It will also provide information about the responsiveness of individual taxes to their bases, and bases to overall growth, that policy makers can use to design appropriate tax reform policies in order to improve the productivity of the tax system. The model defining the relationship between tax revenue and economic growth can be used to predict and influence the future development of tax revenue in Kenya.

The study will be of interest to academicians as it contributes to the existing literature on the productivity of Kenya's tax system and the key components of the tax system. The study updates the literature on the productivity of the tax system in Kenya by providing new estimates of the tax revenue elasticity and buoyancy for the entire tax system, and for the components of the tax system. The study will also reveal whether the growth in tax revenue over the sample period have been the result of discretionary tax measures or if they were due to the automatic increase in tax revenues, that is expected when gross domestic product increases. It will also be of interest to researchers as it will provide a basis for conducting further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter is divided into six parts. It begins with a discussion of the concepts of tax buoyancy and elasticity. It is followed by a discussion of the theoretical relationship between tax revenue and economic growth, methods of analyzing the relationship between tax revenue and economic growth, and the theoretical framework employed in the study. A review of related empirical studies conducted in Kenya and a summary of empirical literature review concludes the chapter.

2.2The Concept of Tax Buoyancy and Elasticity

Ram (1991) points out that the sensitivity of tax revenue to variations in national income is an important dimension of any tax system. The responsiveness of tax revenue to changes in national income or gross domestic product can be measured by applying the concepts of tax buoyancy and tax elasticity. These concepts help to explain the overall structure of a tax system and serve as a valuable analytical tool for designing tax policy.

According to Creedy and Gemmell (2007), tax buoyancy measures the observed percentage change in tax revenues divided by the percentage change in the tax base. The buoyancy of a tax system measures the total response of tax revenues to changes in national income or gross domestic product. Total response takes into account both increases in income and discretionary changes made by tax authorities. A high tax buoyancy is said to be a desirable characteristic of a tax system since it implies that a rise in national income would generate more tax revenue while a less buoyant tax system would generate low levels of tax revenue with respect to growth in national income. Tax Buoyancy is a useful concept for measuring the performance of both tax policy and tax administration over time.

Another important criteria used to describe a tax system is tax elasticity. Creedy and Gemmell (2007) defines tax elasticity as the automatic revenue growth associated with the built in flexibility of a tax system which is measured by the automatic percentage

change in tax revenues divided by the percentage change in the tax base. The concept of elasticity distinguishes the effects of change in national income from those of discretionary changes in tax rates and thresholds, or other factors affecting tax revenue such as improvement in administration of taxes and changes in behaviour of tax payers with respect to avoidance and evasion of taxes. The concept of tax elasticity is a relevant factor for forecasting purposes since it gives an indication to policy makers of whether tax revenue will rise at the same pace as the national income.

According to Groves and Kahn (1952) taxes are classified into three categories with respect to elasticity: (a) Taxes whose yield is very stable, that is whose income elasticity is substantially less than unity; (b) Taxes whose yield varies roughly in proportion to fluctuations in income payments, that is whose income elasticity is close to one, and (c) taxes that have a high sensitivity to changes in income, that is their elasticity coefficient is greater than one.

Mansfied (1972) observes that high tax elasticity is a desirable characteristic of a tax system since it allows growth in expenditure to be financed by rising tax revenue without the need for politically difficult decisions to raise the taxes. If the tax system has a low elasticity the authorities must seek additional revenue by introducing discretionary changes. The difference between the elasticity and buoyancy of a tax system shows the importance of discretionary tax measures in the tax system.

Bilquees (2004) points out that, major taxes in developing countries tend to have low elasticity and buoyancy. He attributes this to weaknesses in economic structure where a large majority remains out of the tax net due to low average income levels and unorganized nature of most economic activities, which erode the income tax base. Another important factor affecting elasticity and buoyancy is the provision of massive tax incentives and exemptions to the manufacturing sector over extended periods in most developing countries. The existence of tax incentives and exemptions changes the behavior of taxpayers so that they can avoid or manage their tax burden by taking advantage of the special provisions.

2.3 Theoretical Relationship between Tax Revenue and Economic Growth

Karran (1985) identifies three models of tax revenue change: (i) Macroeconomic determination model, (ii) consumer preference model and (iii) policy initiative model. Macroeconomic determination model holds that changes in tax revenues are brought about by economic growth and inflation. Economic growth may lead to increase in tax revenue by increasing the real value of the tax base. Mustafa (2000) observes that as the economy grows, more people and companies will be deriving higher income and would therefore be liable to pay higher income taxes. Economic growth can also change purchasing patterns, thus altering the revenues raised by particular taxes. For example, economic growth can generate an upsurge in car ownership which causes an increased demand for petrol, leading to increase in tax revenue obtained from petroleum products. Inflation has a direct effect on the revenue yield of taxes. If a tax base is measured in money terms and levied on a percentage basis it is buoyant with respect to inflation; the increase in the money value of the base increases the revenue yield. Further, if inflation pushes incomes into tax bands with higher percentage levies, the rise in tax yield exceeds that of inflation. Taxes levied in fixed money sums decline in value with inflation.

According to Heinemann (2001) tax revenue may be linked to changes in national income through fiscal drag. Fiscal drag describes the phenomenon whereby inflation and economic growth push more tax payers into higher tax brackets. This has the effect of raising tax revenue without explicitly raising tax rates, or changing tax bases. The effects of fiscal drag are more pronounced in a growing economy where tax allowances, progressive tax rates and the thresholds above which a particular rate of tax applies usually remain constant or are changed only gradually.

Greedy and Gemmell (2007) observes that fiscal drag influence the sensitivity of tax revenue to income growth because of the interactions between income growth and tax progressivity. They also observe that fiscal drag is a familiar feature of income taxes where the existence of fixed or income related tax allowances and rising marginal rates generate a rising share of total income paid in income tax as average income rise.

Heinemann (2001) notes that fiscal drag effect may be split into two parts: inflationary fiscal drag and real fiscal drag. Inflationary fiscal drag refers to the variation of tax revenue due to nominal income moving across income brackets while real fiscal drag refers to variation of tax revenue generated by a real income growth.

White (1983) recognizes that different types of taxes do not respond to fluctuations in national income in the same manner. He proposes the use of diversification in the design of an efficient tax structure which provides the highest possible growth of tax revenue. Garriet (2009) notes that a government has several taxes from which it generates total tax revenue. The percentage change in total state tax revenue is therefore a weighted average of the portfolio of taxes from which revenues are obtained.

2.4Evolution of Analytical Methods

Literature on the relationship between tax revenue and economic activity dates back to Groves and Kahn(1952) who were concerned with the stability of state and local tax yield in the United States of America. To obtain elasticity coefficients for the various state and local taxes, Groves and Kahn regressed the logarithms of tax revenue against the logarithms of income using a simple regression equation of the form:

$$\text{Log}(T) = \log(\alpha) + \beta \log(Y). \qquad (2.1)$$

Where: T is tax revenue, Y is income, logα is a constant and β is the required income elasticity coefficient. Khan and Groves used the model to measure short run elasticities but many researchers have argued that the model measures long run growth potential of the tax bases.

Wilfred (1965) observed that Groves and Kahn did not account for changes in statutory tax rates when computing income elasticity of the tax system. He suggested the use of a multiple regression equation, in which the average statutory tax rate and income are independent variables. The multiple regression equation is of the form:

$$\text{Log } R = \log A + e \log Y + f \log r \qquad (2.2)$$

Where: R is tax revenue, A is a constant, Y is income, r is average tax rate, e is income elasticity and f is the rate – revenue elasticity coefficient.

Building on Groves and Kahn (1952) work, Sobel and Holcombe (1996) brought important methodological improvements to the analysis of the relationship between tax revenue and economic growth. They based their analysis on the following standard elasticity model:

$$(T_t) = \alpha + \beta \ln(Y_t) + \varepsilon_t, \quad (2.3)$$

Where α is, β is the coefficient of income elasticity/buoyancy which is assumed to be constant over the range of income considered. T is total tax revenue, Y is income (GDP) and ε is the stochastic disturbance term.

Sobel and Holcombe (1996) point out that time series data for tax revenue, tax bases and income tends to be non-stationary. A stationary variable is one that tends to return to some mean value through time. Any variable that has a trend will not be stationary as it will continue to move upwards through time, with no inherent tendency to return downward. The tests that are commonly used to determine whether a variable is stationary or nonstationary are the Augmented Dickey–Fuller (ADF) test and Phillips-Perron tests.

