EFFECTS OF TAX REFORMS ON BOUYANCY AND ELASTICITY OF THE TAX SYSTEM IN KENYA: 1963 - 2010

VINCENT OCHIENG OMONDI

A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ECONOMICS (FINANCE) OF KENYATTA UNIVERSITY

MAY 2013
DECLARATION

This research paper is my original work and has not been submitted for degree in any other university.

Signed: ___________ Date: ________________

Ochieng’ V. Omondi (B.ED Arts)
K102/PT/10085/2008

This research paper has been submitted for examination with our approval as university supervisors.

Signed: ___________ Date: ________________

Dr. Nelson H. W. Wawire
Senior Lecturer
School of Economics
Kenyatta University

Signed: ___________ Date: ________________

Dr. Emmanuel O. Manyasa
Lecturer
School of Economics
Kenyatta University
DEDICATION

I dedicate this research to my parents, my fiancée and all family members. It is my wish and belief that it will be an inspiration to all children to work hard and fully exploit their potentials in achieving greater things in the field of academics.
It is with great gratitude that I take this opportunity to thank the Almighty God for granting me wisdom, strength and good health that made it possible to successfully go through my studies. I have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

I am highly indebted to my two supervisors: Dr. Nelson H. W. Wawire and Dr. Emmanuel O. Manyasa for their selfless and valuable contributions by way of critique, guidance and constant supervision as well as for providing necessary information regarding the project. For their support, I sincerely appreciate their time and effort. I would like to express my gratitude towards my parents, fiancée, siblings and colleagues for their kind co-operation and encouragement which helped me in completion of this project.

I would like to express my special gratitude and thanks to my employer, Kenya Revenue Authority, for the training policy that motivated me to pursue this programme and for also giving me such attention and time. My thanks and appreciations also go to my colleagues in developing the project and people who willingly helped me out with their abilities.
## TABLE OF CONTENTS

DECLARATION ......................................................................................i
DEDICATION .......................................................................................... ii
ACKNOWLEDGMENTS ............................................................................... iii
LIST OF TABLES ....................................................................................... vi
LIST OF FIGURES ..................................................................................... vii
ACRONYMS AND ABBREVIATION ........................................................ viii
OPERATIONAL DEFINITION OF TERMS ................................................. x
ABSTRACT .............................................................................................. xii

### CHAPTER ONE: INTRODUCTION ..........................................................1

1.1 Background ..................................................................................... 1
1.3 Tax Reforms in Kenya ...................................................................... 4
1.4 Challenges Facing Tax System in Kenya ......................................... 7
1.5 Statement of the Problem .................................................................. 9
1.6 Research Questions .......................................................................... 10
1.7 Objectives of the Study .................................................................... 11
1.8 Significance of the Study .................................................................. 11

### CHAPTER TWO: LITERATURE REVIEW ................................................12

2.1 Introduction ..................................................................................... 12
2.2 Measurement of Tax Buoyancy ....................................................... 12
2.3 Measurement of Tax Elasticity ......................................................... 13
2.4 Optimal Tax Model ........................................................................... 18
2.5 Empirical Literature ........................................................................ 19
2.6 Overview of Literature ..................................................................... 26
CHAPTER THREE: RESEARCH METHODOLOGY ........................................28
3.1 Introduction ..............................................................................28
3.2 Research Design ......................................................................28
3.3 The Model ...............................................................................28
3.4 Model specification ..................................................................32
3.5 Definition and measurement of variables ..............................35
3.6 Data Source, Type and Refinement .......................................35
3.7 Time series properties .............................................................36
3.8 Data Analysis and interpretation ..........................................37

CHAPTER FOUR: EMPIRICAL FINDINGS ...........................................39
4.1 Introduction ..............................................................................39
4.2 Stationarity tests results ............................................................39
4.3 Johansen cointegration test results .........................................39
4.4 Granger Causality test results ...............................................40
4.5 Diagnostic test results ..............................................................41
4.6 Buoyancy estimates .................................................................43
4.7 Estimation for elasticities .........................................................47

CHAPTER FIVE: SUMMARY, CONCLUSION AND POLICY
IMPLICATIONS ..................................................................................49
5.1 Introduction ..............................................................................49
5.2 Summary ..................................................................................49
5.3 Conclusion ..............................................................................51
5.4 Policy Implications .................................................................52
5.5 Suggestions for further Research ..........................................54

REFERENCES ..................................................................................55
LIST OF TABLES

Table 3.1: Variables used in the Model ..................................................35
Table 4.1: Cointegration Results ...............................................................40
Table 4.2: Granger Causality Test ...............................................................41
Table 4.3: LM and Arch Test Results.........................................................42
Table 4.4: Buoyancy of the tax system .......................................................43
Table 4.5: Regression Results for Elasticity ..............................................47
Table A1: ADF unit root at levels...............................................................64
Table A2: ADF unit root after 1st Difference ..........................................64
Table A3: Raw data .................................................................................66
LIST OF FIGURES

Figure 1.1: Tax Revenue from 1986-2009 ..............................................................4
Figure A1: Normality test ............................................................65
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADBG</td>
<td>African Development Bank Group</td>
</tr>
<tr>
<td>COSIS</td>
<td>Customs oil stocks information system</td>
</tr>
<tr>
<td>DPC</td>
<td>Document processing Centre</td>
</tr>
<tr>
<td>DTM</td>
<td>Discretionary tax measures</td>
</tr>
<tr>
<td>DVA</td>
<td>Dummy variable approach</td>
</tr>
<tr>
<td>DWL</td>
<td>Dead weight loss</td>
</tr>
<tr>
<td>ERS</td>
<td>Economic recovery strategy</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
</tr>
<tr>
<td>IEA</td>
<td>Institute of Economic Affairs</td>
</tr>
<tr>
<td>KIPPRA</td>
<td>Kenya Institute of Public Policy Research and Analysis</td>
</tr>
<tr>
<td>KRA</td>
<td>Kenya Revenue Authority</td>
</tr>
<tr>
<td>LTO</td>
<td>Large Taxpayer’s Office</td>
</tr>
<tr>
<td>MEC</td>
<td>Marginal external cost</td>
</tr>
<tr>
<td>MTO</td>
<td>Medium Taxpayer’s Office</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary least square method</td>
</tr>
<tr>
<td>PA</td>
<td>Proportional adjustment</td>
</tr>
<tr>
<td>PAM</td>
<td>Proportional adjustment method</td>
</tr>
<tr>
<td>PAYE</td>
<td>Pay as you earn</td>
</tr>
</tbody>
</table>
PIN: Personal identification number

RARMP: Revenue Administration Reform and Modernisation Programme.

TMP: Tax modernization programme

TOT: Turnover Tax

VAT: Value added tax
OPERATIONAL DEFINITION OF TERMS

Dead Weight Loss: A loss of economic well-being imposed by a tax.

Optimal taxation theory: Is the study of how best to design a tax to minimize distortion and inefficiency subject to increasing set revenues through distortionary taxation.

Tax buoyancy: It is a measure of how rapidly the actual revenue from a tax rises (including that due to any change in the tax law) as the tax base rises.

Tax elasticity: It is defined as the ratio of proportionate change in tax revenue due to a unit change in income.

Tax reforms: Is the process of changing the way taxes are collected or managed by the government. It is intended change of the tax system characterized by systematic change of parameters in taxes, change in the tax quota or optimization of tax administration.
Tax Revenue Productivity: This refers to the responsiveness of tax revenue to changes in national income measured by buoyancy and elasticity estimates.
ABSTRACT

The Kenya government has been pursuing tax reforms in order to design a system that is viable and productive to finance and sustain government expenditure without recourse to deficit financing. The purpose of this study was to examine the effects of these reforms on tax buoyancy and elasticity estimates. The specific objectives of the study were; to determine the effect of tax modernization programme and revenue administration reforms and modernization programme on tax buoyancy and tax elasticity. The study employed regression analysis and used annual time series for the period 1963 to 2010. Secondary data from Kenya National Bureau of Statistics, Kenya Revenue Authority, Central Bank of Kenya and World Bank was used. Elasticity estimates were determined by adjusting data for discretionary changes using the proportional adjustment method. The study revealed that both revenue administration reform and modernization programme (RARMP) and tax modernization programme (TMP) were important in explaining the variations in buoyancy and elasticity of the tax system in Kenya. Although the reforms analyzed had positive effect on both tax buoyancy and elasticity, the results indicate that this was not sufficient to help generate adequate revenue to finance the ever increasing government expenditure. With an inelastic tax system, the Kenya government has to re-evaluate the implementation strategies and pursue further reforms for it to fully exploit the tax revenue potential in the economy.
CHAPTER ONE
INTRODUCTION

1.1 Background

Over the years, the Kenya government has been faced with the challenges of increased expenditures. This has been as a result of economic and political changes in the country. With the devolved structure of governance spelt out in the country’s constitution, there is need for increased revenue collection to sustain the activities for both the devolved and central governments. Moyi and Ronge (2006) argued that since taxation has become the single largest source of government’s budgetary resources, more tax revenue must be generated to sustain the public budget.

Musgrave (1987) asserted that high revenue productivity of a tax system is considered as one of the criteria of a good tax system in developing countries. Revenue productivity of a tax system is determined by applying the concepts of buoyancy and elasticity. The distinction between the two was developed by Mansfield (1972). Tax elasticity measures the automatic response of tax revenue to income changes. Revenue changes under elasticity concepts exclude the effects of discretionary or legal changes in tax rates or in the tax base as well as the introduction of new taxes. Tax buoyancy on the other hand measures the total response of revenue changes including discretionary adjustments to changes in income.
Wilford and Wilford (1978) asserted that one of the most important general hypotheses upon which most economists agree is that emerging nations must increasingly mobilize their own internal resources to promote economic growth. Wawire (1991) argued that the most important instrument by which resources may be marshaled is through the implementation of an effective tax policy. This section presents a discussion on the importance of taxation as well as the tax reforms in Kenya.

Cheeseman and Griffiths (2005) argued that the primary function of taxation is to raise revenue to finance government expenditure and through taxation, the government can mobilize extra finances to help service provision to the citizens such as infrastructural development, help school systems, or build recreational facilities. In any country, it is the obligation of the government of the day to provide all public goods and services to its population.

There is a long history of evidence that supports the notion that economic and political development cannot easily happen without a consolidated central state (Di John, 2009). A state may tax only residents or citizens on transactions that have direct connection with its territory and benefit from its protection. “Possibly, however, a more realistic interpretation is that states can in practice collect taxes only when they have some control over the taxpayers or the transactions” (Goode, 1984:78).
Taxation is important since it can be used to clear market imperfections. In case of a negative externality, a corrective tax is used to adjust the marginal private cost of a good or service in such a way as to internalize the externalities. The tax must be equal to the marginal external cost (MEC) per unit of output. It makes sellers of the product pay a fee equal to the MEC per unit of output sold and similarly for consumers of products that negatively affect others in an economy.

