TAXATION AND REVENUE STABILITY IN KENYA

BY

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DECLARATION

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

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This Research paper has been forwarded for examination with our approval as university supervisors.

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MR. OCHORO WALTER

DEDICATION

This paper is dedicated to my loving Dad, Charles Muraya

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I would like to foremost acknowledge Almighty God for His sufficient grace and provision that has seen me through all my life.

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I however assume sole responsibility for any errors and omissions that may be contained in this paper.

ABSTRACT

This study examined tax buoyancy, tax elasticity and the determinants of revenue stability in Kenya. To identify the determinants of revenue stability, this study was based on the portfolio theory. Revenue instability, the dependent variable, was regressed against revenue diversification, revenue capacity, economic base instability and the quadratic form of population using the OLS method. The proportional adjustment method was used to calculate tax elasticities of various taxes. Overall tax buoyancy was calculated using the double log method.

This study found that there was no short run relationship between the revenue instability and the independent variables. Although in the long run the exogenous variables had an impact on revenue instability, only economic base instability had a significant impact.

The study also examined tax buoyancy and tax elasticity in Kenya. In the long-run tax revenue in Kenya was found to be highly buoyant (3.622). However there was no short- run buoyancy. Income tax, tax on international trade, VAT, tax on other goods and services and non-tax revenue were found to be highly elastic while property tax was inelastic in the long run.

The results reveal that revenue diversification does not necessarily result to improvement in revenue stability in Kenya. The results also depict that most taxes are income elastic. Thus combination of these taxes is likely to increase revenue instability in case of fluctuations in national income.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AAI	Action Aid International
ADF	Augmented Dickey Fuller
AfDB	African Development Bank
ARIMA	Autoregressive Integrated Moving Average
CIT	Corporate Income Tax
CV	Coefficient of Variation
DRM	Domestic Revenue Mobilization
DTM	Discretionary Tax Measures
EAC	East Africa Community
ECM	Error Correction Model
ECT	Error Correction Term
FCM	Fixed Coefficient Model
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GoK	Government of Kenya
HHI	Hirschman- Herfindahl Index
ICT	Information and Communication Technology
IMF	International Monetary Fund
KIPPRA	Kenya Institute of Public Policy Research and Analysis
KRA	Kenya Revenue Authority
Kshs.	Kenya Shillings

OLS	Ordinary Least Squares
PAM	Proportional Adjustment Method
PBO	Parliamentary Budget Office
PIT	Personal Income Tax
PP	Phillip Perron (PP)
RARMP	Revenue Administration Reform and Modernisation Programme
RCM	Random Coefficient Model
RESET	Regression Specification Error Test
SAPs	Structural Adjustment Programmes
SBP	Single Business Permit
SIC	Schwarz Information Criterion
TJN-A	Truth Justice Network- Africa
TMP	Tax Modernisation Programme
TOT	Turnover Tax
US$	US Dollar
VAT	Value Added Tax

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

A tax system is legal framework through which government collects revenue from its citizenry. Tax is the main weapon used by government to raise enough revenue. Taxation is generally targeted at meeting two major objectives. First, it is meant to raise revenue sufficient to fund public expenditure without too much public sector borrowing. Second, it is used in revenue mobilization with an aim of enhancing equity while at the same time minimizing taxation disincentive effects (Moyi & Ronge, 2006).

Tax elasticity is the responsiveness of tax revenue to percentage change in national income (Muriithi &Moyi, 2003). According to Sen (1999) buoyancy is the responsiveness of tax revenue to the percentage change in the tax base without correction for any changes in the tax structure. It thus measures combined effects of discretionary changes in the tax rates and changes in the tax base.

Revenue instability is defined as the variability of tax revenue in the short run. It is the degree of deviation of actual revenue from the predicted revenue. Revenue stability therefore is achieved in the case where fluctuations of actual revenue from the predicted revenue are minimal. According to Merriman & Dye (2004), a tax system that is inelastic will generally lead to a revenue system that is cyclically stable. Therefore, if the tax structure is modified such that it includes low elastic taxes, then there could be a reduction in revenue risk associated with economic cycles. The

trade-off however is that during periods of economic boom, there will be not much increase in revenue growth (Yan, 2008).

History Background

Before independence, the tax system was mainly geared towards mobilizing financial resources from households in order to finance the colonial government's operations. At independence, Kenya adopted a taxation system whose principles and fundamentals were inherited from the British model.