Sobel and Holcombe (1996) also point out that the use of non- stationary time series observations may generate spurious regression but the risk of spurious regression is eliminated if the variables in question tend to move together over a long period of time, that is, they are cointegrated. Bruce et al (2006) argues that income shares a theoretical relationship with tax bases, mitigating the probability of spurious regression. Sobel and Holcombe caution that although the presence of cointegration removes the problem of spurious regression, the standard method of using ordinary least squares to estimate the elasticity and buoyancy of taxes may result in estimates that are asymptotically biased and have inconsistent standard errors, which make standard hypothesis testing inaccurate. They observe that the inconsistency of the standard error can be corrected by using the Newey-West correction procedure while the co-efficient bias can be corrected by using Dynamic ordinary least squares. The tests that are commonly used to test for cointegration among variables are the Augmented Engle-Granger test and the Johensen cointegration tests.

2.5 Theoretical Framework

2.5.1 Elasticity of the Tax System and Decomposition of Elasticity

Groves and Kahn (1952) define the term income elasticity with respect to a given tax as the ratio of the percentage change in tax revenue to a given percentage change in income and presents it symbolically as follows:

$$E = \frac{\frac{\Delta T}{T}}{\frac{\Delta Y}{Y}} \quad (2.4)$$

Where E is elasticity, T is tax revenue, Y is aggregate income, ΔT is change in tax revenue and ΔY is change in aggregate income.

Mansfied (1972) recognized that individual taxes that define a tax system have widely divergent responses to changes in income. Therefore the elasticity of tax revenue to income is more realistically visualized as the weighted average of the sum of the elasticity of separate taxes that comprise the tax system. He also points out that the income elasticity of each separate tax may be decomposed into two elements: the elasticity of the tax to base and the elasticity of the base to income.

Using the symbols T_t = total tax revenue, T_k = revenue from K_{th} tax, Y = income and B_k = base of K_{th} tax, Mansfied (1972) defines four concepts of elasticity as follows:

(i) Elasticity of total tax revenue to income $= E_{T_t} y = \frac{\Delta T_t}{\Delta y} \times \frac{Y}{T_t}$ (2.5)

(ii) Elasticity of K_{th} individual tax to income $= E_{T_K} y = \frac{\Delta T_k}{\Delta Y} \times \frac{Y}{T_k}$ (2.6)

(iii) Elasticity of K_{th} individual tax to base $= E_{T_k B_k} = \frac{\Delta T_k}{\Delta B_K} \times \frac{B_k}{T_k}$ (2.7)

(iv) Elasticity of K_{th} individual Base to income $= E_{B_K} y = \frac{\Delta B_K}{\Delta Y} \times \frac{Y}{B_k}$ (2.8)

Given the above definitions of elasticity, the elasticity of total tax revenue to income in a system of n taxes is equal to the weighted sum of individual tax elasticities as shown below:

$$\boldsymbol{E_{T_t}y = \frac{T_1}{T_t}\left(\frac{\Delta T_1}{\Delta Y} \times \frac{Y}{T_1}\right) + \cdots\cdots \frac{T_k}{T_t}\left(\frac{\Delta T_k}{\Delta Y} \times \frac{Y}{T_k}\right) + \cdots\cdots + \frac{T_n}{T_t}\left(\frac{\Delta T_n}{\Delta Y} \times \frac{Y}{T_n}\right)} \quad (2.9)$$

The elasticity of any individual tax may be decomposed into the product of the elasticity of the tax to its base and the elasticity of the base to income as follows:

$$E_{T_K}y = \left(\frac{\Delta T_k}{\Delta B_K} \times \frac{B_k}{T_k}\right)\left(\frac{\Delta B_K}{\Delta Y} \times \frac{Y}{B_k}\right) \quad (2.10)$$

Mansfield (1972) notes that the elasticity of total revenue to income into a system of n taxes depends on the product of the elasticity of tax to base and base to income for each separate tax, weighted by the importance of the tax in the total system. The elasticity is represented by the following expression:

$$ETty = \frac{T_1}{T_t}\left[\left(\frac{\Delta T_1}{\Delta B_1} \times \frac{B_1}{T_1}\right)\left(\frac{\Delta B_1}{\Delta Y} \times \frac{Y}{B_1}\right)\right] + \cdots \frac{T_k}{T_t}\left[\left(\frac{\Delta T_k}{\Delta B_k} \times \frac{B_k}{T_k}\right)\left(\frac{\Delta B_k}{\Delta Y} \times \frac{Y}{B_k}\right)\right] \ldots + \frac{T_n}{T_t}\left[\left(\frac{\Delta T_n}{\Delta B_n} \times \frac{B_n}{T_n}\right)\left(\frac{\Delta B_n}{\Delta Y} \times \frac{Y}{B_n}\right)\right] \quad (2.11)$$

Since elasticity measures the automatic response of revenue to incomes changes, it is necessary to eliminate the effects of discretionary tax measures from the actual tax revenue data. Wawire (2002) highlights four methods of adjusting for the effect of discretionary tax measures. These are proportional adjustment method, dummy variable method, constant rate structure method and divisia index method. This study will employ the proportional adjustment method.

2.5.2 Proportional Adjustment Method

The proportional adjustment method of accounting for discretionary effects was developed by Prest (1962) to study the responsiveness of personal income tax to personal income in the United Kingdom. The method which was later elaborated by Mansfied (1972) involves two main steps.

The first step derives a preliminary series of adjusted tax revenue by subtracting the estimated amount attributed to the discretionary tax measures from the actual tax revenue series for all years except the first year which is treated as the reference or base year. If T_1, T_2……T_n (T_i where$i$=1,2…..n) is the actual tax revenue series; D_1, D_2……. D_n($D_i$where$i$=1,2…….n) are the revenue effects of discretionary

changes in those years, then the preliminary series of adjusted tax revenue is represented by T_{1i} where i=1,2……n and is obtained as follows:

For the first year, $T_{11} = T_1$(2.12)

For subsequent years, $T_{1i} = T_i - D_i$ where i= 2,3……n (2.13)

The second step derives a final series of tax revenue by applying the formula shown in part (4) below to the preliminary adjusted tax revenue series obtained in step one. The formula is applied to the revenue series for year 3 to year n, in order to eliminate the continuing impact of each year's discretionary change on future years' tax revenue. The objective of the second step is to generate a revenue series based on the tax structure of a reference year.

If the final series is represented by: T_{2i} where i = 1,2,…….n, then the series is obtained as follows:

$T_{21} = T_{11}$ and $T_{22} = T_{12}$ for the first and second year respectively. (2.14)

For subsequent years (i = 3,4……n) :

$$T_{2i} = T_{1i} \times \frac{T_{1,i-1}}{T_{i-1}} \times \frac{T_{1,i-2}}{T_{i-2}} \times \frac{T_{1,i-3}}{T_{i-3}} \times \dots\dots\dots\dots\dots\dots\dots\dots \times \frac{T_{13}}{T_3} \times \frac{T_{12}}{T_2} \quad (2.15)$$

The terms in equation 4 can be obtained more quickly from the following expression:

$$T_{2i} = T_{1i} \times \frac{T_{2,i-1}}{T_{i-1}} \text{ for } i = 4,5,6,\dots\dots.n \quad (2.16)$$

The proportional adjustment method is summarized in Table 2.1 below.

2.5.3 Tax Buoyancy

According to Mansfield(1972) Tax buoyancy measures the total percentage change in tax revenues, including changes resulting from discretionary measures, associated with a given percentage change in income. Computation of tax buoyancy is similar to that of tax elasticity except that computation of elasticity employs adjusted tax revenue while buoyancy employs actual tax revenue. The buoyancy of a tax system can also be decomposed into tax to base buoyancy and base to income buoyancy.

Table 2.1: Proportional Adjustment Method

Year	Actual Tax Revenue	Estimated Revenue From Discretionary Measures	Preliminary Adjusted Data	Adjusted tax revenue
1	T_1		$T_{11} = T_1$	$T_{21} = T_{11}$
2	T_2	D_2	$T_{12} = T_2 - D_2$	$T_{22} = T_{12}$
3	T_3	D_3	$T_{13} = T_3 - D_3$	$T_{23} = T_{1,3} \times \frac{T_{12}}{T_2}$
4	T_4	D_4	$T_{14} = T_4 - D_4$	$T_{24} = T_{14} \times \frac{T_{12}}{T_2} \times \frac{T_{13}}{T_3} = T_{14} \times \frac{T_{23}}{T_3}$
5	T_5	D_5	$T_{15} = T_5 - D_5$	$T_{25} = T_{15} \times \frac{T_{24}}{T_4}$
7	T_7	D_7	$T_{17} = T_7 - D_7$	$T_{27} = T_{17} \times \frac{T_{26}}{T_6}$
⋮				
n	T_n	D_2	$T_{1n} = T_n - D_n$	$T_{2n} = T_{1,n} \times \frac{T_{2,n-1}}{T_{n-1}}$

2.5.4 Measurement of Elasticity and Buoyancy

Many empirical studies conducted to estimate buoyancy and elasticity of tax systems rely on the following function to represent the relationship between tax revenue and income:

$$T=\alpha Y^{\beta}\varepsilon \quad (2.17)$$

Where α is a constant indicating tax yield when the base is set to zero. β is the coefficient of income elasticity/buoyancy which is assumed to be constant over the range of income considered . T is total tax revenue, Y is income (GDP) and ε is the stochastic disturbance term.