In the case of externalities, one should attempt to tax or to subsidize directly the good or activity that produces the externality (Stern, 1988). When the use of a good or service causes negative externalities, the standard prescription is to levy a Pigovian (corrective) tax, which forces the supplier to internalize the costs of the negative side effects (Nellor, 1995).

1.2 The Structure of Tax Revenues

KIPPRAG (2006) contends to the fact that despite Kenya being a high tax yield country, the tax system still faces challenges. Similarly, Economic Recovery Strategy for Wealth and Employment Creation (2003-2007) emphasized the need to deepen tax reforms in order to reduce tax burden and broaden the tax bases. These would in turn increase tax revenue collection. Figure 1.1 illustrates the trend in tax revenues as a percentage of GDP since 1986.
As shown in the graph, tax revenue growth as a percentage of GDP was at its highest between 1993/94 to 1995/96 at 23%. It then declined to its lowest of 15.64% in 1999/2000. Since then, there has been slow increase towards 20%.

1.3 Tax Reforms in Kenya

Tax reform measures are mainly undertaken in order to restore buoyancy to revenues, strengthen modern taxes, and drastically reduce the complexity and lack of transparency of the system (World Bank, 1990). The main factors contributing to an improved revenue performance are changes in tax legislation, tax administration and minimal tax evasion (Morrisset and Izquierdo, 1993).
After independence in 1963, Kenya continued to operate under the tax system inherited from the colonial government until early 1970s when policy and administrative changes were initiated. According to KIPPRA (2006), there was little problem with revenue mobilization until 1970s energy crisis necessitated tax reforms to mobilize more revenue. Kenya adopted the income tax act in 1973 (African Development Bank Group, 2010). Since then, there have been three distinct phases of tax reform measures which is the basis of this study.

According to a study by African Development Bank Group (2010), the initial measures were aimed at widening the tax base by way of introducing the sales tax in 1973 and the capital gains tax in 1975. This was a reactive strategy aimed at mitigating against the decline in duty revenues brought about by the imports substitution industrialization policies. The capital gains tax was later abolished in 1984.

The major tax reforms began in 1985 following a study by World Bank (1985) which undertook a review of Kenya’s economic policy that led to a Sessional Paper No. 1 of 1986 (Republic of Kenya, 1986). Therefore, the second phase of tax reforms was Tax Modernisation Programme (TMP) which took place between 1986 and 2002. TMP had the following policy objectives; (i) raise revenue from 22 to 28 percent of GDP, (ii) improve economic efficiency of the tax system through lowering and rationalization of tax rates, (iii) enhance greater reliance on
self assessment system supported by selective tax audits, (iv) improve administrative efficiency through computerization, (V) address constraints in existing tax structures as well as overreliance on direct taxes (KIPPPRA, 2006).

The formation of Kenya Revenue Authority (KRA) was also articulated in the TMP. KRA was expected to improve tax administration and implement organizational reforms that would improve tax administration (Cheeseman and Griffiths, 2005). Facing the challenge posed by manual processes, KRA in its second corporate plan recommended a strategy to address this issue in the revenue administration reform and modernisation programme (RARMP) which commenced in 2004/05. This marked the third Phase of tax reforms in Kenya. The goal was to transform KRA into a modern fully integrated and client focused organization (Kenya Revenue Authority, 2003).

Key reforms undertaken under RARMP included; (i) implementation of the Simba system and creation of a Document processing Centre (DPC) in year 2005 which enabled the automation of about ninety per cent of customs operations and dispensed with the need for traders to physically visit KRA. Second reform was the implementation of the customs oil stocks information system (COSIS). COSIS is a web based ICT system that monitors and reconciles oil stocks per oil marketer. Third reform was the introduction of the Electronic Tax Registers (ETR) in year 2005. ETR was aimed at addressing the perennial problem of poor
record keeping for business transactions. In year 2008, the Integrated Tax Management System (ITMS) was introduced to facilitate online registration and filing by taxpayers.

This study analysed the three phases of reforms as discussed in order to estimate their effects in improving tax revenue productivity by way of estimating buoyancy and elasticity of the tax system. Each of the phases clearly indicated policy shifts coupled by regime changes; the death of President Kenyatta and President Moi taking over in 1978, NARC government coming into power in 2003 and the coalition government in 2008. Emphasis was on TMP and RARMP reform epochs due to the major shifts the two have brought to the tax system in terms of policy and administration.

1.4 Challenges Facing Tax System in Kenya

Developing countries face formidable challenges when they attempt to establish efficient tax systems. To begin with, most workers in these countries are typically employed in agricultural sector or in small, informal enterprises. As they are seldom paid a regular, fixed wage, their earnings fluctuate, and many are paid in cash, off the books. The base for an income tax is therefore hard to calculate.

Workers in this sector spend their earnings in small stores that do not keep accurate records of sales and inventories. As a result, Tanzi (2000) asserted that modern means of raising revenue, such as income taxes and consumer taxes, play
a diminished role in economies with a large informal sector. Like many developing countries, Kenya has large informal sector.

World Bank (2009) asserted that Kenya’s tax system is the most complex in the East African region. The study further argued that it takes more than four hundred hours for firms to do all the paperwork, including compiling data, calculating, payment and meeting all other tax requirements. Another study indicated that the Kenyan tax code was complex and cumbersome, characterized by uneven and unfair taxes, a narrow tax base with very high tax rates and rates dispersions with respect to trade, and low compliance (KIPPRA, 2004a).

A study conducted by KIPPRA (2004b) stated that even though the tax system had continuously changed, in pursuit of the objectives of the Tax Modernization Programme that came into force in 1986, the challenges that confronted the tax authorities were not much different from the pre-reform challenges. Moyi and Ronge (2006) also asserted that over time, Kenya had moved from being a low tax burden country to a high tax burden country, yet the country faced the obvious need for more tax revenues to maintain public services.
1.5 Statement of the Problem

Problems of taxation have been receiving special and increasing attention in recent years. In Kenya, because of the limited amount of resources that can be obtained from abroad and from domestic borrowing, the government needs to increase its tax revenues in order to meet social obligations. These demands have pushed the government to continue pursuing its tax reform agenda since taxation is the major source of financing the budget.

Furthermore, with the release of almost 1.5 trillion budget figures in June 2012 (Republic of Kenya, 2012), doubt is being cast on the ability of Kenya Revenue Authority to raise sufficient revenue. The government is also under pressure to finance an expanded government structure spelt out in the current constitution. An understanding of the productivity of the tax system is thus very crucial with the ongoing policy and administrative reforms.

One of the key reasons for undertaking tax reforms has been to create a sustainable tax system that would generate adequate revenue to finance public expenditures. In this respect, the TMP and RARMP reforms undertaken since 1986 endeavor to achieve a tax system that is sustainable in the face of changing conditions domestically and internationally. In spite of the ongoing reforms, tax revenue is falling below targets thus the need to investigate their impact on revenue productivity.
The public expenditures have been increasing and the revenue generation missing targets. The question that arises is, are the tax reforms being carried out effective in tax revenue productivity in Kenya? Therefore, with ongoing tax reforms, it was important to conduct a study to find out its effect on tax buoyancy and elasticity which are measures of tax revenue productivity.

1.6 Research Questions

The study sought to answer the following research questions:

i. What is the effect of tax modernization programme reforms on buoyancy of the Kenya’s tax system?

ii. What is the effect of tax modernization programme reforms on elasticity of the Kenya’s tax system?

iii. To what extent has revenue administration reforms and modernization programme reforms influenced the buoyancy of Kenya’s tax system?

iv. How have the revenue administration reforms and modernization programme reforms affected tax elasticity?

v. What are the policy implications of the study findings on tax revenue productivity in Kenya?
1.7 Objectives of the Study

The general objective of the study was to examine the effects of TMP and RARMP reforms on tax revenue productivity in Kenya. The specific objectives were to:

i. Determine the effect of tax modernization programme on tax buoyancy in Kenya.

ii. Investigate the effect of tax modernization programme on tax elasticity in Kenya.

iii. Determine the effect of revenue administration reforms and modernization programme on tax buoyancy in Kenya.

iv. Investigate the effect of revenue administration reforms and modernization programme on tax elasticity in Kenya.

v. To suggest policy implications based on the study findings.

1.8 Significance of the Study

This study provides an empirical ground work of Kenya’s tax revenue responsiveness, both pure and total to changes in national income. This could be the basis upon which prudent tax measures would be pursued. This study also contributes to the existing literature on the tax structure in Kenya. It also stimulates further research in the area of taxation.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature and is organized as follows. First, section 2.2 presents the measurement of tax buoyancy while section 2.3 presents the measurement of tax elasticity. Section 2.4 optimal tax theory model then an empirical literature as provided in section 2.5 followed by an overview of literature in section 2.6.

2.2 Measurement of Tax Buoyancy

This study sought to establish the impact of tax reforms on tax buoyancy hence a review on how to measure tax buoyancy is important. The response of tax revenues to changes in the GDP is measured by tax elasticity and tax buoyancy.


\[ T = e^{\alpha} Y^\beta e^e \]  

Where; \( T \) = tax revenue, \( Y \) = income (GDP), \( \alpha \) = constant term, \( \beta \) = buoyancy coefficient and \( e \) = natural number.

The double-log version of equation (2.1) is estimated using OLS.
2.3 Measurement of Tax Elasticity

Tax elasticity is the product of two components: (1) the base elasticity which is the elasticity of the base with respect to aggregate income; and (2) the rate elasticity which is the elasticity of the tax yield with respect to the base. The change in tax revenues during a given period is the sum total of changes in economic activity and changes due to discretionary tax measures (Trinidad, 1981). The following measurements methods are available:

(a) Proportionate Adjustment Method

The proportional adjustment (PA) method was originally developed by Prest (1962) and has since been used by Mansfield (1972), Jeetun (1978), Sury (1985), Gillani (1986), Lambert and Suckling (1986), Osoro (1993), and Ariyo (1997). In this method, a series of adjusted tax revenue is first obtained by subtracting from the actual tax revenue in each year the budget estimate of the revenue impact of discretionary changes in that year. The series is further adjusted by excluding the continuing impact of each discretionary change on future year's tax revenue.

The method adjusts a historical revenue series according to a particular year's tax structure on the assumption that this particular tax structure is maintained throughout the period under consideration. Thus, this method basically involves two steps. Firstly, observed revenue data for each year are adjusted for discretionary changes by removing from such data the estimated revenue impact of discretionary changes. This gives an estimate of the automatic growth in
revenue between two successive years. Secondly, the series are converted to the first year’s basis by adjusting the year to year changes by the ratio of the tax yield on the basis of the first year rates to the actual tax yield (Chelliah and Chand, 1974).