Republic of Kenya (1965), Sessional Paper No. 10 was articulated based on Africa Socialism. The blue print aimed at eliminating poverty, illiteracy and disease. Therefore, revenue collected was to be used to fund projects which would address these three enemies of development. Between 1964- 1977 period, the government of Kenya (GoK) was able to fully finance its current expenditures and partly finance its development expenditure with the use of recurrent revenue. Kenya also had a good flow of donor funding in terms of project aid as well as grants (PBO, 2010). However, in 1970s the country experienced severe fiscal deficits as a result of both external and internal shocks. The collapse of the East Africa Community (EAC) and the eventual collapse of the EAC Revenue Authority in 1977 implied that each country was now supposed to manage its own tax administration domestically. There were minor tax reforms in 1970s following oil shocks – which had led to significant fiscal crisis (Eissa & Jack, 2009).

From 1963 to early 1980s, public expenditure in Kenya was mainly financed through an uncoordinated set of fees and taxes supplemented by inflows of foreign aid. The tax system at

independence comprised of sales tax, excise tax, customs duty and income tax. These direct taxes mainly targeted consumption and income. In an attempt to raise more revenue, existing consumption taxes were replaced with sales tax which targeted specific goods. This system of taxation also favoured the inward-looking industrialization policy pursued by the country at that time (Moyi & Ronge, 2006)

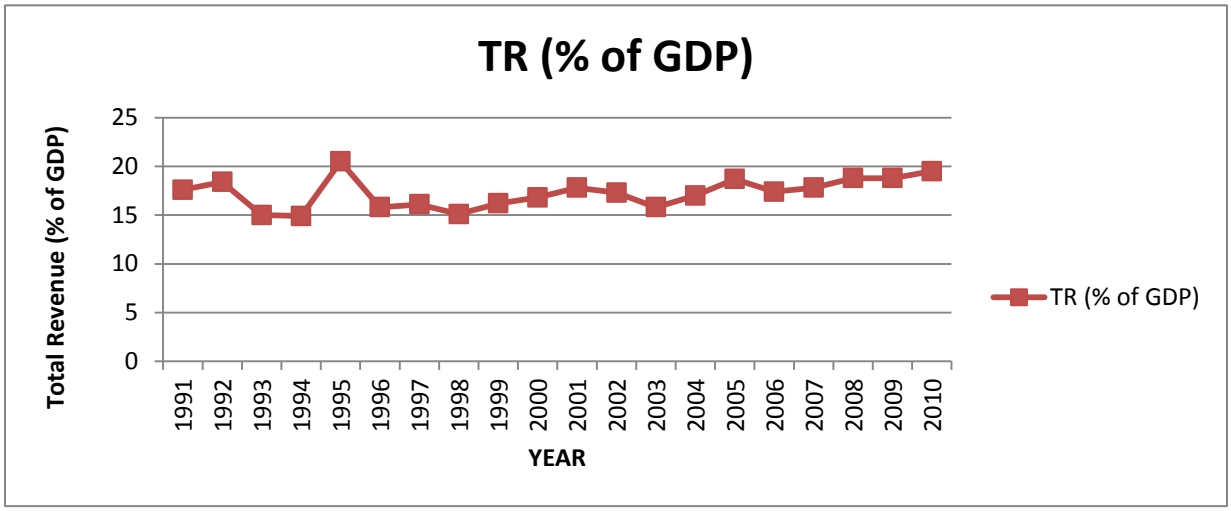
The 1970s debt hangovers spilled over into early 1980s. Fiscal indiscipline and economic mismanagement during this time also saw the onset of economic deterioration in Kenya. Consequently, the indicators of macroeconomic performance began to waver. In mid-1980s, the donor community introduced the Structural Adjustment Programmes (SAPs) to counter the situation (Njeru, 2011).

The new constitution (2010) brought about important changes in public finance management. Kenyans therefore need to understand that there is nothing for free and that every benefit has to be paid for either in form of debt or taxes (Njeru, 2011). The expenditure side of government budget requires corresponding financing. This financing could be through: taxes, sale of state assets, sale of securities (domestic borrowing), external borrowing, grants and printing money (borrowing from the Central Bank of Kenya).

Taxation is the largest source of government revenue in Kenya. The non-tax revenue too plays a significant role of enhancing a sustainable public budget. A good fiscal management system ensures that there are stable revenues over time. Revenue stability eases fiscal management because revenues can easily and predictably be forecast.

Figure 1 shows the total tax revenue as a percentage of GDP. The figure shows that tax revenue as a percentage of GDP has ranged from 15% to 20% without any substantial increase over time.