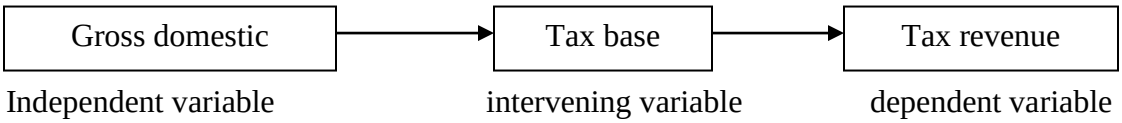
To obtain the coefficient of income elasticity or buoyancy, β, the equation is transformed to a log-linear equation by taking the logarithms of the variables. The double logarithmic equation becomes;

$$\ln(T_t) = \alpha + \beta \ln(Y_t) + \varepsilon_t \quad (2.18)$$

Tax buoyancy/elasticity (β) is then obtained by regressing the logs of tax revenue against the logs of income.

2.5.5 Tax Determination Model

Karran(1985) argues that tax revenue accruing from a specific source in any one year is determined by three factors: the tax base, the rate of tax payable on the given base, and the administration of tax collection. If the rate of tax and the effectiveness of tax administration are treated as a constant, then the tax base determine the amount of tax revenue. Karran observes that the tax base is an intervening variable which is influenced by economic factors. Economic growth, therefore, affects tax revenue through its interaction with the tax base. The following diagram summarizes the relationship between economic growth (proxied by Gross Domestic Product) and tax revenue.



Independent variable intervening variable dependent variable

The tax determination model shows that tax revenues increase with economic growth based on the assumption that tax bases grow as gross domestic product increases. The model which link economic activity to revenue enables the researcher to identify the variables that will be used in the study.

2.5.6 Variables used in the study

The variables used in this study can be classified into three broad categories: actual tax revenue, adjusted tax revenue and tax bases. Actual tax revenue and adjusted tax revenues are the dependent variables used to determine tax buoyancy and tax elasticity respectively. Tax bases are dependent or independent variables depending on whether we are estimating tax to base elasticity or base to income elasticity. Gross domestic product is the independent variable for base to income elasticity and the overall tax buoyancy/elasticity. Kenya's tax system comprises four individual taxes: Income tax, Value added tax, Excise tax, and Customs duty. The variables used in this study are summarized in table 2.2.

Table 2.2: Variables used in the study

	Dependent variable	**Independent variable**
Buoyancy :		
Income tax	Actual income tax revenue	Gross domestic product
Value added tax	Actual value added tax revenue	Gross domestic product
Excise duty	Actual Excise tax revenue	Gross domestic product
Import duty: Tax to base	Actual import duty	Gross domestic product
Elasticity:		
Income tax :Tax to base	Adjusted income tax revenue	Domestic factor income
:Base to income	Domestic factor income	Gross domestic product
:Tax to income	Adjusted income tax revenue	Gross domestic product
Value added :Tax to base	Adjusted value added tax revenue	Private Final Consumption
:Base to income	Private Final Consumption	Gross domestic product
:Tax to income	Adjusted value added tax revenue	Gross domestic product
Excise duty :Tax to base	Adjusted Excise tax revenue	Private Final Consumption
:Base to income	Private Final Consumption	Gross domestic product
: Tax to income	Adjusted Excise tax revenue	Gross domestic product
Import duty: Tax to base	Adjusted import duty	Total Imports
:Base to income	Total Imports	Gross domestic product
: Tax to income	Adjusted import duty	Gross domestic product

2.6 Related Empirical Studies

There are several empirical studies which examine the relationship between tax revenues and economic growth in Kenya.

Ole (1975) examined the relationship between tax revenue and economic growth for the period 1962/1963 to 1972/1973 by computing the income elasticity and buoyancy of the Kenyan tax system. The proportional adjustment method proposed by Prest (1962) was used to remove the effects of discretionary measures from tax revenue series. The results showed that the overall elasticity and buoyancy of the Kenyan tax system for the period 1963 to 1973 were 0.81 and 1.25 respectively. The study concluded that the tax structure was income inelastic.

Another empirical study was conducted by Njoroge (1993) to analyze the effects of tax reforms in Kenya for the period 1972/73 to 1990/91. The study used the method employed by Ole (1975) except that the study period was divided into two periods to

enable comparison between pre-reform and post reform period. The estimated buoyancy coefficients for the pre-reform and post reform periods were 1.19 and 1 respectively while the pre reform and post reform coefficients of income elasticity were 0.67 and 0.86 respectively.

Wangombe (1999) examined the Kenyan tax system for the period 1989-1998 using the double log regression model. Buoyancy coefficient and elasticity coefficient for the overall tax system were 1.27 and 1.26 respectively. The proportional adjustment method was used to account for the effect of discretionary measures on tax revenue.

Muriithi and Moyi (2003) studied the Kenyan tax system to assess whether tax reforms introduced in Kenya in 1980's achieved the intended objective of making the yield of individual taxes responsive to changes in national income. The study period of 1973-1999 was split into two parts to account for pre reform and post reform period. They applied the concepts of elasticity and buoyancy and computed the coefficients of buoyancy and elasticity for the pre reform as well as the post reform period. During the pre-reform period the overall tax system yielded an elasticity of 0.276 against a buoyancy index of 1.023. In comparison, the post reform period recorded a buoyancy and elasticity of 1.661 and 1.495 respectively. The results showed that tax reforms had a positive impact on the overall tax structure and on individual taxes. The results also showed that the elasticity of indirect taxes was low and that of direct taxes was high especially after the reform. They highlighted that despite the fact that the reforms had positive impacts on revenue they failed to make value added tax responsive to changes in income. The major limitation of their study is that they did not take into account the time series properties of the data.

Kieleko (2006) evaluated the Kenyan tax system for the period 1973-2003 with an objective of analyzing the elasticities and buoyancies of the tax system during the pre-reform (1973-1985) and post reform (1986-2003) periods. Buoyancy coefficients for pre reform and post reform period were 1.044 and 1.677 respectively while the income elasticity coefficients for the same periods were 0.277 and 1.498 respectively.

Kotut and Menjo (2011) conducted a study to examine the productivity of the tax system in Kenya by applying the concepts of tax buoyancy and tax elasticity. They used time

series data for the period of 1986 to 2009 to estimate elasticity and buoyancy coefficients. To estimate tax elasticity, they used the proportional adjustment method to eliminate the discretionary effects from the revenue series. The results showed that the buoyancy of the whole tax system was 0.525 while the elasticity was 0.509 for the period 2005 to 2009.They concluded that the Kenyan tax system is neither income elastic nor buoyant and that all major tax components in Kenya are inelastic. They also concluded that import duties are the most buoyant tax component while value added tax is the least buoyant.

2.7 Summary of Literature Review

From the empirical literature, it is clear that the elasticity and buoyancy of the tax system in Kenya are not constant but changes over time. The studies are of interest to this study because they provide information that will be useful when interpreting the findings of this study. A review of empirical studies conducted in Kenya also reveal that researchers use the standard model of regressing the logarithms of tax revenue against the logarithms of income to estimate the coefficients of buoyancy and elasticity of the tax system without taking into consideration the time series properties of the data. The study used the model proposed by Sobel and Holcombe (1996) to estimate the coefficients of buoyancy and elasticity. Proportional adjustment method developed by Prest (1974) was used to control for the effects of discretionary tax measures such as charges in statutory tax rates.

All studies employ the proportional adjustment method to eliminate the effects of discretionary tax measures from tax revenue series. The studies also focus on the reforms that were initiated in Kenya in 1986 through the tax modernization programme and therefore fail to provide information for the recent past. This study provides updated estimates of tax buoyancy and elasticity of the Kenyan tax system by analyzing data for the last decade**.**

The decomposition of elasticity into tax to base elasticity and base to income elasticity as proposed by Mansfield (1972) is useful for two reasons. First, it permits identification of the sources of fast revenue growth or the causes of lagging revenue growth. Second it permits the identification of that part of revenue growth within the control of the authorities. Factors that affect tax to base elasticity such as tax rates, exemptions and

improvements in tax administration are within the control of the fiscal authorities thereby making this measure important for policy purposes. Base to income elasticity on the other hand is determined largely by the way in which the economic structure responds to growth.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the research design, the target population and the sample that was used in the study, methods of collecting data and methods of analyzing and presenting the data.