As argued by Muriithi and Moyi (2003), this method of eliminating the discretionary effects from the revenue series is prevalent in most studies because of it superiority. Wawire (2011) noted that the following model is used for the PA method:

\[ \ln T_p = \alpha_p + \beta_p \ln Y + \varepsilon_p \]

Where \( \beta_p \) provides an estimate of the income elasticity of the \( p^{th} \) tax; \( T_p \) is \( p^{th} \) tax, and \( Y \) is income (GDP). Ariyo (1997) suggested additional modifications to the model by suggesting the introduction of a one-year lag in GDP to capture the potential effects on tax revenues due to implementation time lag. This method of estimating tax elasticity suffers from several limitations as highlighted by Ariyo (1997) and Wawire (2011). The first limitation stems from the fact that data on revenue receipts directly and strictly attributable to discretionary changes in tax policy are unavailable. Chipeta (1998) noted that this approach assumes that the discretionary changes are as progressive as the underlying tax structure, hence it is contingent on the assumption that discretionary changes are more or less
progressive than the tax structure they modify. This approach is highly aggregative compared to other methods (Wawire, 2011).

(b) Dummy Variable Approach (DVA)

This method involves introduction of a dummy variable for each exogenous tax policy change. The method was developed by Singer (Singer, 1968) and used by Chand and Wolf (1973), Khan (1973) and Artus (1974). Chipeta (1998) argued that although the technique is simple, its usefulness in estimating tax elasticity where the number of discretionary changes is large relative to the length of the data period may be limited.

The dummy variable is used as a proxy for each of the discretionary tax measures (DTMs) to estimate tax elasticity by means of a single equation model of the form:

\[ \ln T_p = \alpha_p + \beta_p \ln Y + \sum \sigma_i D_i + \epsilon_p \]  

(2.3)

Where the dummy variable \( D_i \) \((i = 1, 2, \ldots)\) takes zero (0) before the discretionary change and one (1) after the change. The coefficient \( \beta_p \) estimates the revenue elasticity. The summation takes care of the possibility of multiple changes during the period covered (Wawire, 2011).
While this technique is simple, its usefulness in estimating tax elasticity where the number of discretionary changes is large relative to the length of the data period may be limited. Ariyo (1997) suggested two additional modifications to the model by introducing a one-year lag in GDP to capture the potential effects on tax revenues due to implementation time lag and also introducing a slope dummy variable. The non-dummy and dummy models suggested are:

\[
\ln T_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln Y_{t-1} \quad \text{(2.4)}
\]

\[
\ln T_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln Y_{t-1} + \beta_3 D_1 + \beta_4 D_2 \quad \text{(2.5)}
\]

Where \( Y_{t-1} \) = previous level of income (GDP), \( T_t = \) total tax revenue, \( Y_t = \) income (GDP), \( t = \) year, \( D_1 = \) intercept dummy and \( D_2 = \) slope dummy (\( D_2 = D_1 \times Y_t \))

According to Wawire (2006; 2011), the major shortcomings of this technique include the fact that it becomes impossible to use the method when tax policy changes are too frequent and that the technique creates a potential multicollinearity problem from the inclusion of more than one dummy variable into the tax function.

(c) Constant Rate Structure Method

The third approach used in estimating tax elasticity is the Constant Rate Structure Method used by Andersen (1973) for Denmark and Choudhry (1975) for West Malaysia. In this approach, the method is to apply the current year’s rates to the previous year’s tax bases and to construct the adjusted tax revenue series that
would have been obtained, had the same tax structure been applied consistently over time. In order to do this, it is necessary to have a detailed tax-base series for all the individual taxes, which, at times, can be difficult to obtain in most developing countries.

As an example of the level of detailed information required in this particular methodology for revenue forecasting, consider the case of forecasting personal income taxes when the current system has different marginal tax rates for different levels of individual income. In this case, a tax base series with detailed information about the various income brackets is required in order to simulate the current period’s marginal tax rate structure over previous years’ income brackets and to obtain a clean adjusted series. Similar problems would arise in the case of multiple rates of consumption or excise taxes. However, this method can be used if the number of items is small, the range of tax rates is narrow, and the data can be compiled relatively easily (as in some excise tax cases).

(d) Divisia Index Method

Divisia Index is the fourth method. Derived from a weighted sum of growth rate of factor inputs, it is an index of factor inputs, for the measurement of technical change. The index of technical change is the ratio of an index of total productivity to an index of factor productivity; the latter measured by the Divisia index. This measure implies that the percentage increase in total productivity caused by technical progress is equal to the percentage increase in output divided by the
percentage increase in factor inputs. The appropriateness of this measure is based on its property of invariance, that is, if there is no technical change, the growth in total productivity is entirely due to factor inputs. A change in the Divisia index, therefore, gives a measure of the change in total productivity that shifts the production function due to all sorts of factors that are jointly termed as technical change (Choudhry, 1979).

2.4 Optimal Tax Model

Optimal tax theory is the study of how best to design a tax to minimize distortion and inefficiency subject to increasing set revenues through distortionary taxation (Mayshar, 1990). The standard theory of optimal taxation posits that a tax system should be chosen to maximize a social welfare function subject to a set of constraints (Mankiw et al., 2010).

The literature on optimal taxation typically treats the social planner as a utilitarian: that is, the social welfare function is based on the utilities of individuals in the society. In its most general analyses, this literature uses a social welfare function that is a nonlinear function of individual utilities. Nonlinearity allows for a social planner who prefers, for example, more equal distributions of utility.

Ramsey (1927) developed a theory for optimal commodity sales taxes. The intersection on downward sloping demand curve and upward sloping supply curves implies that there is producer surplus and consumer surplus. Any sales tax
reduces output and imposes a deadweight loss (DWL). Modern theory of optimal taxation can be used to evaluate the efficiency of tax reforms in regard to marginal deadweight losses (Mayshar 1990, Slemrod & Yitzhaki 1996).

Although the reforms suggested by optimal taxation are based upon rigorous economic theory, as Deaton (1988), McLure (1989) and Thirsk (1995) emphasized, putting them into operation leads to an intractably large number of rates, which would be difficult to calculate and infeasible to administer effectively. Slemrod (1990) argued that the optimal tax theory can serve as a guide to designing optimal tax systems, only if one considers the technology of tax collection, for instance, the feasibility of tax instruments, the cost of administration and compliance.

2.5 Empirical Literature

Wagacha (1974) studied the impact of the tax structure on the distribution of personal incomes in Kenya. The analysis did show that the incidence of the structure of personal income taxes on the distribution of income was slightly regressive.

Ole (1975) estimated income elasticity of tax structure in Kenya for the period 1962/63 to 1972/73. In the study, tax revenue was regressed on income without adjusting for unusual observations. The results showed that the tax structure was income inelastic (0.81) for the period studied. The results also implied that
Kenya’s tax structure was not buoyant and therefore the country would require foreign assistance to close the budget deficit.

Wawire (1991) assessed the performance of Kenya’s tax system from 1958 to 1989 by analyzing the tax capacity factors that were considered to be the main determinants of various tax ratios. Through a regression analysis, the study concluded that increases in the volume of international trade, mining, quarrying, manufacturing, building and construction does increase the tax ratio given by tax/GDP. The result of the study showed an inverse relationship with respect to share of forestry, agriculture and fishing sectors of the economy.

Njoroge (1993) studied the revenue productivity of tax reforms in Kenya for the period 1972/73 to 1990/91. Tax revenue was regressed on income after adjusting tax revenues for discretionary changes. The period of study was divided into two to make it easier to analyse the effects of tax reforms on revenue from various taxes. The only shortcoming was that this study never took into account time series properties of data making the results unreliable.

Adari (1997) analyzed the structure, administration and performance of VAT. The estimated buoyancy and elasticity coefficients were less than unity implying a low response of revenue from VAT to changes in GDP. This suggested the presence of laxity and deficiencies in VAT administration.
Wang’ombe (1999) analyzed the revenue productivity and some administrative factors of the Kenyan tax system for the period 1989-1998. The result of this study came up with buoyancy estimates of the total tax system as 1.26 while elasticity was 1.27. The study thus concluded that the tax system in general was both elastic and buoyant implying that tax reforms had greatly improved productivity. Discretionary tax measures had a very small effect on tax productivity implying improved efficiency.

Using total GDP, Wawire (2000) estimated the tax buoyancy and income-elasticity of Kenya’s tax system. Tax revenues from various sources were regressed on their tax bases. The study concluded that the tax system had failed to raise necessary revenues. However, the shortcomings of the study were that it never considered other important determinants of tax revenue, for instance the unusual circumstances that could have affected tax revenue productivity. It also never disgregated tax revenue data by source hence it was difficult to say which tax bases contributed more to the exchequer. Finally, it never considered the time series properties of the data used.

Muriithi and Moyi (2003) analyzed the productivity of Kenya’s tax structure in the context of the tax reforms focusing on pre and post reform period. In the study, they assessed the buoyancy and elasticity of individual taxes and the overall tax system. Their findings suggested that tax reforms had a positive
impact on the overall tax structure and on the individual tax handles, even though the impact of the reforms was not always uniform. The reforms had a bigger impact on direct taxes than on indirect taxes, suggesting that revenue leakage is still a major problem for indirect taxes.

The study established that the better responsiveness of direct taxes could be attributed to the relative effectiveness of the reforms in direct taxes, which not only made the tax system simpler but also reduced avenues for evasion and corruption. Such reforms include the introduction of PIN, lower rates, reduction of exemptions and a shift away from multiple rates across many categories.

The two found elasticity for Kenya’s overall tax system to be 0.645 for the period 1973-1999. On this basis, it can be argued that the growth in GDP spurred a less than proportionate automatic increase in tax revenue. Specifically, this means that the tax system yielded a 0.645% change in tax revenue (resulting from economic activity alone) for every 1% change in GDP. Thus, a decreasing proportion of incremental income was transferred to the government in the form of tax revenues, meaning that the tax structure in Kenya was inelastic.

However, they noted that the result was due to the high inelasticity of 1973–1985 which overwhelmed the fair elasticity of 1986–1999. They also sounded a
cautionary note about the success of imposition of VAT concluding that VAT was still the most rigid tax system still in place.

Even though the current study adopted model used by Muriithi and Ronge (2003), it differs from their study in some dimension. First, this study used data of since 1963-2010. Second, nominal figures were converted to real figures. Finally this study considered stationarity of a time series data and the data regressed for the whole period of the study.

Wawire (2003) aimed at highlighting the trends in Kenya’s tax ratios, tax effort indices and their implication for further tax reforms. In the study tax revenue was regressed on income. The estimated tax equation was used to compute tax effort indices by dividing the predicted with the actual figures. After examining the tax effort indices, the study concluded that the slowdown in economic growth had resulted in high levels of taxation that did not match delivery of public goods and services.