Figure 1: Tax Revenue as a Percentage of GDP

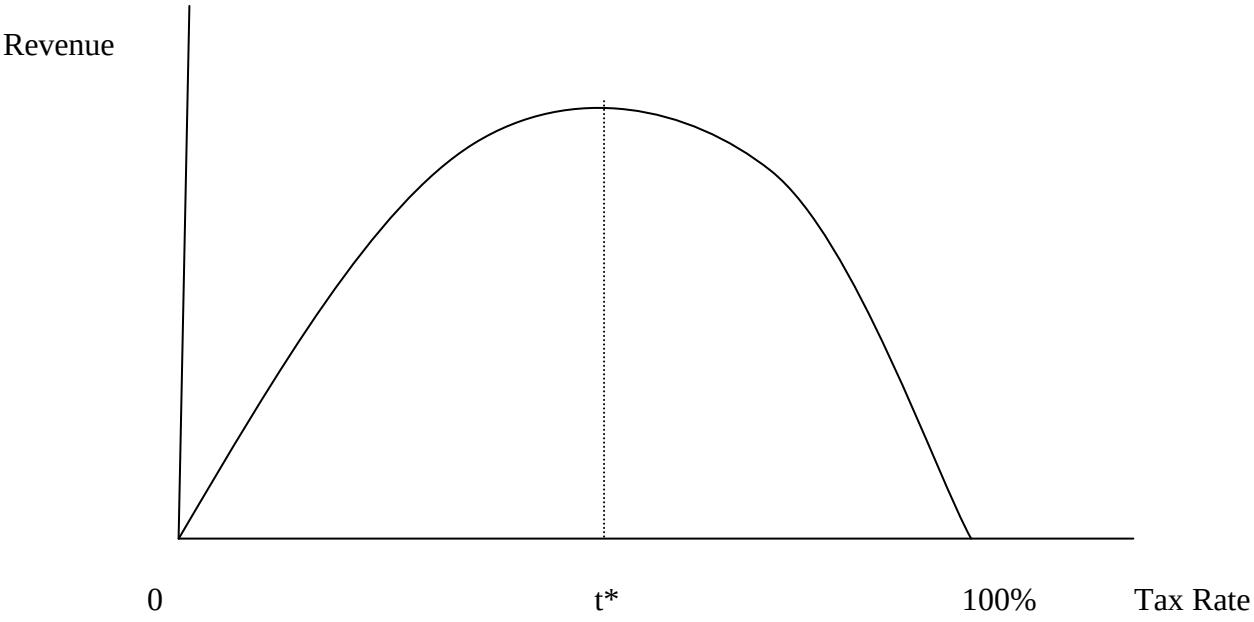


Source: World Bank Database

There is need to raise more tax revenue to fund public services in Kenya. However, Kenya already has a high tax burden hence it is almost impossible to raise additional revenue through taxation. Kenya's firms report that more than 60% of their profits go to taxes; this lowers the tax competitiveness of the country and makes Kenya one of the world's less tax friendly countries. According to Adam Smith (1776), high tax rates do not necessarily translate to higher government revenue. Instead, higher taxes on certain commodities could diminish consumption of such commodities leading to lower revenue than would have been collected in case the taxes were moderate.

Laffer (1981) strengthens Smith's prediction through the Laffer curve which illustrates that increase in tax rates can only increase government revenue up to a certain limit, beyond which increase in tax rates leads to decline in the overall revenue. Laffer curve is illustrated in figure. 2.

Figure 2: Laffer curve



Source: Laffer (1981)