3.1 Research design

The study used causal research design with an aim of establishing a cause and effect relationship between the dependent and independent variable. According to Sekaran (2010) a causal study is done when it is necessary to establish a definite cause and effect relationship. This implies that the intention of the researcher conducting a causal study is to be able to state that variable X causes variable Y. Zikmund et al (2010) observes that causal research allows causal inferences to be made and that causal inference is a conclusion that when one thing happens, another specific thing will follow. This study sought to establish whether increases in national income are followed by increase in tax revenue and is therefore a causal study.

3.2 Population

According to Cooper and Schindler (2011) a population is the total collection of elements about which we wish to make some inferences. This study sought to analyze the relationship between tax revenue and economic growth for the period 2002-2012. This was a census study whose population comprised of annualized time series data in respect of tax revenue, gross domestic product and tax bases for 10 years running from 2002 to 2012.

3.3 Sampling

The process of sampling involves using a part of a population to make conclusions about the whole population. Sekaran (2010) defines a sample as a subject of the population because it comprises some members selected from it. A population can be studied by

examining every element of the population or by studying a sample so that the researcher is able to draw conclusions that are generalizable to the population of interest. Sampling is generally applied when the population is large but the population for this study is small since only 10 years will make up the population. The researcher therefore conducted a census study instead of sampling. Cooper and Schindler (2011) define a census as an examination of all the elements in a population.

3.4 Data collection

The study was based on secondary data obtained from government publications such as statistical abstracts prepared by the Kenya Bureau of statistics, budget estimates prepared by the treasury and revenue data provided by Kenya Revenue Authority. The study used data on domestic factor income derived from the sources of income side of the national accounts as proxy base for income taxes. Private final consumption was used as the proxy base for value added tax since it is levied at retail and wholesale level. Private consumption was also taken as the proxy base for excise duties. The proxy base for import duty was imports from the balance of payments while the proxy base, for the overall tax system was the Gross domestic product.

The data on gross domestic product, imports, private final consumption and domestic factor incomes was obtained from statistical abstracts. Data on the revenue impacts of discretionary tax measures was obtained from annual budget speeches produced at the treasury while data on the tax revenue was obtained from the ministry of Finance website. The raw data collected from the relevant sources is provided in the appendix.

3.5 Data analysis and presentation

Data was analyzed by regressing the logarithms of tax revenue against the logarithms of national income and tax bases. The tax revenue model used by Sobel and Holcombe (1996) was employed to estimate the coefficients of buoyancy and elasticity. The standard model used to estimate the coefficients of buoyancy and elasticity is of the form:

$$\ln(T_{t,i}) = \alpha + \beta \ln(Y_t) + \varepsilon_t \qquad (3.1)$$

Where: i = 1, 2,…….n, and n is the number of different taxes, t = 1, 2,…….m, and m is the number of periods,$T_{t,i}$ is the tax revenue of each individual tax during period t, Y_t is the level of aggregate income during period t, β represents the income elasticity or buoyancy of tax revenue, α is a constant, ε is the stochastic disturbance term.

To determine the Tax to base elasticity for each individual tax, the researcher used the following model:

$$\ln(T_{t,i}) = \alpha + \beta \ln(B_t) + \varepsilon_t \quad (3.2)$$

Where:$T_{t,i}$ is the tax revenue of each individual taxduring period t, B_t is thetax base of each individual taxduring period t,β represents the tax to base elasticity for each individual tax, α is a constant, ε is the stochastic disturbance term.

To determine the base to income elasticity for each individual tax, the researcher used the following model:

$$\ln(B_{t,i}) = \alpha + \beta \ln(Y_t) + \varepsilon_t \quad (3.3)$$

Where:$B_{t,i}$ is the tax base of each individual taxduring period t, Y_t is the level of aggregate income during period t.β represents the base to income elasticity for each individual tax, α is a constant, ε is the stochastic disturbance term.

Ordinary least squares method was used to determine the coefficients of buoyancy and elasticity of the tax system and the individual taxes. To determine the buoyancy coefficients, the researcher will used actual tax revenue time series data without any adjustment. The coefficient was estimated for the entire tax system as well as for individual taxes.

To determine the elasticity coefficients the researcher used adjusted time series data for tax revenue. The study used the proportional adjustment method (Prest, 1962) to remove the effects of discretionary tax measures from actual tax revenue series. The researcher analyzed the overall tax elasticity and elasticity of individual taxes, decomposing each into elasticity of tax to base and that of base to income.

The researcher used the t-statistic to test the statistical significance of the regression coefficients of the independent variables. The statistic was used to test the hypothesis that a regression coefficient is significantly different from one. The coefficient of determination (R^2) for each regression equation was used to measure the extent to which the estimated regression line fits the actual observations.

The researcher used Ms Excel package and the Statistical Package of Social Sciences (SPSS) to analyze the data. The data was presented using suitable tables, graphs and diagrams.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The chapter begins with a description of the data used in the study. Data about tax revenue, tax bases and gross domestic product is presented in section 4.2 using graphs and diagrams. The results of regression analysis and a discussion of the findings are presented in section 4.3 to section 4.6 in this chapter.

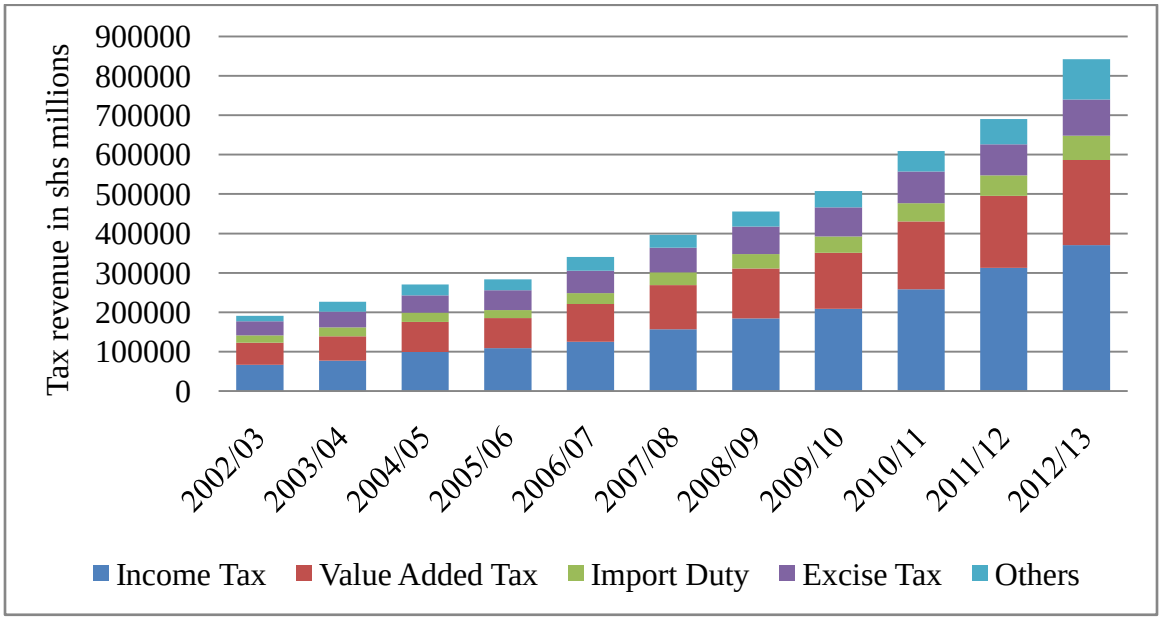
4.2 Description of the data used in the study.

This section presents the data used in the study in both absolute and relative terms. Actual component bar charts, percentage component bar charts, pie charts and line graphs are used to present the data.

4.2.1 Total tax revenue and its components for 2002/2003 to 2012/2013

The trend of total tax revenue and its major components in the period 2002/2003 to 2012/2013 is shown in figure 4.1 below.

Figure 4.1: Components of total tax revenue



Source: Author's construction using research data

The figure shows that revenue collection has grown significantly over the study period. All the major components of tax revenue recorded significant growth over the period. Tax revenue from income tax has risen rapidly over the period as compared to other types of taxes.

4.2.2 Percentage Contribution of Individual Taxes to Total Tax Revenue

Figure 4.2 shows the percentage contribution of each type of tax to total tax revenue for 2002/2003 to 2012/13 fiscal years.