Cheeseman and Griffiths (2005) asserted that there was some evidence that the Kenyan government overestimated the tax revenue that would be collected in future years as a way of presenting international organizations with a balanced budget. By greatly inflating the estimations of revenue to be collected, they argued, the government can claim that its policy expenses are covered and so access crucial international funds. At the same time, it generates for itself the
space to implement its public spending programs that are essential for its popularity domestically.

Karingi and Wanjala (2005) evaluated the effect of tax reforms on tax revenue and its composition in the pre- and post adjustment period, as measured by the tax/GDP ratios and the share of specific taxes in total tax revenue. In their study, they observed that tax yield rose successfully even before the major tax reform programme to peak on average at 19.7 per cent of GDP by the early 1980s. But this level of tax yield compared to the expenditure-to-GDP ratio was nonetheless insufficient. Consequently, they argued that since one of the main objectives of the TMP was to raise tax yield on a zero deficit strategy to match expenditures which were on average 28 per cent of GDP, this objective was never achieved and the best performance in terms of tax yield was during the years 1993/4-97/8, when it climbed to 24.4 per cent of GDP.

Kieleko (2006) evaluated tax revenue productivity in Kenya for the period 1973 - 2003. The productivity was measured through buoyancy and elasticity. The coefficients were measured through log regression of the taxes to the Gross Domestic Product. The analysis of this study was carried out using the Proportional Adjustment Method (PAM) in capturing the effects of tax reforms on discretionary tax measures and tax productivity. The results showed that there had been a considerable improvement of the tax revenue productivity and that the
reforms made in this period had significant effect on the responsiveness of the tax system.

However, this study only concentrated on the TMP reforms and also failed to consider the period immediately after independence when the British tax system was still in force. The current study therefore bridged this gap by analysing the tax system since 1963 and also captured the RARMP reforms which were never captured before.

Wawire (2011) studied the determinants of value added tax revenue in Kenya for the period 1963/64 to 2008/2009. By introducing dummies to cater for unusual behaviours, an OLS regression was done. The study concluded that VAT revenues respond with lags to changes in their respective tax bases implying that the previous levels of tax bases (such as GDP, volume of trade, and volume of imports) have significant influence on the present levels of VAT revenues.

The study further concluded that from the results, it meant that new policy guidelines contained in the budget speeches are not usually implemented immediately hence the long time lag in the response of the taxes influences VAT revenue collected from various sources at a point in time.
2.6 Overview of Literature

The chapter has presented a review of theoretical literature on the methods of estimating tax revenue productivity (buoyancy and elasticity of tax). There is an agreement among scholars on estimating buoyancy but there are several methods for estimating elasticity. Among the four methods of adjusting for discretionary changes in estimating tax elasticity, proportional Adjustment Method (PAM) was considered appropriate due to its superiority in capturing the effects of tax reforms on discretionary tax measures.

The Dummy Variable Approach although simple, was found to be limited in use where the number of discretionary changes exceeds length of the data period. Furthermore, Wawire (2006; 2011) noted that it becomes impossible to use Dummy Variable Approach when tax policy changes are too frequent. On the other hand, using Contant Rate Structure may be limited due to the difficulty in obtaining detailed tax-base series for all the individual taxes especially in most developing countries.

The empirical literature has shown a clear gap as to the empirical results on the effect of reforms on tax revenue productivity in Kenya. The study by Wagacha (1974) on impact of tax structure on the distribution of personal income in Kenya did not focus on the influence of tax reforms on tax revenue productivity in addition to analyzing only one type of tax – personal income tax in Kenya. In
determining the elasticity of the tax structure in Kenya, Ole (1975) did not adjust for discretionary changes.

In estimation of buoyancy and elasticity coefficients by Adari (1997) and Wawire (2000), time series properties of data were disregarded, rendering the results unreliable for planning purposes. Muriithi and Moyi (2003) and Kieleko (2006) analyzed the productivity of Kenya’s tax structure in the context of the tax reforms focusing on pre and post reform period. This study differed from their studies in some dimension. First, this study used data of since 1963-2010. Second, nominal figures were converted to real figures. Finally this study considered stationarity of a time series data and the data regressed for the whole period of the study. Emphasis was on RARMP reforms which were not captured by any of the studies. Two slope dummies were introduced in the estimation equations so as to analyse the effects of TMP and RARMP on buoyancy and elasticity coefficients captured as slope dummies.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the methodology adopted to address study objectives is explained. It also includes research design as well as model specification that assisted in identifying the data to be collected. Variables used have been defined and explained.

3.2 Research Design

This study aimed at establishing the productivity of the tax system in Kenya hence adopted causal relationship research design. According to Cooper and Schindler (2006), causal analysis is concerned with how one variable affects, or is responsible for changes in another variable. This was important in understanding the relationships between various taxes levied and their proxy bases hence the predictive power of the overall tax system.

3.3 The Model

In this study, productivity of the tax system was determined by applying the concepts of tax buoyancy and tax elasticity. The model followed Mansfield (1972) who defined elasticity algebraically as follows:

As a ratio of total tax revenue to income,

\[ E_{TY} = \frac{\Delta T_t}{\Delta Y} \cdot \frac{Y}{T_t} \]  

\[ (3.1) \]
Where; \( E = \) elasticity, \( T = \) tax revenue and \( Y = \) income

As elasticity of \( k^{th} \) individual tax to income,

\[
E_{T_k} = \frac{\Delta T_k}{\Delta Y} \cdot \frac{Y}{T_k} \quad \text{.......................... (3.2)}
\]

This is a measure of the effect of economic growth on a particular sector of the economy thus affected by the economic structure.

As elasticity of the \( k^{th} \) individual tax to base,

\[
E_{T_kB_k} = \frac{\Delta T_k}{\Delta B_k} \cdot \frac{B_k}{T_k} \quad \text{.......................... (3.3)}
\]

This function measures the legal structure and tax compliance thus is a measure of the effectiveness of tax policy.

As elasticity of \( k^{th} \) individual base to income,

\[
E_{B_kY} = \frac{\Delta B_k}{\Delta Y} \cdot \frac{Y}{T_k} \quad \text{.......................... (3.4)}
\]

Where; \( E_T = \) tax elasticity, \( T_t = \) total tax revenue, \( T_k = \) revenue from \( k^{th} \) tax, \( B_k = \) base of \( k^{th} \) tax, \( Y = \) income (GDP) and \( \Delta = \) change in the variable

Mansfield (1972) further asserted that a widely used measure of tax elasticity is the definition of tax elasticity as the weighted average of the sum of the elasticities of separate taxes that often have widely divergent responses to changes in income. Therefore, the elasticity of total revenue to income can be shown to depend on the product of the tax to base and base to income elasticities of
individual taxes weighted by the importance of the individual taxes in the tax structure as follows:

\[ E_{T_{ky}} = \frac{T_t}{T_t} [\left( \frac{\Delta T_1}{\Delta B_1} \right) \left( \frac{B_1}{T_1} \right) \Delta Y_1 + \ldots + \frac{T_n}{T_t} \left( \frac{\Delta T_n}{\Delta B_n} \right) \left( \frac{B_n}{T_n} \right) \Delta Y_n] \] \hspace{1cm} (3.5)

Where; \( E_{T_{ky}} \) = elasticity of total tax revenue to income, \( T_t \) = total tax revenue, \( T_k \), \( T_n \) = tax revenue from \( k \)th and \( n \)th taxes in a system of \( n \) taxes, \( B\) = tax base; \( Y\) = income and \( \Delta \) = the discrete change in the variable associated with it. An advantage of using such a definition is the ability to identify factors responsible for rapid or lagged revenue growth.

Tax buoyancy is a useful concept for measuring the performance of both tax policy and tax administration over time. However, it is tax elasticity that is the relevant factor for forecasting purposes. The tax elasticity coefficient gives an indication to policy-makers of whether tax revenues will rise at the same pace as the national income.

Buoyancy is estimated as follows:

\[ E_{T_Y^b} = \frac{\Delta T^b}{\Delta Y} \cdot \frac{Y}{T^b} \] \hspace{1cm} (3.6)

Where; \( E_{T_Y^b} \) = buoyancy of tax revenue to income, \( T^b \) = total tax revenue, \( \Delta T^b \) = change in total tax revenue, \( Y \) = income and \( \Delta Y \) = change income.

30
Buoyancy can be better expressed when individual taxes are broken down as follows

\[ T^b = T^b_1 + T^b_2 + T^b_3 \]  

(3.7)

Where: \( T^b_1 \) = Revenue from tax 1 (value added tax), \( T^b_2 \) = Revenue from tax 2 (trade tax) and \( T^b_3 \) = Revenue from tax 3 (income taxes).

Equation (3.8) can therefore be rewritten as;

\[ E_T^b = \frac{\Delta T^b_1 + \Delta T^b_2 + \Delta T^b_3}{\Delta Y} \cdot \frac{Y}{T^b} \]  

By opening the brackets we have;

\[ \frac{T^b_1}{T^b} \cdot \left( \frac{\Delta T^b_1}{\Delta Y} \cdot \frac{Y}{T^b_1} \right) + \frac{T^b_2}{T^b} \cdot \left( \frac{\Delta T^b_2}{\Delta Y} \cdot \frac{Y}{T^b_2} \right) + \frac{T^b_3}{T^b} \cdot \left( \frac{\Delta T^b_3}{\Delta Y} \cdot \frac{Y}{T^b_3} \right) = E_{TY}^b \]  

(3.8)

\( E_{T1Y}^b, E_{T2Y}^b, E_{T3Y}^b \) stand for buoyancy of the tax revenues 1, 2, and 3 with respect to income.

Equation (3.8) can then be written as:

\[ E^b_{TY} = T^b_1 \cdot E^b_{T1Y} + T^b_2 \cdot E^b_{T2Y} + T^b_3 \cdot E^b_{T3Y} \]  

(3.9)

This equation represents the weighted sum of buoyancy for the three taxes. The total tax buoyancy may be written as:

\[ E^b_{TY} = E^b_{T1Y} \cdot E^b_{T1B1} \cdot \left( \frac{T^b}{T} \right) + E^b_{T2Y} \cdot E^b_{T2B2} \cdot \left( \frac{T^b}{T} \right) + E^b_{T3Y} \cdot E^b_{T3B3} \cdot \left( \frac{T^b}{T} \right) \]  

(3.10)
This expression shows how each tax base responds to changes in income over time. For estimation purposes, tax revenue is taken as a function of income proxied by GDP and the model is specified in the following section.

3.4 Model specification


\[ T = e^{\alpha Y^\beta e\mu} \]  

(3.11)

Where \( T \) = tax revenue, \( Y \) = income (GDP), \( \alpha \) = constant term, \( e \) = natural number, \( \beta \) = buoyancy coefficient and \( \mu \) = error term.