Figure 4.2 Share of individual taxes in total tax revenue

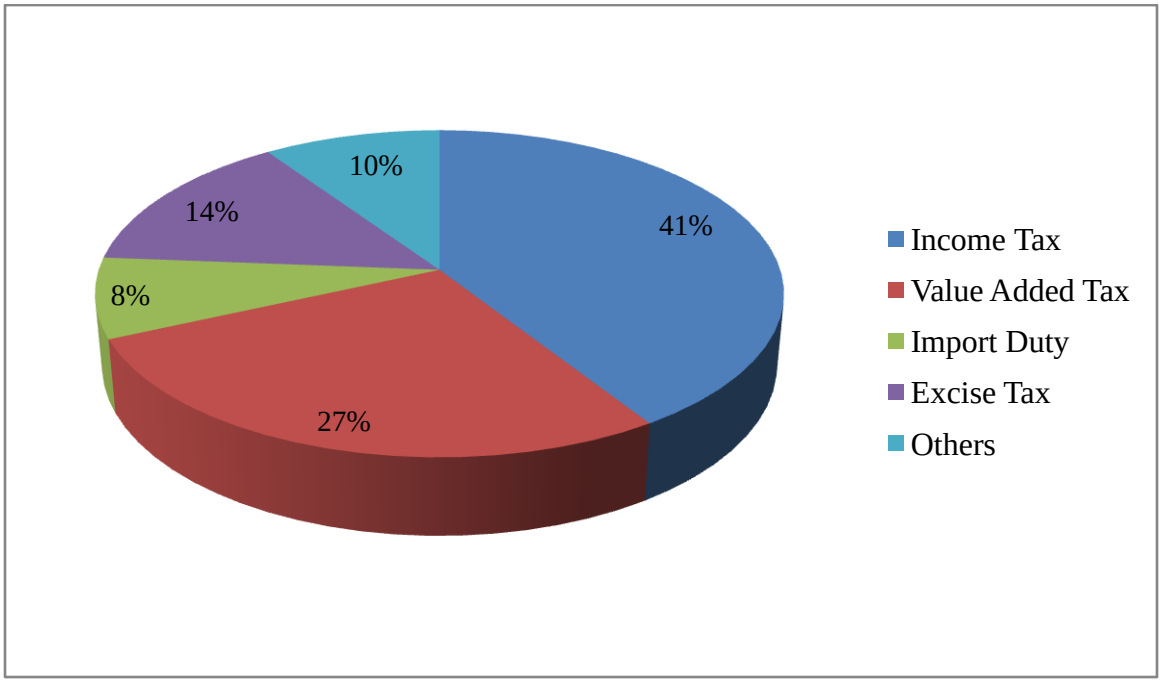
Source: Author's construction using research data

The figure indicates that the percentage contribution of income tax has increased gradually over the period. The share of excise tax in total tax revenue declined drastically from about 17 percent of total revenue in 2002 to less than 10 percent in 2012. Custom duty has also declined in importance over the period.

4.2.3 Average Contribution of Each Tax to Total Tax Revenue for 2002/03 to 2012/13 Fiscal Years

Figure 4.3 highlights the average percentage contribution of each tax to total tax revenue over the study period.

Figure 4.3: Average percentage contribution of individual taxes



Source: Author's construction using research data

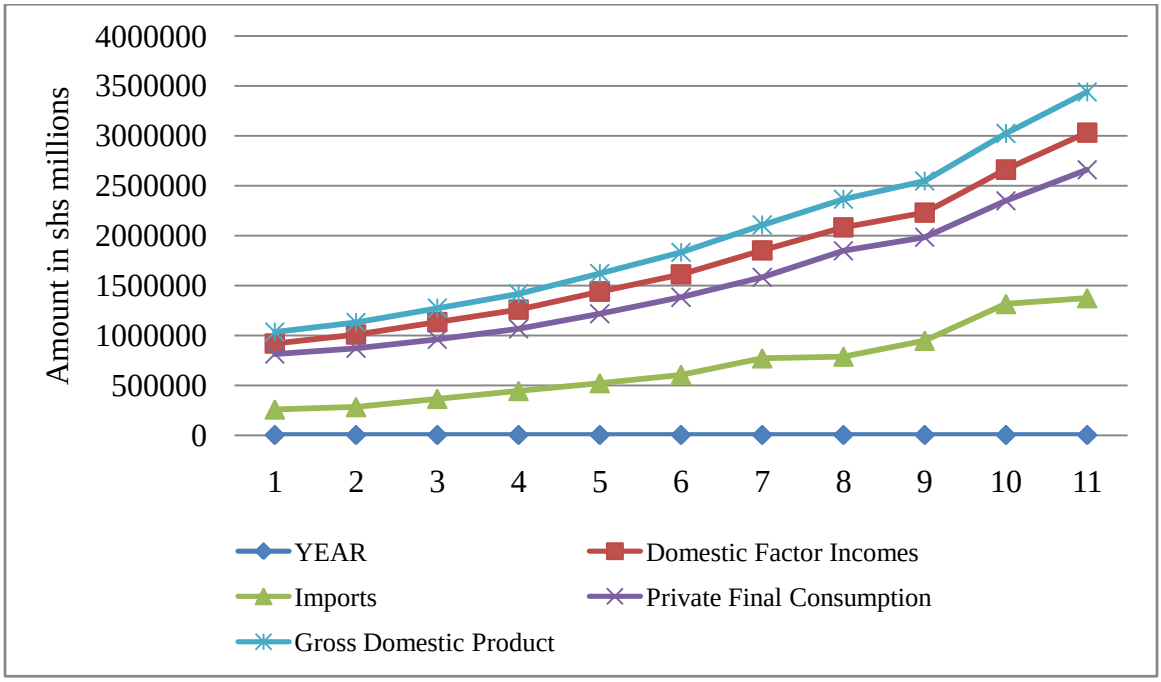
The figure indicates that on average, the highest proportion of tax revenue was derived from income tax. Import duty and excise tax accounts for a very small proportion of total tax revenue. Value added tax and income tax were the most important sources of tax revenue accounting for an average of 68% of the total tax revenue in the period 2002 to 2012.

4.2.4 Trends of Various Tax Bases and Gross Domestic Product

The data for tax bases and gross domestic product is presented in figure 4.4 below. The figure shows that all the tax bases recorded an improvement in the study period. The tax base for income tax was consistently larger than tax bases for other taxes. The figure

reveals that for all years, tax bases and gross domestic product maintained consistent growth patterns.

Figure 4.4: Tax bases and Gross domestic product

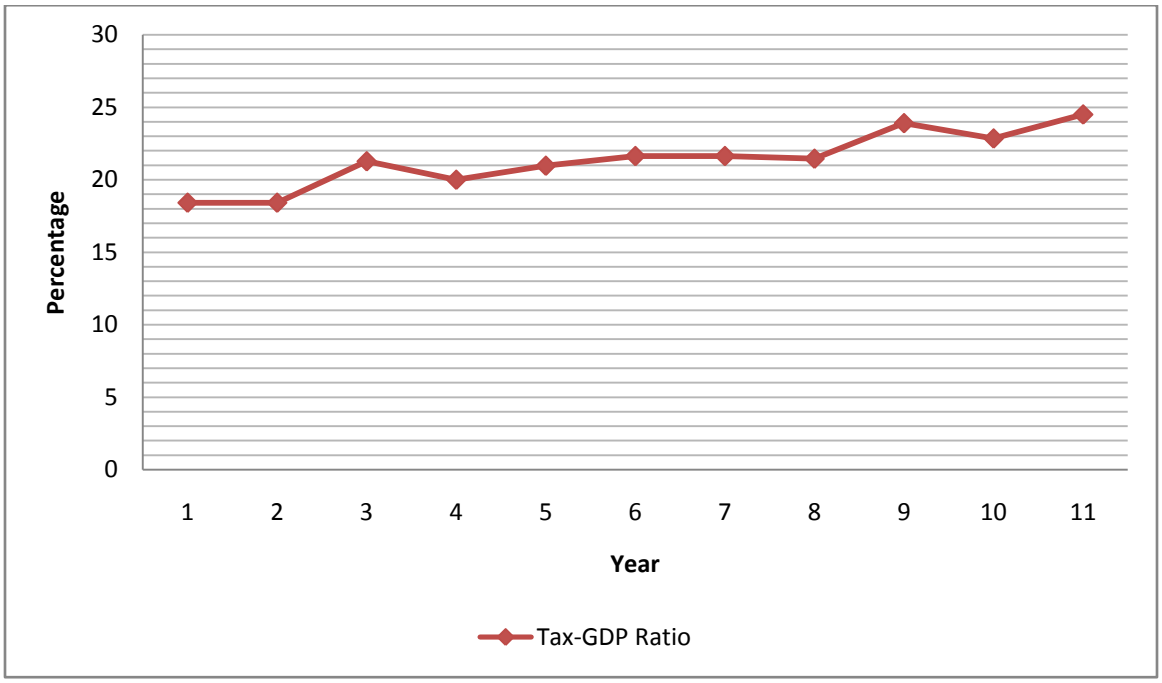


Source: Author's construction using research data

4.2.5 Trends in Tax to Gross domestic product ratio

Figure 4.5 shows the movement of total tax to gross domestic product ratio for 2002/03 to 2012/13 fiscal years. The ratio was obtained by expressing each year's total tax revenue as a percentage of gross domestic product. It can be observed from the graph that the ratio of total tax revenue to gross domestic product increased gradually over the study period. The ratio increased from 18 percent in 2002/2003 fiscal year to 24 percent in 2012/2013 fiscal year.