The model used in this study was specified by taking the double logarithm of equation (3.11) which yields the buoyancy coefficient of \( \beta_k \) as shown below;

\[ \ln T_k = a_k + \beta_k \ln Y + \mu_k \]  

(3.12)

Where, \( T_k \) = revenue from the \( k^{th} \) tax, \( \beta_k \) = buoyancy coefficient, \( a_k \) = constant term and \( \mu_k \) = error term.
To analyse effects of TMP and RARMP reforms, equation (3.12) was modified by introduction of slope dummy variables taking value 1 for the period with TMP and RARMP reforms and 0 otherwise. The equation estimated for tax buoyancy was;

\[ \ln T_k = a_k + \beta_k \ln Y + \varphi_1(D_1 \ln Y) + \varphi_2(D_2 \ln Y) + \mu_k \]  

(3.13)

Equation (3.13) was used to estimate the effects of TMP and RARMP reforms on tax buoyancy thus answering objective (i) and (iii). \( \beta_k \) gives the magnitude of tax buoyancy during pre reform period while \( \varphi_1 \) and \( \varphi_2 \) the magnitude of differential tax buoyancy during post tax reform periods. If \( \beta_k + \varphi_1 + \varphi_2 \) is more than \( \beta_k \), then there will be an upward shift in the degree of tax buoyancy during post tax reform period so long as the coefficients are statistically significant.

On estimation of tax elasticity, this study adjusted for the discretionary effects using the proportional adjustment method originally developed by Prest (1962) and has since been used by Mansfield (1972), Omuroyi (1983), Osoro (1993), Ariyo (1997), Wawire (2000), Muriithi and Moyi, (2003), Wawire (2003; 2006; 2011). This method of eliminating the discretionary effects from the revenue series is prevalent in most studies because of its superiority. It was based on the construction of revenue series by adjusting for the effects of discretionary changes introduced in tax systems over time. The following steps were followed:

i. The first step was to compile data on actual revenue collection throughout the period 1963-2010 given as: \( T_1, T_2, \ldots, T_{n-1}, T_n \)
ii. The second step was to compile data series for discretionary changes.
   Revenue collected from discretionary changes; $D_1, D_2, \ldots, D_{n-1}, D_n$

iii. Step three involved adjusting actual tax revenue series using discretionary change coefficient.

The adjustment process removes the effects on revenue collection produced by discretionary changes introduced in time. For the $n^{th}$ period, no adjustment is needed since the tax collection includes discretionary changes. That is, tax revenue in $n^{th}$ period reflects the current tax structure. With discretionary changes considered, elasticity was estimated by regressing the following equation;

$$\ln \text{AT}_k = \alpha_k + \beta_k \ln Y + \mu_k$$ .......................................................... (3.14)

Where; $\text{AT} =$ adjusted revenue from tax $k$, $\alpha_k =$ constant, $\beta_k =$ elasticity of the $k^{th}$ tax and $\mu_k =$ error term. For tax elasticity estimates, slope dummy variables were introduced in equation (3.14) as follows;

$$\ln \text{AT}_k = a_k + \beta_k \ln Y + \phi_1 (D_1 \ln Y) + \phi_2 (D_2 \ln Y) + \mu_k$$ ................................................. (3.15)

Equation (3.15) answered objective (ii) and (iv). $\beta_k$ gave the magnitude of tax elasticity during pre reform period while $\phi_1$ and $\phi_2$ the magnitude of differential tax elasticity during post tax reform periods. If $\beta_k + \phi_1 + \phi_2$ is more than $\beta_k$, then there is an upward shift in the degree of tax elasticity during post tax reform period so long as the coefficients are statistically significant.
3.5 Definition and measurement of variables

The variables of the model were; real GDP (Y), total tax revenue (T) and Dummy variables (D) which are the reform variables. Table 3.1 below shows the variables, their symbols and how they were measured.

Table 3.1: Table of Variables used in the Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symbol</th>
<th>Definition and Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tax Revenue</td>
<td>T</td>
<td>This is the summation of all individual tax revenues measured in Kenya shillings</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>Y</td>
<td>This is the value of goods and services produced in a country over a period of one year regardless of whether they were produced by foreigners or residents. It will be measured in Kenya shillings.</td>
</tr>
<tr>
<td>TMP</td>
<td>$D_1$</td>
<td>This is a slope dummy variable representing the TMP reforms and take value 1 for the period under TMP (1986-2002) and 0 otherwise.</td>
</tr>
<tr>
<td>RARMP</td>
<td>$D_2$</td>
<td>This is a slope dummy variable representing the RARMP reforms and take value 1 for the period under RARMP (2003-2010) and 0 otherwise.</td>
</tr>
</tbody>
</table>

3.6 Data Source, Type and Refinement

Data from 1963-2010 was obtained from the Kenya National Bureau of Statistics, statistical data from the Kenya Revenue Authority, the Central Bank of Kenya, and World Bank. Both dependent and independent variables were converted from their nominal values to real values. Conversion of time series data for GDP was done by dividing nominal values with the GDP deflator using 1963 as the base
year. TMP and RARMP reforms were denoted by slope dummies taking value 1 for the period with TMP and RARMP reforms and 0 otherwise.

Real tax revenues were arrived at by dividing the nominal values by the consumer price index (CPI). This was necessary to avoid biased result due to inflation. According to Wawire (2006, 2011), CPI is more of a cost of living index hence it is the right to employ for tax revenues which have the effect of reducing disposable income.

3.7 Time series properties

Before running any regression, test for stationarity was conducted to determine the randomness and non-randomness of the data collected. Time series data generally assumes stationarity among variables. A time series is stationary if its mean, variance and autocovariances are independent of time. It was important to test whether the variables in this model are stationary so as to avoid the problems associated with regression analysis of time series data where variables are non-stationary.

As explained in Gujarati (1995), the non-random behavior of time series data undermine the usefulness of the standard econometric methods applied without considering time series properties. Regression on such data is thus expected to be spurious and inconsistent thereby causing a common time trend.
There are a number of tests that are used to test for stationarity or the unit root in variables. Most studies have applied unit root tests introduced by David Dickey and Wayne Fuller (1979, 1981) commonly called Dickey-Fuller (DF) test and the Augmented Dickey Fuller test (ADF). In this study, stationarity tests were performed for each variable using Augmented Dickey Fuller test. After stationarity tests, it was necessary to undertake tests for cointegration so as to establish whether there could be a long run relationship amongst or between non stationary variables.

3.8 Data Analysis and interpretation

Before subjecting data to regression analysis, variables were described. This included showing the trends of various variables both in nominal and in real terms. Also the trend of contribution of each tax to revenue was described. This study applied tax revenue model for estimating buoyancy and elasticity. To estimate parameters of the model using Ordinary Least Square method, the equation was linearized by taking the logarithms of the variables in the model.

In adjusting for discretionary changes, proportional adjustment method which was suggested by Prest (1962) and later described by Mansfield (1972) was used. The adjusted data was used to estimate the elasticity. Proportional adjustment method was used because a series of discretionary changes had taken place during the sample period, 1963/64 to 2009/10.
Equation (3.13) specified was used to examine the effects of TMP and RARMP reforms on tax buoyancy thus answering objective (i) and (iii). $\beta_k$ gave the magnitude of tax buoyancy during pre reform period while $\varnothing_1$ and $\varnothing_2$ the magnitude of differential tax buoyancy during post tax reform periods.

Similarly, Equation (3.15) was used to answer objective (ii) and (iv). $\beta_k$ gave the magnitude of tax elasticity during pre reform period while $\varnothing_1$ and $\varnothing_2$ the magnitude of differential tax elasticity during post tax reform periods. If the regression coefficients of dummy variables are significantly positive then the average gross tax revenue go up; if significantly negative, then the average gross tax revenue go down during post tax reform periods.
CHAPTER FOUR
EMPERICAL RESULTS AND INTERPPRETATION

4.1 Introduction

This chapter presents stationarity, cointegration, diagnostic tests and the regression results. Interpretation and discussion of results is also done.

4.2 Stationarity tests results

When time series data is non-stationary and used for analysis it may give spurious results because estimates obtained from such data will possess non constant mean and variance. Because this study used time series data, it was important to establish the Stationarity of the data or what order they are integrated to make sure that the results obtained are not spurious. In this regard Augmented Dickey Fuller (ADF) was used to test for unit roots.

The unit root results of the variables in the model are reported in the appendix; tables A1 and A2. As shown in table A1, the results of the unit root show that tax was stationary at levels while GDP was stationary after the first difference.

4.3 Johansen cointegration test results

Cointegration tests were carried out to verify whether the two variables had a long-run relationship or not. Testing for cointegration required that the residuals for a given regression are integrated of order zero \([1(0)]\) or stationary. If they are stationary \([1(0)]\), although the variables are individually \([1(1)]\) or have stochastic
trends, their linear combination cancels out the stochastic trends in these variables and as a result, such a regression would be meaningful and not spurious.

Table 4.1: Cointegration test results

<table>
<thead>
<tr>
<th>Eigen value</th>
<th>Likelihood Ratio</th>
<th>5 percent Critical value</th>
<th>1 percent critical Value</th>
<th>Hypothesized No. of CE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.229</td>
<td>17.601</td>
<td>15.41</td>
<td>20.04</td>
<td>None</td>
</tr>
<tr>
<td>0.115</td>
<td>5.625</td>
<td>3.76</td>
<td>6.65</td>
<td>At most 1 **</td>
</tr>
</tbody>
</table>

*(**) Denotes rejection of the hypothesis at 5% (1%) significance level
L.R. test indicates 2 cointegrating equations at 5% significance level

From the analysis in table 4.1, the results indicate two cointegrating equations, given that the likelihood ratio is greater than the critical value at 5 percent significance level and therefore there is a linear combination among the variables.

After the cointegration test, the Granger Causality test was conducted.

4.4 Granger Causality test results

The study sought to find out if there was causation between tax revenue and GDP in Kenya. Granger causality test was carried out to find the causation between the two variables. The results are reported in table 4.2. The Granger causality test results revealed a bi-directional causality between the tax revenue and GDP.
Table 4.2: Granger Causality test results.

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>F-Statistic</th>
<th>Lags</th>
<th>Probability</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax does not granger cause GDP</td>
<td>5.735*</td>
<td>4</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>GDP growth does not Granger Cause tax</td>
<td>3.511*</td>
<td>4</td>
<td>0.016</td>
<td>Bi-directional Causality</td>
</tr>
</tbody>
</table>

* Denotes rejection of the null hypothesis at 5% significance level

Causality runs in both directions, that is, from tax revenue to GDP and from GDP to tax revenue. There is a two-way causality or a bi-directional causality from tax revenue to GDP and vice versa.

4.5 Diagnostic test results

The following diagnostic tests were performed on the model to evaluate the validity of the model. They include Jarque-Bera test for normality, LM auto correlation test, ARCH (Auto regressive conditional heteroskedasticity) to detect heteroskedasticity. The results are presented in table 4.3 and figure A1 in the appendix.
<table>
<thead>
<tr>
<th>Test</th>
<th>Obs*R-squared</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM – test</td>
<td>21.94</td>
<td>0.000</td>
</tr>
<tr>
<td>ARCH test</td>
<td>3.998</td>
<td>0.010</td>
</tr>
</tbody>
</table>

From the summarized in table 4.3, the statistic labeled "Obs*R-squared" is the LM test statistic for the null hypothesis of no serial correlation. The probability value (0.000) indicates absence of serial correlation in the residuals at five percent significance level.

The statistic labeled "Obs*R-squared" is also the ARCH test statistic for the null hypothesis of autoregressive conditional heteroskedasticity (ARCH) in the residuals. The probability value (0.010) indicates that there is no heteroskedasticity in the residuals at five percent significance level.

Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as $\chi^2$ with 2 degrees of freedom. The reported probability is the probability that a statistic Jarque-Bera exceeds (in absolute value) the observed value under the null hypothesis. Thus, a small probability value leads to the rejection of the null hypothesis of a normal distribution. This is shown in the appendix, figure A1. The value Jarque-Bera(299) is greater than that of the given probability (0.000); therefore, the series are normally distributed. This implies that the model has power to capture all the variables.
4.6 Buoyancy estimates

The study sought to estimate the effects of tax reforms on buoyancy of Kenya’s tax system. The results are presented in table 4.4.

Table 4.4: Regression results for buoyancy estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Gross Domestic Product</td>
<td>1.144*</td>
<td>42.484</td>
<td>0.000</td>
</tr>
<tr>
<td>Tax Modernisation Programme</td>
<td>0.214*</td>
<td>2.341</td>
<td>0.024</td>
</tr>
<tr>
<td>Error term(-1)</td>
<td>-0.283*</td>
<td>-3.910</td>
<td>0.000</td>
</tr>
<tr>
<td>Revenue Administration Reforms and Modernisation Programme</td>
<td>0.455*</td>
<td>3.447</td>
<td>0.001</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.322*</td>
<td>-12.244</td>
<td>0.000</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F -statistic</td>
<td>4.491</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Denotes significance interval at 5%

Interactive slope dummies were introduced in the regression equation in order to capture the effects of tax reforms on tax buoyancies. From table 4.4, the regression had an adjusted $R^2$ of 0.995. This means that variations in Gross Domestic Product, revenue administration reform and modernization programme (RARMP) and tax modernization programme (TMP) explain 99.5% of the variation in the tax revenue in Kenya. The F-value of 4.49 with a probability of 0.00 at 5% significance level indicates that GDP, RARMP and TMP jointly contribute to the variations in tax revenue.

The coefficient of the error correction term gives the speed of adjustment of each variable towards its long-run equilibrium value. The sign of the coefficient gives
the direction of adjustment towards equilibrium. The higher the coefficient of lagged error term, the faster the speed of adjustment towards equilibrium level. If the sign of the coefficient is negative, it implies convergence towards the equilibrium in the long-run.

As indicated in table 4.4, the coefficient of the error correction term is 0.283 and is significant. It implies a low speed of adjustment. This means that 28 percent of the previous errors in the tax revenue are corrected for in the current period. The following is a discussion of each variable with regard to sign, significance and possible policy implications.

The coefficient of log GDP was statistically significant as shown by a t-ratio of 42.48. The coefficient of this variable is positive suggesting that if GDP increases by 1% total tax revenue increases by 1.144%. This means that the tax system yielded a 1.144% change in tax revenue as a result of changes in discretionary policy measures for every 1% change in GDP.

The implication of the buoyancy coefficient greater than unity is that discretionary changes were important in raising tax revenue. The results confirm the causality results that indicate a bi-directional causation between tax collected and GDP. These results are consistent with the findings of Njoroge (1993), Wang’ombe (1999), Moyi and Muriithi (2003) who found a buoyancy coefficient of more than unity.
The study employed the use of two dummy variables to represent the reforms which have been implemented by the government to enhance the revenue collection. The regression results indicate that both revenue administration reforms and modernization programme and tax modernization programme were statistically significant. Since they were represented by the use of the dummy variables, the coefficients of the variables could not be interpreted as buoyancies.

The dummy coefficients measured the discontinuous effect of the changes in income and tax policy decisions. This captured the interaction effect of tax reforms on gross tax revenue.

Revenue Administration Reform and Modernization Programme (RARMP) had a t-statistic of 3.447 and a P-value of 0.000. This implies that the revenue administration reforms had a positive impact on the overall tax structure. The positive impact of the programme could be associated with the organizational realignment achieved by the implementation of the various tax reforms.

During the period of RARMP reforms, the differential buoyancy estimate was found to be 0.455. It therefore implies that the reforms improved tax buoyancy by about 46% over the reform period thereby a boost in revenue collection. This positive impact can be attributed to objectives set by KRA through a number of initiatives which included: broadening of tax base and widening the tax net;
improving voluntary compliance; enhancing and improving assessments/audits; improving debt/arrears and exemptions management; and implementation of an integrated enforcement policy.

Tax Modernization Programme (TMP) had a t-statistic of 3.447 and a P-value of 0.000. This implies that the revenue administration reforms had a positive impact on the overall tax structure. The primary aim of the TMP was to raise the revenue-to-GDP ratio from 22% in 1986 to 24% by the mid-1990s, although this target was increased to 28% in 1992. The Tax Modernization Programmes reforms were aimed at encouraging a free market atmosphere and therefore increasing the level of foreign direct investment.

The results indicate that differential tax buoyancy estimate under TMP reforms was 0.214 implying 21% increase in tax revenue collection over the period. This is a slight improvement in buoyancy of the tax system. Although there was an upward shift in revenue collection for both categories of reforms, RARMP had a higher effect on tax buoyancy as compared to TMP reforms. Doing away with some of the manual processes could have led to this difference since RARMP enhanced computerization, online declarations and clearance of goods. That in effect limited interaction between tax officers and taxpayers hence reducing revenue leakages as a result of corruption.
4.7 Estimation for elasticities

The second and fourth objectives of the study aimed at determining the effect of TMP and RARMP on elasticity of the Kenya’s tax system. In order to address these objectives, data was adjusted for discretionary changes. A regression analysis was carried out and the results shown in table 4.5.

### Table 4.5: Regression results for elasticity estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Gross Domestic Product</td>
<td>0.690*</td>
<td>8.825</td>
<td>0.000</td>
</tr>
<tr>
<td>Error term (-1)</td>
<td>0.775*</td>
<td>8.787</td>
<td>0.000</td>
</tr>
<tr>
<td>Tax Modernisation Programme</td>
<td>0.554*</td>
<td>4.301</td>
<td>0.000</td>
</tr>
<tr>
<td>Revenue Administration Reform and Modernisation Programme</td>
<td>0.199*</td>
<td>2.361</td>
<td>0.034</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.505*</td>
<td>-27.215</td>
<td>0.000</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.998</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Denotes that the coefficient is significant at 5% level

The results, presented in Table 4.5 indicate that the elasticity for Kenya’s overall tax system is 0.690. This implies that the increase in national income spurred a less than proportionate increase in tax revenue. The results are consistent with the findings of Njoroge (1993), Moyi and Muriithi (2003) and Wawire (2006) who found the overall tax system to be inelastic. Results however deviate from the findings of Wang’ombe (1999) who found an elasticity coefficient of 1.27.

The coefficient of error correction term gives the speed of adjustment of each variable towards its long-run equilibrium value, while the sign of the coefficient gives the direction of adjustment towards equilibrium. From the results, the coefficient of the error correction term is 0.775 and is significant. It implies a high
speed of adjustment. This means that 77 percent of the previous errors in the tax revenue are corrected for in the current period.

The results from the regression indicate that the tax modernization programme (TMP) and revenue administration reform and modernization programme (RARMP) increased the revenue collected over the reform period. This is indicated by the t-ratios of the coefficients of these reform programmes. The results are in line with the findings of Kieleko (2006) who found TMP reforms to have a positive impact on Kenya’s tax system.

The differential elasticity coefficients were 0.554 and 0.199 for TMP and RARMP respectively. It is therefore apparent that the elasticity ratio increased by 55.4% during TMP reforms and 19.9% during RARMP reforms. TMP seem to have had a bigger impact. It is therefore clear that these reforms appear to have improved tax elasticity more than the buoyancy. This is expected since reforms ought to improve automatic response of the tax system to changes in GDP rather than the responsiveness of the tax system to discretionary policy measures undertaken by the government.
CHAPTER FIVE
SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction
This chapter presents a summary of the study, conclusions, policy implications and areas for further research.

5.2 Summary
The Kenya government has been implementing tax reforms so as to enhance tax revenue productivity. In spite of the ongoing reforms, tax revenue is falling below targets. Given this scenario, there was need to examine the effects of TMP and RARMP reforms on tax revenue productivity in Kenya. The specific objectives of the study were to: determine the effect of tax modernization programme on tax buoyancy in Kenya, investigate the effect of tax modernization programme on tax elasticity in Kenya, determine the effect of revenue administration reforms and modernization programme on tax buoyancy in Kenya and to investigate the effect of revenue administration reforms and modernization programme on tax elasticity in Kenya.

The findings suggest that tax reforms had a positive impact on the overall tax structure as illustrated by the coefficients of slope dummies. Since buoyancy and elasticity are measures of tax revenue productivity; the positive effects as established on the two as a result tax reforms, implies an improvement in revenue generation capacity of Kenya’s tax system.
The first objective of the study was to determine the effect of tax modernization programme on tax buoyancy in Kenya. The results indicated that the buoyancy coefficient was greater than unity. That is, 1.144 and 1.358 for pre and post reform periods respectively. This implies that discretionary changes were important in raising revenue. Furthermore, tax modernization reforms improved the buoyancy coefficient over the study period.

The second objective was to investigate the effect of tax modernization programme on tax elasticity in Kenya. The regression results indicate an inelastic tax system with an elasticity coefficient of 0.690 during the pre reform period. However, with the implementation of tax modernization programme reforms, the elasticity coefficient improved by 0.554.

The third and fourth objectives were to determine the effect of revenue administration reforms and modernization programme on tax buoyancy in Kenya and to investigate the effect of revenue administration reforms and modernization programme on tax elasticity in Kenya respectively. The reforms were included in the regression models as dummies for estimation purposes. The study showed that the revenue administration reform and modernization programme (RARMP) and tax modernization programme (TMP) were important in explaining the variations in the buoyancy of tax system in Kenya and also on the elasticity of the tax system.
Although the reforms analyzed had positive effect on both tax buoyancy and elasticity, the results indicate that this was not sufficient to help generate adequate revenue to finance the ever increasing government expenditure. With an inelastic tax system, the Kenya government has to re-evaluate the implementation strategies and pursue further reforms for it to fully exploit the tax revenue potential of the economy.