Figure 4.5: Tax to Gross domestic product ratio



Source: Author's construction using research data

4.3: Buoyancy of the main taxes and the total tax system

This section provides the buoyancy estimates of the main taxes and the total tax system in Kenya for the period 2002 to 2012 and a discussion of the results. The buoyancy estimates were obtained by regressing the natural logarithms of actual tax revenue against the natural logarithms of gross domestic products. Table 4.2 reports the results of regression analysis for individual taxes and the total tax system.

Table 4.1: Buoyancy of the main taxes and the total tax system.

Tax	Buoyancy	*t statistic*	$t_{\propto=0.05}$	R^2
Income	1.405	12.770	1.833	0.995
V.A.T	1.130	3.585	1.833	0.991
Excise	0.765	-5.233	- 1.833	0.970
Import	0.983	-0.267	- 1.833	0.964
Total	1.184	6.244	1.833	0.994

Source: Author's computations

Income tax was the most buoyant tax over the study period with a buoyancy estimate of 1.405. A one tailed test was performed to check whether the buoyancy estimate was significantly greater than one. The computed t statistic was 12.770 while the critical value was 1.833 at 5% level of significance. Since the computed t statistic is greater than the critical value, we conclude that the buoyancy estimate of 1.405 is significantly greater than 1. This implies that income tax is a highly buoyant tax. Changes in income tax revenue were to a large extent explained by variations in gross domestic products. This was evident from the high R^2 of 0.995 which implies that 99.5 percent of variation in income tax is explained by variation in gross domestic product.

Value added tax was the second most buoyant tax over the study period with a buoyancy estimate of 1.130 and this was slightly greater than one. A one tailed test was performed to check whether the buoyancy estimate was significantly greater than one. The computed t statistic was 3.585 while the critical value was 1.833 at 5% level of significance. The computed t statistic is greater than the critical value, and this suggests that the buoyancy estimate of 1.130 was significantly greater than 1 at 5% level of significance. This implies that value added tax was responsive to changes in national income and discretionary tax measures. The coefficient of determinant was 0.991 indicating that 99.1percent of variation in value added tax was explained by variation in gross domestic product.

The buoyancy coefficient for import duty during the study period was 0.983 and this was less than unity. The computed t statistic for the buoyancy coefficient was -0.267 while the critical value was -1.833. This led to the acceptance of the null hypothesis that the buoyancy estimate was not significantly different from unity at 5% level of significance. This implies that import duty was buoyant during the study period. The coefficient of determination was 0.964 signifying that variation in gross domestic product accounted for 96.4% of variation in custom duty.

The least buoyant tax was the excise tax with a buoyancy coefficient of 0.765. A one tailed test was performed to check whether the buoyancy estimate was significantly less than one. The computed t statistic was -5.233 while the critical value was -1.833 at 5% level of significance. The computed t statistic is less than the critical value, and this

suggests that the buoyancy estimate of 0.765 was significantly less than 1 at 5% level of significance. This implies that excise tax was not buoyant during the study period. The coefficient of determination was 0.97 indicating that 97% of variation in excise tax was explained by variation in gross domestic product.

For the period 2002-2012, the overall tax system had a buoyancy coefficient of 1.184. A one tailed t-test was performed to check whether the buoyancy estimate was significantly different from unity. The computed t statistic was 6.244 while the critical value was 1.833 at 5% level of significance. This led to rejection of the null hypothesis that the buoyancy estimate was not significantly different from 1 at 5% significance level. This implies that the overall tax system is fairly buoyant. This means that the total tax revenue grew at a higher rate than the growth in gross domestic product. The coefficient of determination was 0.994 and this implied that variation in gross domestic product accounted for 99.4% of variation in total tax revenue.

4.4: ELASTICITY OF THE MAIN TAXES AND TOTAL TAX SYSTEM.

This section presents the elasticity estimates of the main taxes and the overall tax systems in Kenya for the period 2002 to 2012 and a discussion of results. The elasticity estimates measures the automatic response of tax revenue to economic growth, net of discretionary tax measures. These estimates were obtained by regression the natural logarithms of adjusted tax revenue against the natural logarithms of gross domestic product. The proportional adjustment method was used to adjust the actual tax revenue for the effects of discretionary tax measures in order to obtain adjusted tax revenue series. Table 4.2 presents the results of regression analysis for individual taxes and the overall tax system.

Table 4.2: Elasticity of the main taxes and the total tax system

Tax	Elasticity	$t\ statistic$	$t_{\propto=0.05}$	R^2
Income	1.647	3.803	1.833	0.979
V.A.T	0.988	-0.059	- 1.833	0.918
Excise	0.858	-3.523	- 1.833	0.996
Import	0.180	-17.54	- 1.833	0.069
Total	1.223	1.019	1.833	0.940

Source: Author's computations

Income tax was the most elastic tax in the Kenyan tax system in the period 2002 -2012 with an elasticity estimate of 1.647. According to this estimate a 1 percent increase in gross domestic product was accompanied by 1.647 percent increase in income tax revenue during the study period. A one tailed test was performed to check whether the elasticity estimate was significantly greater than one. The computed t statistic was 3.803 while the critical value was 1.833 at 5% level of significance. The computed t statistic is greater than the critical value, and this suggests that the elasticity estimate of1.647 was significantly greater than 1 at 5% level of significance. Changes in adjusted income tax revenue were to a large extent explained by variations in gross domestic product, given the high value of R^2 at 0.979.

The elasticity of value added tax in the study period was less than unity with an elasticity coefficient of 0.988. This implies that a 1 percent increase in gross domestic product was accompanied by 0.988 percent increase in adjusted value added tax revenue during the study period. A one tailed t-test was performed to check whether elasticity estimate was significantly different from unity. The computed t statistic was -0.059 while the critical value was -1.833. This led to acceptance of the null hypothesis that the elasticity estimate was not significantly different from 1 at 5% significance level. This implies that value added tax was neither elastic nor inelastic during the study period. The value of R^2 was 0.918 which means the changes in gross domestic product accounted for 91.8 percent of the variations in value added tax.

The elasticity of excise tax was 0.858 in the period 2002-2012. A one tailed test was performed to check whether the elasticity estimate was significantly different from unity.

The computed t statistic was -3.523 while the critical value was -1.833. This led to acceptance of the alternate hypothesis that the elasticity estimate was significantly less than unity at the 5% level. This implies that excise tax revenue was in inelastic during the study period. Changes in excise tax revenue were to a large extent explained by variation in gross domestic product. This was evident from the high $R^2$of 0.996 which implies that 99.6 percent of variations in excise tax revenue were explained by variations in gross domestic products.

The most inelastic tax during the study period was import duty with an elasticity estimate of 0.080. This implies that a one percent increase in gross domestic product was accompanied by 0.18% increase in import duty during the study period. Import duty was therefore highly inelastic during the study period and this means that the tax was not responsive to changes in gross domestic product. The computed t statistic for the elasticity coefficient was -17.54 while the critical value was -1.833. The result of the test showed that the elasticity estimate was significantly less than unity confirming that import duty was not responsive to changes in gross domestic product during the study period. The value of R^2 was quite low at 0.069 indicating that changes in gross domestic product accounted for 6.9 percent of variation in import duty.

The elasticity of the overall tax system in the study period was 1.223 which indicates that the elasticity of the tax system was more than unity. This signifies that a 1% increase in gross domestic product was accompanied by 1.223 percent increase in total tax revenue in the absence of discretionary tax measures. A one tailed test was performed to check whether the elasticity estimate was significantly different from unity. The computed t statistic was 1.019 while the critical value was 1.833. This led to acceptance of the null hypothesis that the elasticity estimate was not significantly different from unity at the 5% significance level. The value of R^2 was 0.940 which implied that the regression model accounted for 94% of the variation in the adjusted total tax revenue.

4.5 Decomposition of elasticity of the main taxes

In this section, the elasticity coefficient of each tax is decomposed into tax to base elasticity and base to income elasticity. Tax to base elasticity was obtained by regressing the natural logarithms of adjusted tax revenue of each tax against the natural logarithm of

its base. Base to income elasticity was obtained by regressing the natural logarithms of the tax bases against the natural logarithms of gross domestic product. The results of regression analysis are presented in table 4.3.

Tax to base and base to income elasticity for income tax, value added tax, custom duty and excise duty are presented in the table shown below.