5.3 Conclusion

In conclusion, the study revealed that Kenya has a buoyant tax system. This implies that budgetary changes have increased the responsiveness of tax revenues to income changes. It was found that discretionary tax measures have had an overall impact on growth in total revenue over the period. However, the automatic response of revenue to changes in the tax base was found to be less than unity.

The study further revealed that Kenya has an inelastic tax structure. Taxes are not greatly responsive to changes in income with the elasticity coefficient registering below unity. The low elasticity observed in the Kenya’s tax system is explained through factors such as exemptions, tax incentives, duty waivers, low compliance and vibrant sectors of the economy which are not subject to taxation. Therefore, the automatic responsiveness of taxes to income is seen to be low.

Although reforms undertaken improved tax elasticity, it was not sufficient in generating adequate revenue required to finance the budgets. This implies that the ability of the economy to increase revenue on its own remains fairly weak.
requiring discretionary measures coupled with increased borrowing to make up for the shortfalls in revenue. This leads to the conclusion that, discretionary tax measures impact favorably on total tax revenue. It can therefore be deduced that a big percentage of tax revenue comes from discretionary tax policy and not from pure responsiveness of tax revenue to changes in national income.

5.4 Policy Implications

In order to stimulate higher economic growth, a well-designed tax system should be put in place to encourage competitive growth across various sectors of the economy. Even more importantly, the distortion and/or opportunities created by a tax system should not be the cause for tax planning, but provide direction towards more productive endeavors through lowering the tax rates, eliminating tax on tax and widening the base. Secondly the government should reduce tax rates further especially for taxes on capital and intermediate goods so as to encourage more investments and promote business activities. These measures will help improve further on the tax buoyancy thereby ensuring that the tax system generates a sustainable revenue capacity.

The government needs to facilitate the growth of domestic manufactured output and widen tax bases. This is because the less than unity tax elasticity could be attributed to a narrow tax base. Generally, the total tax revenue of the government will invariably depend upon the size of the tax base, the levels of tax rates adopted within the tax system, administrative efficiency, and the compliance rate. The
taxes introduced should be appropriate and sufficient to finance the expenditure needs of the government over time. In other words, revenues should rise with national income, and the entire tax system should evolve to enhance the revenue yield over time.

An effective tax administration is needed to improve tax compliance, enhance revenue collection and to prevent tax evasion. RARMP reforms improved tax elasticity by 0.199. This effect is marginal. The problem could therefore be due to implementation mechanisms put in place by KRA. To harmonize the operations of revenue agencies, there is need to increase resource allocation to Kenya Revenue Authority. This will enable it be more effective in pursuing tax reforms.

Furthermore, KRA should pay more attention to taxpayer education, compliance and tax audits. This is because despite tax reforms, the tax system remains inelastic post TMP and RARMP reforms. These measures will enhance tax revenue collection as a result of taxpayers embracing the reforms undertaken and also understanding their tax obligations. With complex tax laws, taxpayers have to bear additional costs in order to interpret the law and process tax returns. This tends to give the taxpayers an incentive to evade tax and, therefore, provides a rationale for aggressive taxpayer education.
5.5 Suggestions for further Research

Although the Kenya government undertook TMP and RARMP tax reforms, the major challenge remains taxation of the informal sector and underworld economy. Despite the introduction of turn over tax (TOT) aimed at bringing the informal sector into the tax net, its effectiveness in generating the anticipated tax revenue is in doubt. Further research is therefore required to investigate the effectiveness and the contribution of TOT on the overall tax system in Kenya.

Furthermore, there could be a lot of revenue lost due to the unrecorded activities in the underground economy. Conducting a study to estimate the revenue generated from the underworld economy in Kenya would be a step towards curbing tax revenue loss and sealing loopholes that result from tax evasion. The only challenge is how to get data on the underworld economy.

There is also tax incentive policies put in place by the Kenya government. Such policies include tax exemption, zero rating of tax on essential products, tax holidays and investment deductions given to various investors. These incentives have direct impact on the actual tax revenue collection hence there is need to conduct a study on their effectiveness in promoting investments activities. It would also be important to quantify the costs and benefits of tax incentives.
REFERENCES


**APPENDICES**

Table A1: ADF Unit root at levels

| Variable               | ADF statistic | Critical values  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tax Revenue</td>
<td>12.874</td>
<td>1% -3.578</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% -2.925</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% -2.601</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>-1.436</td>
<td>1% -3.578</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% -2.925</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% -2.601</td>
</tr>
</tbody>
</table>

Table A2: ADF unit root test (After 1st difference)

| Variable               | ADF statistic | Critical values  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Domestic Product</td>
<td>2.128</td>
<td>1% -2.626</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% -1.950</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% -1.612</td>
</tr>
</tbody>
</table>
Figure A1: Normality test results