Table 4.3: Tax to base elasticity and base to income elasticity of the main taxes

	Tax to base		Base to income	
Tax	Elasticity	R^2	Elasticity	R^2
Income	1.657	0.981	0.987	0.999
V.A.T	1.138	0.894	1.009	0.998
Excise	0.999	0.991	1.009	0.998
Import	0.070	0.034	1.422	0.990

Source: Author's computations

Tax to base elasticity for income tax is 1.657 and this figure is significantly different from unity. The base of income tax is domestic factor incomes. Therefore, the tax to base elasticity indicates that if domestic factor incomes increase by 1 percent, income tax revenue increase by 1.657 percent. This implies that income tax revenue is highly responsive to changes in domestic factor incomes. The high value of R^2 at 0.981 suggests that changes in income tax are to a large extent explained by variations in domestic factor incomes. Therefore changes in domestic factor incomes account for 98.1 percent of variation in income tax.

Value added tax had a tax to base elasticity of 1.138 in the period 2002-2012. The base of value added tax is private final consumption. A tax to base elasticity of 1.138 indicates that a one percent increase in private final consumption is accompanied by 1.138 percent increase in value added tax. The value of R^2 is 0.894 and this implies that the regression model accounts for 89.4 percent of variation in value added tax.

The tax to base elasticity estimate for excise tax was 0.999 in the study period. This estimate was not statistically different from unity since 0.999 is very close to one. The base of excise tax is private final consumption. The result therefore indicate that excise

tax revenue and private final consumption change at the same rate, since a 1% change in private final consumption is accompanied by 0.999 percent change in excise tax. The coefficient of determination for the regression model was 0.991. This implies that changes in private domestic consumption accounted for 99.1 percent of variation in excise tax.

Import duty had the least tax to base elasticity at 0.0701 in the study period. The base of import duty is the value of imports at cost insurance and freight. The results indicate that an increase of 1 percent for imports was accompanied by 0.07 percent increase in import duty. This implies that the tax base was highly inelastic. The coefficient of determination for the regression model was very low at 0.034. This suggests that change in imports accounted for 3.4 percent of variation in import duty.

The major tax bases in Kenya are private final consumption on which value added tax and excise tax are levied, domestic factor incomes on which income tax is levied, and the value of imports on which import duty is levied.

The most elastic tax base was imports with base to income elasticity of 1.422. The results suggest that a 1 percent increase in gross domestic product raised imports by 1.422 percent. The elasticity estimate was significantly different from unity meaning that the tax base was highly elastic. Therefore the tax base grew at a higher rate than gross domestic product in the period 2002 to 2012. The R^2 statistic for the regression model was 0.990. The statistic suggests that 99 percent of variation in imports was explained by variation in gross domestic product.

The base to income elasticity for value added tax and excise duty was 1.009. The tax base for value added tax and excise tax is private final consumption. This elasticity estimate is not significantly different from unity which means that private final consumption and gross domestic product grew at the same rate during the study period. The coefficient of determination for the regression model was 0.998. This implies that 99.8 percent of the variation in private final consumption was explained by variation in gross domestic product.

Domestic factor income was the least elastic tax base during the study period. Its base to income elasticity estimate was 0.987 in the period 2002 to 2012. However this estimate was not significantly different from unity. The results indicate that an increase of 1 percent in domestic factors income was accompanied by 0.987 percent increase in income tax. The coefficient of determination for the regression model was 0.999. This means that the gross domestic product accounted for 99.9 percent of variation in domestic factor incomes.

4.6: Difference between buoyancy and elasticity coefficients of main taxes and the overall tax system.

This section compares the buoyancy and elasticity estimates of the main types of taxes and the total tax system to determine the effects of discretionary tax measures on tax revenue. The buoyancy estimates, elasticity estimates, and their differences are summarized in table 4.4 below.

Table 4.4: Difference between buoyancy and elasticity coefficients

Tax	Buoyancy	Elasticity	Difference
income	1.405	1.647	- 0.242
V.A.T	1.130	0.988	0.142
Excise	0.765	0.858	- 0.093
Import	0.983	0.180	0.803
Total	1.184	1.223	- 0.039

Source: Author's computations

The results in table 4.4 indicate that elasticity estimates for income tax and excise tax exceeded the buoyancy estimates by 0.242 and 0.093 respectively. This implies that the discretionary tax measures implemented during the study period decreased tax revenue obtained from income and excise tax. Income tax revenue decreased by 0.242 percent for every 1 percent increase in gross domestic product while excise tax revenue decreased by 0.093 percent for every 1 percent increase in gross domestic product.

The buoyancy estimates for value added tax and import duty exceeded the elasticity estimates by 0.142 and 0.803 respectively during the period 2002 to 2012. The positive

difference implies that the discretionary tax measures undertaken during the study period were effective in raising tax revenue obtained from import duty and value added tax. Import duty registered the largest positive difference between buoyancy and elasticity at 0.803. This implies that discretionary tax measures raised import duties by 0.803 percent for every 1 percent increase in gross domestic product. The difference between buoyancy estimate and elasticity estimate for value added tax was very low at 0.142 percent. This implies that the discretionary tax measures implemented during the study period were not very successful in raising additional value added tax revenue.

The elasticity estimate of the total tax system exceeded the buoyancy estimate by 0.039. The difference between the two measures shows that the discretionary tax measure implemented by the government during the study period resulted in loss of total revenue. This implies that the increase in total tax revenue obtained during the period resulted from the automatic response of the tax system to economic growth rather than the discretionary tax measures implemented during the period.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1: Introduction

This chapter provides a summary of the findings in section 5.2 and the conclusions derived from the findings in section 5.3. The recommendations arising from the conclusions are presented in section 5.4. The limitations of the study and suggestions for further research are presented in section 5.5 and 5.6 respectively.

5.2: Summary of findings

The results of the study show that the overall tax system had a buoyancy coefficient of 1.184 in the period 2002 to 2012. This means that the combined effect of the inbuilt flexibility of the tax system and the discretionary tax measures undertaken during the study period increased total tax revenue by 1.184 percent for every 1 percent increase in gross domestic product. The coefficient of tax to income elasticity for the overall tax system was 1.223 in the period 2002 to 2012. This implies that total tax revenue increased automatically by 1.223 percent as a result of change in national income for every 1 percent increase in gross domestic product.

The buoyancy coefficients of individual taxes varied between 0.765 and 1.405. Income tax had the highest buoyancy of 1.405, followed by value added tax with buoyancy of 1.130 and import duty with buoyancy of 0.985. The tax with the least buoyancy was excise tax with an estimate of 0.765. The tax to income elasticity for individual taxes was less than unity except for income taxes. The elasticity estimates for income tax, value added tax, excise tax and import duty were 1.647, 0.988, 0.858 and 0.180 respectively. The elasticity estimate for import duty was very low when compared with other taxes.

The elasticity of tax bases with respect to gross domestic product varied between 0.987 and 1.422. The base for income tax, that is domestic factor incomes, had an elasticity coefficient of 0.987. The base for value added tax and excise tax, that is private final consumption, had an elasticity coefficient of 1.009.The base for import duty that is, imports, registered the highest elasticity coefficient at 1.422.

All the tax to base elasticity coefficients of the main taxes were greater than or equal to unity except for import duties which registered a very low elasticity coefficient. The tax to base elasticity for income tax, value added tax, excise tax, and import duty was 1.657, 1.138, 0.999 and 0.070 respectively. This means that a very small proportion of import duty tax base was transferred to the government in the form of import duty.

All the regression models performed very well in terms of goodness of fit except the model for tax to base elasticity of import duty in which the value of R^2 was 0.034. For all the other regression models, the value of R^2 was more than 0.984. This means that a high percentage of variation in dependent variables was explained by the independent variables used in the models.

According to Kieleko (2006), the total tax system had an elasticity and buoyancy coefficient of 0.277 and 1.044 respectively for the period 1973 to 1985. A study conducted by Kotut and Menjo (2009) showed that the elasticity of the whole tax system was 0.509 while the buoyancy of the tax system was 0.525 in the period 1986-2009. This study reports an elasticity coefficient of 1.223 and a buoyancy coefficient of 1.184 for the period 2002 to 2012. This implies that there is a marked difference between the coefficients reported for the previous periods and the coefficient obtained in this study.

5.3 Conclusions

From the findings, it is evident that total tax revenue was responsive to changes in national income during the period 2002 to 2012. The proportionate increase in tax revenue exceeded the proportionate increase in national income by 0.22 percent for every 1 percent increase in gross domestic product signifying that an increasing proportion of increase in national income was transferred from the private sector to the public sector in the form of tax revenue.

The coefficient of elasticity for the tax system was greater than the coefficient of buoyancy during the study period. From the difference between the buoyancy of the tax system and the elasticity of the tax system, it is clear that discretionary tax measures implemented during the study period were not successful in raising additional tax revenue. The overall effect of these measures on tax revenue was to reduce total tax

revenue by 0.039 percent for every 1 percent increase in gross domestic product. Despite the negative effects of discretionary tax measures on tax revenue, total tax revenue increased tremendously during the study period. This implies that the increase in total tax revenue experienced in the study period resulted from the automatic response of the tax system to economic growth rather than the discretionary tax measures implemented during the period.

The base to income elasticity for various taxes show that the growth of tax bases for import duty value added tax and excise tax, kept pace with growth in national income since the estimated coefficients of base to income elasticity were slightly more than one for these bases. This means that the tax bases grew at a higher rate than national income. The base of income tax grew at a lower rate than the growth of gross domestic product. However, the highest amount of tax revenue was extracted from the income tax base which was not highly responsive to changes in national income. The high tax to income elasticity of income tax had the greatest impact on the overall elasticity of the tax system since income tax was the most dominant tax contributing over 40 percent of total tax revenue during the study period.

5.4 Recommendations

Measures should be taken to improve the tax to base elasticity for taxes whose coefficient of elasticity was less than unity. Excise tax and import duty had a low tax to base elasticity and policy measures should be devised to enable the government extract more tax revenue from their tax bases. This can be done by the imposition of higher marginal tax rates on specified goods and services and improvement in administration of taxes to reduce tax evasion and ensure high levels of compliance among tax payers. The government can also use advalorem tax rates to ensure that revenue increase as the value of tax bases rise.

Since income tax and value added tax were elastic during the study period, the government does not need to seek additional revenue from these taxes by introducing discretionary tax measures such as imposition of higher marginal tax rates. Tax revenue from these taxes can be improved by widening the tax bases to make them more responsive to growth in national income. The government can also increase tax revenue

by reducing or eliminating exemptions and allowances which adversely affect the tax bases.

The study showed that the discretionary tax measures implemented during the study period were not effective in raising additional tax revenue. If there is need for the government to raise additional tax revenue through discretionary tax measures, the policy units of the government should design discretionary tax measures that are effective in raising additional tax revenue.

5.5 Limitations of the study

The decomposition of elasticity for individual taxes into tax to base elasticity and base to income elasticity required information on the legal tax bases. Information on the legal tax bases were not available and so data obtained from proxy bases was used in the analysis. It is not clear whether the proxy bases are good estimates of the legal tax bases.

Data for the revenue obtained through discretionary tax measures was not available for all the financial years during the study period. This happened because the budget speeches for the years 2007/2008 to 2012/2013 presented the proposed tax measures in form of the objectives that the tax measures were designed to achieve rather than the projected tax revenue expected from different types of taxes.

5.6 Suggestions for further research.

This study employed the proportional adjustment method to account for discretionary tax measures. An analysis of the tax system using other methods of accounting for discretionary tax measures should be carried out. These methods are the dummy variable method, the constant rate structure method, and the divisia index method.

Import duty had a highly elastic tax base with respect to gross domestic product but its tax to base elasticity was very low leading to low tax to income elasticity of import duty. It is necessary to carry out a study to investigate the level of compliance among tax payers with a view to establishing whether noncompliance could have contributed to low tax to income elasticity of import duty.

The discretionary tax measures introduced during the study period had adverse effects on total tax revenue because they resulted in loss of total revenue. There is need to investigate whether the discretionary tax measures implemented during the study period were aimed at achieving objectives other than mobilization of tax revenue and the extent to which those objectives were achieved in the study period.

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APPENDICES

Table 1: Actual tax revenue for 2002/03 to 20012/13 fiscal years.

FISCAL YEAR	Income Tax	Import Duty	Excise Tax	Value Added Tax	OTHERS	TOTAL TAX
2002/03	66744	18477	35643	56135	13592	190591
2003/04	77410	22324	40085	61725	24934	226478
2004/05	99255	23532	44151	75989	27948	270875
2005/06	108897	20511	50309	76263	27447	283427
2006/07	124855	27510	56406	96270	34970	340011
2007/08	156832	32944	61857	111939	32916	396488
2008/09	184447	36181	69872	126854	38426	455780
2009/10	209098	41271	74112	141971	41012	507464
2010/11	258651	46072	80567	171881	52053	609224
2011/12	312463	51712	78884	183386	64288	690733
2012/13	370600	61484	91810	216000	102673	842567

Source: Treasury website.

Table 2: Tax bases and G.D.P data for 2002 to 2012

YEAR	D.F.I	Imports	P.F.C.	G.D.P.
2002	920618	257710	814361	1035622
2003	1010644	281844	872821	1131783
2004	1135440	364557	961974	1273975
2005	1259432	443093	1066471	1418071
2006	1440623	521483	1217635	1622565
2007	1611696	605117	1383603	1833511
2008	1852920	770651	1583651	2107589
2009	2084149	788097	1849582	2366984
2010	2231617	947206	1983496	2549825
2011	2663107	1315671	2350129	3024782
2012	3032525	1374587	2660565	3440115

Source: Kenya Statistical Abstracts and Economic Survey

Table 3: Tax revenue obtained through discretionary tax measures

YEAR	INCOME TAX	IMPORT DUTY	EXCISE DUTY	VAT	OTHERS	TOTAL
2002/03	2600	3200	850	2300	870	9820
2003/04	0	503	904	300	200	1907
2004/05	-208	363	333	1700	0	2188
2005/06	-798	126	1942	-650	-234	386

Source: Kenya Budget Speeches

Table 4: Adjusted tax revenue

YEAR	INCOME TAX	IMPORT DUTY	EXCISE DUTY	VAT	T0TAL
2002/03	66744	18477	35643	56135	190591
2003/04	77410	21821	39181	61425	224571
2004/05	99463	22647	42830	73928	266425
2005/06	109925	19618	46920	74827	278391

Source: Author's computations using research data

Table 5: Natural logarithms of adjusted tax revenue

YEAR	**LN(ADIT)**	LN(ADIMD)	LN(ADEX)	LN(ADVAT)	LN(ADTT)
2002/03	11.10861968	9.824281994	10.48130805	10.93551478	12.15788505
2003/04	11.25687125	9.990628088	10.57594721	11.0255722	12.32194719
2004/05	11.50754099	10.02778267	10.66499407	11.21084693	12.49284806
2005/06	11.60755359	9.884202791	10.7561993	11.22293406	12.53678188

Source: Author's computations using research data

Table 6: Natural logarithms of Tax bases

YEAR	LN(D.F.I)	LN(IMD)	LN(PFC)	LN(GDP)
2002	13.73280046	12.4595902	13.61015904	13.85051277
2003	13.82609831	12.54910901	13.67948577	13.93930482
2004	13.9425308	12.8064382	13.7767427	14.05765249
2005	14.04617138	13.00153496	13.87986562	14.16480806
2006	14.18058622	13.16443195	14.01242101	14.29951879
2007	14.2927976	13.31317711	14.14020152	14.42174327
2008	14.43227333	13.55499089	14.2752435	14.5610552
2009	14.54987118	13.57737646	14.43047023	14.67712713
2010	14.61823699	13.76127188	14.5003715	14.75153529
2011	14.79500404	14.08985736	14.66998078	14.92234958
2012	14.92490616	14.13366388	14.79404906	15.05101546

Source: Author's computations using research data.

Table 7: Natural logarithms of actual tax revenue

YEAR	LN(AITR)	LN(AIMD)	LN(AEXT)	LN(AVAT)	LN(TTR)
2002/03	11.10861968	9.824281994	10.48130805	10.93551478	12.15788505
2003/04	11.25687125	10.01341761	10.59875748	11.03044431	12.33040309
2004/05	11.50544758	10.06611648	10.69537086	11.23834387	12.50941274
2005/06	11.59815776	9.928716607	10.82593927	11.24194317	12.55470987
2006/07	11.73490834	10.22230485	10.94033081	11.47491202	12.73673325
2007/08	11.96293045	10.40256443	11.03258055	11.62570936	12.89040105
2008/09	12.12511744	10.4962894	11.15442028	11.7507921	13.02976552
2009/10	12.25055832	10.62791535	11.21333274	11.86337809	13.13718105
2010/11	12.46323494	10.73796067	11.29684442	12.05455766	13.3199413
2011/12	12.65224134	10.85344514	11.2757337	12.1193485	13.44550863
2012/13	12.82287859	11.02653226	11.4274765	12.28303369	13.64420846

Source: Author's computations using research data.

Table 8: Tax to Gross Domestic Product Ratio

YEAR	Total Tax Revenue	Gross Domestic Product	Tax-GDP Ratio
2002	190591	1035622	18.40352947
2003	226478	1131783	20.01072644
2004	270875	1273975	21.26219117
2005	283427	1418071	19.98679897
2006	340011	1622565	20.95515434
2007	396488	1833511	21.62452257
2008	455780	2107589	21.62565851
2009	507464	2366984	21.43926617
2010	609224	2549825	23.89277696
2011	690733	3024782	22.83579445
2012	842567	3440115	24.49240796

Source: Author's computations using research data