Series: Residuals
Sample: 1963-2010
Observations: 48

- Mean: -2.43E-12
- Median: 767.8724
- Maximum: 86719.19
- Minimum: -3132422
- Std. Dev.: 17416.99
- Skewness: 2.241445
- Kurtosis: 14.38104
- Jarque-Bera: 299.2486
- Probability: 0.000000
<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Total taxes</th>
<th>Direct taxes</th>
<th>Import taxes</th>
<th>Sales tax/VAT</th>
<th>Excise taxes</th>
<th>GDP</th>
<th>GDP deflator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962/63</td>
<td>688</td>
<td>229</td>
<td>253</td>
<td>Na</td>
<td>100</td>
<td>6,609</td>
<td>0.92</td>
</tr>
<tr>
<td>1963/64</td>
<td>669</td>
<td>266</td>
<td>271</td>
<td>Na</td>
<td>119</td>
<td>6,626</td>
<td>0.99</td>
</tr>
<tr>
<td>1964/65</td>
<td>13,120</td>
<td>4,778</td>
<td>4,891</td>
<td>na</td>
<td>2,150</td>
<td>118,571</td>
<td>0.056</td>
</tr>
<tr>
<td>1965/66</td>
<td>13,533</td>
<td>4,646</td>
<td>5,480</td>
<td>na</td>
<td>2,153</td>
<td>114,482</td>
<td>0.058</td>
</tr>
<tr>
<td>1966/67</td>
<td>14,319</td>
<td>5,294</td>
<td>5,638</td>
<td>na</td>
<td>2,065</td>
<td>108,852</td>
<td>0.061</td>
</tr>
<tr>
<td>1967/68</td>
<td>16,910</td>
<td>6,155</td>
<td>6,476</td>
<td>na</td>
<td>2,734</td>
<td>107,096</td>
<td>0.062001</td>
</tr>
<tr>
<td>1968/69</td>
<td>18,868</td>
<td>7,538</td>
<td>6,334</td>
<td>na</td>
<td>3,333</td>
<td>105,397</td>
<td>0.063</td>
</tr>
<tr>
<td>1969/70</td>
<td>20,919</td>
<td>8,204</td>
<td>7,042</td>
<td>na</td>
<td>3,804</td>
<td>107,096</td>
<td>0.062</td>
</tr>
<tr>
<td>1970/71</td>
<td>29,146</td>
<td>12,304</td>
<td>9,365</td>
<td>na</td>
<td>5,058</td>
<td>127,692</td>
<td>0.052</td>
</tr>
<tr>
<td>1971/72</td>
<td>33,036</td>
<td>14,578</td>
<td>10,258</td>
<td>na</td>
<td>5,453</td>
<td>118,571</td>
<td>0.056</td>
</tr>
<tr>
<td>1972/73</td>
<td>55,061</td>
<td>24,289</td>
<td>16,156</td>
<td>na</td>
<td>8,310</td>
<td>170,256</td>
<td>0.039</td>
</tr>
<tr>
<td>1973/74</td>
<td>50,632</td>
<td>23,429</td>
<td>11,736</td>
<td>1,175</td>
<td>7,321</td>
<td>144,348</td>
<td>0.046</td>
</tr>
<tr>
<td>1974/75</td>
<td>62,951</td>
<td>22,836</td>
<td>15,597</td>
<td>12,545</td>
<td>8,175</td>
<td>130,196</td>
<td>0.051</td>
</tr>
<tr>
<td>1975/76</td>
<td>66,153</td>
<td>25,717</td>
<td>14,037</td>
<td>15,621</td>
<td>7,558</td>
<td>110,667</td>
<td>0.06</td>
</tr>
<tr>
<td>1976/77</td>
<td>70,749</td>
<td>27,766</td>
<td>15,133</td>
<td>18,238</td>
<td>6,348</td>
<td>102,154</td>
<td>0.065</td>
</tr>
<tr>
<td>1977/78</td>
<td>67,314</td>
<td>27,349</td>
<td>13,382</td>
<td>16,563</td>
<td>7,144</td>
<td>84,051</td>
<td>0.079</td>
</tr>
<tr>
<td>1978/79</td>
<td>88,839</td>
<td>31,781</td>
<td>23,155</td>
<td>20,614</td>
<td>8,549</td>
<td>73,778</td>
<td>0.09</td>
</tr>
<tr>
<td>1979/80</td>
<td>85,657</td>
<td>30,967</td>
<td>20,668</td>
<td>20,361</td>
<td>10,005</td>
<td>67,755</td>
<td>0.098</td>
</tr>
<tr>
<td>1980/81</td>
<td>92,592</td>
<td>31,063</td>
<td>18,465</td>
<td>27,911</td>
<td>10,712</td>
<td>59,820</td>
<td>0.111</td>
</tr>
<tr>
<td>1981/82</td>
<td>92,592</td>
<td>31,063</td>
<td>61,529</td>
<td>18,465</td>
<td>19,731</td>
<td>50,511</td>
<td>0.131458</td>
</tr>
<tr>
<td>1982/83</td>
<td>92,212</td>
<td>30,040</td>
<td>22,117</td>
<td>27,180</td>
<td>9,127</td>
<td>45,277</td>
<td>0.146653</td>
</tr>
<tr>
<td>1983/84</td>
<td>85,537</td>
<td>28,094</td>
<td>20,035</td>
<td>23,742</td>
<td>8,964</td>
<td>40,242</td>
<td>0.165</td>
</tr>
<tr>
<td>1984/85</td>
<td>87,085</td>
<td>27,513</td>
<td>18,712</td>
<td>27,735</td>
<td>8,681</td>
<td>71,245</td>
<td>0.0932</td>
</tr>
<tr>
<td>Fiscal year</td>
<td>Total taxes</td>
<td>Direct taxes</td>
<td>Import taxes</td>
<td>Sales tax/VAT</td>
<td>Excise taxes</td>
<td>GDP</td>
<td>GDP deflator</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>--------------</td>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>1962/63</td>
<td>688</td>
<td>229</td>
<td>253</td>
<td>Na</td>
<td>100</td>
<td>6,609</td>
<td>0.92</td>
</tr>
<tr>
<td>1963/64</td>
<td>669</td>
<td>266</td>
<td>271</td>
<td>Na</td>
<td>119</td>
<td>6,626</td>
<td>0.99</td>
</tr>
<tr>
<td>1964/65</td>
<td>13,120</td>
<td>4,778</td>
<td>4,891</td>
<td>na</td>
<td>2,150</td>
<td>118,571</td>
<td>0.056</td>
</tr>
<tr>
<td>1965/66</td>
<td>13,533</td>
<td>4,646</td>
<td>5,480</td>
<td>na</td>
<td>2,153</td>
<td>114,482</td>
<td>0.058</td>
</tr>
<tr>
<td>1966/67</td>
<td>14,319</td>
<td>5,294</td>
<td>5,638</td>
<td>na</td>
<td>2,065</td>
<td>108,852</td>
<td>0.061</td>
</tr>
<tr>
<td>1967/68</td>
<td>16,910</td>
<td>6,155</td>
<td>6,476</td>
<td>na</td>
<td>2,734</td>
<td>107,096</td>
<td>0.062001</td>
</tr>
<tr>
<td>1968/69</td>
<td>18,868</td>
<td>7,538</td>
<td>6,334</td>
<td>na</td>
<td>3,333</td>
<td>105,397</td>
<td>0.063</td>
</tr>
<tr>
<td>1969/70</td>
<td>20,919</td>
<td>8,204</td>
<td>7,042</td>
<td>na</td>
<td>3,804</td>
<td>107,096</td>
<td>0.062</td>
</tr>
<tr>
<td>1970/71</td>
<td>29,146</td>
<td>12,304</td>
<td>9,365</td>
<td>na</td>
<td>5,058</td>
<td>127,692</td>
<td>0.052</td>
</tr>
<tr>
<td>1971/72</td>
<td>33,036</td>
<td>14,578</td>
<td>10,258</td>
<td>na</td>
<td>5,453</td>
<td>118,571</td>
<td>0.056</td>
</tr>
<tr>
<td>1972/73</td>
<td>55,061</td>
<td>24,289</td>
<td>16,156</td>
<td>na</td>
<td>8,310</td>
<td>170,256</td>
<td>0.039</td>
</tr>
<tr>
<td>1973/74</td>
<td>50,632</td>
<td>23,429</td>
<td>11,736</td>
<td>1,175</td>
<td>7,321</td>
<td>144,348</td>
<td>0.046</td>
</tr>
<tr>
<td>1974/75</td>
<td>62,951</td>
<td>22,836</td>
<td>15,597</td>
<td>12,545</td>
<td>8,175</td>
<td>130,196</td>
<td>0.051</td>
</tr>
<tr>
<td>1975/76</td>
<td>66,153</td>
<td>25,717</td>
<td>14,037</td>
<td>15,621</td>
<td>7,558</td>
<td>110,667</td>
<td>0.06</td>
</tr>
<tr>
<td>1976/77</td>
<td>70,749</td>
<td>27,766</td>
<td>15,133</td>
<td>18,238</td>
<td>6,348</td>
<td>102,154</td>
<td>0.065</td>
</tr>
<tr>
<td>1977/78</td>
<td>67,314</td>
<td>27,349</td>
<td>13,382</td>
<td>16,563</td>
<td>7,144</td>
<td>84,051</td>
<td>0.079</td>
</tr>
<tr>
<td>1978/79</td>
<td>88,839</td>
<td>31,781</td>
<td>23,155</td>
<td>20,614</td>
<td>8,549</td>
<td>73,778</td>
<td>0.09</td>
</tr>
<tr>
<td>1979/80</td>
<td>85,657</td>
<td>30,967</td>
<td>20,668</td>
<td>20,361</td>
<td>10,005</td>
<td>67,755</td>
<td>0.098</td>
</tr>
<tr>
<td>1980/81</td>
<td>92,592</td>
<td>31,063</td>
<td>18,465</td>
<td>27,911</td>
<td>10,712</td>
<td>59,820</td>
<td>0.111</td>
</tr>
<tr>
<td>1981/82</td>
<td>92,592</td>
<td>31,063</td>
<td>61,529</td>
<td>18,465</td>
<td>19,731</td>
<td>50,511</td>
<td>0.131458</td>
</tr>
<tr>
<td>1982/83</td>
<td>92,212</td>
<td>30,040</td>
<td>22,117</td>
<td>27,180</td>
<td>9,127</td>
<td>45,277</td>
<td>0.146653</td>
</tr>
<tr>
<td>1983/84</td>
<td>85,537</td>
<td>28,094</td>
<td>20,035</td>
<td>23,742</td>
<td>8,964</td>
<td>40,242</td>
<td>0.165</td>
</tr>
<tr>
<td>1984/85</td>
<td>87,085</td>
<td>27,513</td>
<td>18,712</td>
<td>27,735</td>
<td>8,681</td>
<td>71,245</td>
<td>0.0932</td>
</tr>
<tr>
<td>Year</td>
<td>Amount 1</td>
<td>Amount 2</td>
<td>Amount 3</td>
<td>Amount 4</td>
<td>Amount 5</td>
<td>Amount 6</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>1985/86</td>
<td>86,440</td>
<td>29,799</td>
<td>15,067</td>
<td>27,084</td>
<td>7,800</td>
<td>69,529</td>
<td>0.0955</td>
</tr>
<tr>
<td>1986/87</td>
<td>101,298</td>
<td>33,821</td>
<td>20,175</td>
<td>28,885</td>
<td>8,480</td>
<td>63,969</td>
<td>0.1038</td>
</tr>
<tr>
<td>1987/88</td>
<td>111,777</td>
<td>34,751</td>
<td>22,226</td>
<td>35,813</td>
<td>9,574</td>
<td>56,996</td>
<td>0.1165</td>
</tr>
<tr>
<td>1988/89</td>
<td>115,589</td>
<td>36,641</td>
<td>22,084</td>
<td>39,172</td>
<td>9,721</td>
<td>50,075</td>
<td>0.1326</td>
</tr>
<tr>
<td>1989/90</td>
<td>122,721</td>
<td>38,211</td>
<td>22,409</td>
<td>43,902</td>
<td>10,257</td>
<td>42,537</td>
<td>0.1561</td>
</tr>
<tr>
<td>1990/91</td>
<td>99,491</td>
<td>32,563</td>
<td>18,911</td>
<td>34,801</td>
<td>8,117</td>
<td>35,413</td>
<td>0.1875</td>
</tr>
<tr>
<td>1991/92</td>
<td>100,138</td>
<td>33,956</td>
<td>15,937</td>
<td>36,480</td>
<td>8,817</td>
<td>27,817</td>
<td>0.2387</td>
</tr>
<tr>
<td>1992/93</td>
<td>85,668</td>
<td>29,460</td>
<td>8,856</td>
<td>32,103</td>
<td>11,781</td>
<td>19,053</td>
<td>0.3485</td>
</tr>
<tr>
<td>1993/94</td>
<td>69,868</td>
<td>22,720</td>
<td>10,447</td>
<td>25,191</td>
<td>9,519</td>
<td>14,792</td>
<td>0.4489</td>
</tr>
<tr>
<td>1994/95</td>
<td>100,396</td>
<td>39,239</td>
<td>15,787</td>
<td>30,944</td>
<td>11,873</td>
<td>14,565</td>
<td>0.4559</td>
</tr>
<tr>
<td>1995/96</td>
<td>108,111</td>
<td>43,506</td>
<td>18,598</td>
<td>24,534</td>
<td>19,332</td>
<td>13,379</td>
<td>0.4963</td>
</tr>
<tr>
<td>1996/97</td>
<td>110,854</td>
<td>43,317</td>
<td>19,077</td>
<td>25,589</td>
<td>20,371</td>
<td>12,014</td>
<td>0.5527</td>
</tr>
<tr>
<td>1997/98</td>
<td>106,035</td>
<td>40,380</td>
<td>18,860</td>
<td>24,917</td>
<td>19,772</td>
<td>11,258</td>
<td>0.5898</td>
</tr>
<tr>
<td>1998/99</td>
<td>119,354</td>
<td>45,556</td>
<td>20,137</td>
<td>28,253</td>
<td>23,264</td>
<td>10,646</td>
<td>0.6237</td>
</tr>
<tr>
<td>1999/00</td>
<td>118,721</td>
<td>42,164</td>
<td>21,713</td>
<td>29,927</td>
<td>21,934</td>
<td>9,681</td>
<td>0.6859</td>
</tr>
<tr>
<td>2000/01</td>
<td>106,245</td>
<td>36,669</td>
<td>19,673</td>
<td>28,160</td>
<td>19,596</td>
<td>9,155</td>
<td>0.7253</td>
</tr>
<tr>
<td>2001/02</td>
<td>116,270</td>
<td>38,907</td>
<td>19,512</td>
<td>34,627</td>
<td>19,261</td>
<td>8,979</td>
<td>0.7395</td>
</tr>
<tr>
<td>2002/03</td>
<td>110,519</td>
<td>41,149</td>
<td>11,366</td>
<td>34,609</td>
<td>22,000</td>
<td>8,176</td>
<td>0.8121</td>
</tr>
<tr>
<td>2003/04</td>
<td>114,649</td>
<td>42,295</td>
<td>12,370</td>
<td>34,458</td>
<td>23,924</td>
<td>7,325</td>
<td>0.9065</td>
</tr>
<tr>
<td>2004/05</td>
<td>250,291</td>
<td>99,312</td>
<td>30,832</td>
<td>75,996</td>
<td>44,151</td>
<td>6,640</td>
<td>1.1445</td>
</tr>
<tr>
<td>2005/06</td>
<td>236,839</td>
<td>114,629</td>
<td>29,861</td>
<td>79,926</td>
<td>46,646</td>
<td>5,802</td>
<td>1.1445</td>
</tr>
<tr>
<td>2006/07</td>
<td>257,629</td>
<td>130,179</td>
<td>40,235</td>
<td>96,497</td>
<td>56,123</td>
<td>5,286</td>
<td>1.2562</td>
</tr>
<tr>
<td>2007/08</td>
<td>242,604</td>
<td>165,078</td>
<td>45,858</td>
<td>111,904</td>
<td>61,906</td>
<td>4,187</td>
<td>1.5859</td>
</tr>
<tr>
<td>2008/09</td>
<td>249,596</td>
<td>18,447</td>
<td>51,202</td>
<td>126,854</td>
<td>69,872</td>
<td>3,833</td>
<td>1.7323</td>
</tr>
<tr>
<td>2009/10</td>
<td>291,200</td>
<td>220,281</td>
<td>57,746</td>
<td>148,353</td>
<td>78,066</td>
<td>3,833</td>
<td>1.7323</td>
</tr>
</tbody>
</table>

Source: Kenya Statistical Abstracts (Various years)