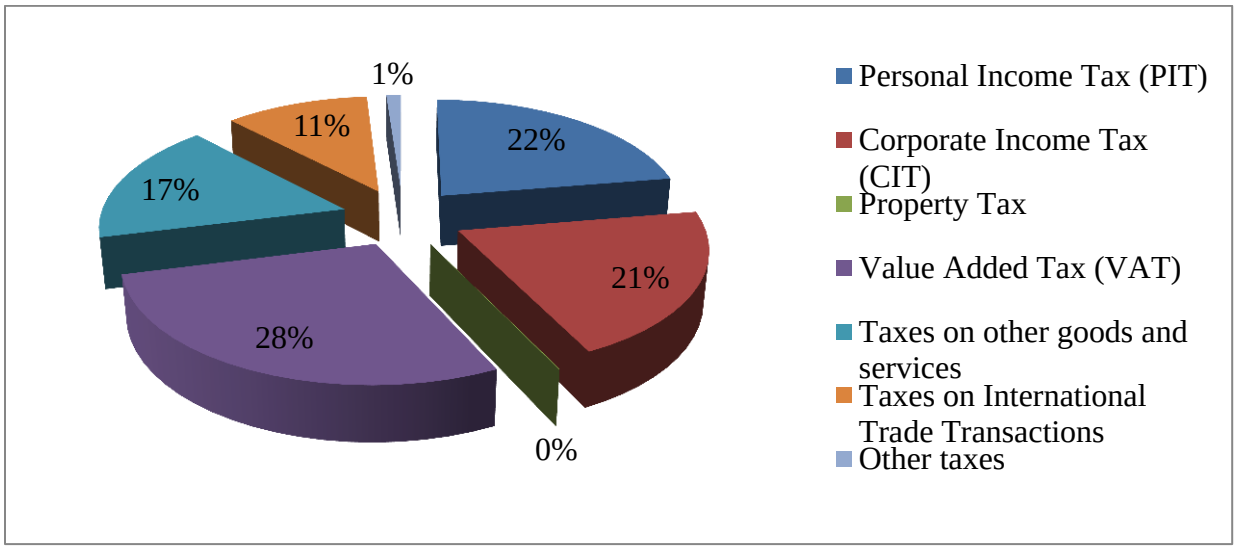
From Figure 2, beyond t* any increase in tax rate results into a decline in the overall tax revenue.

The level of tax evasion is also high in Kenya. This could be partly attributed to the high tax rates. The informal sector in Kenya contributes about 34.3% of the GDP and employs approximately 77% of labor. Such an environment compromises the tax system's ability to raise sufficient revenue with minimum distortions (Moyi & Ronge, 2006; Ogutu, 2011; KIPPRA, 2004a).

1.1.1 Composition of Kenya's Tax Revenue and Revenue Stability in Kenya

The tax revenue in Kenya is comprised of personal income tax (individual income), corporate income tax (tax on profits), and value added tax (VAT) as well as excise duties. Taxes on various goods and services constitute the largest share of the total revenue- over 47% from 1992 to 2004. Consumption tax is preferred to income tax because it does not discriminate between present consumption and future consumption and it has very low efficiency losses or deadweight loss. Taxes on profits and income however continue to have a crucial role in the country's tax revenue structure (Waris, Kohonen & Ranguma, 2009). Tax on income is progressive in burden distribution. Income tax can be classified into two: Corporate income tax (CIT) and personal income tax (PIT) (Karingi, 2005). Figure 3 shows composition of tax revenue collected in the fiscal year 2011/12 in Kenya.

Figure 3: Tax Revenue Composition for the Year 2011/12



Source: Republic of Kenya (2012)

From Figure 3 tax revenue collected, in year 2011/2012, in form of VAT comprised the largest percentage (28%) of the total tax revenue while property tax was less than 1%. Income tax also (PIT and CIT) constitute a large percentage (43%) of Kenya's total tax revenue.

1.1.2 Tax Reforms and Revenue Stability in Kenya

Revenue structures in many developing countries have failed to attain the desired productivity level. More often revenue growth does not match the government spending pressures. These countries have had to embrace tax structure reforms with the aim of achieving revenue adequacy, equity and fairness, simplicity and economic efficiency (Muriithi & Moyi, 2003). Tax reforms involve changes in the manner of tax collection and management by the government. It may encompass adoption or expansion of value added tax, removal of stamp and some minor duties, broadening and simplification of corporate or personal income or the asset taxes, or revision of tax code to enable the enactment of comprehensive administration as well as criminal penalties in case of evasion (Moyi & Ronge, 2006). Tax reform encompasses both broad economic policy issues as well as very specific issues of design of tax structure and administration (Cheeseman & Griffiths, 2005).

According to Karingi et al (2005), theoretically tax reforms are initiated in response to a country's economic crisis or some international pressure. The main objective of tax reforms is to increase the tax base while minimizing the enforcement and administration cost. Kaldor (1963), questioned whether the less developed countries will ever "learn to tax" given the high standards of living in these countries.

In the period prior to the tax reforms, 1964- 1977, the fiscal operations of the country were less problematic. There were not only minimal fiscal deficits, but the government was also in a position to contain its expenditure within the limits of its recurrent revenue (Karingi et al, 2005). Generous donor aid and grants also contributed to the minimal fiscal deficits in that period. In the late 1970's external and internal shocks however, seriously destabilized the budget balance resulting to huge fiscal deficits (Moyi & Ronge, 2006).

There are mainly two epochs in tax reform policies and administration. The first epoch is associated with the 1986 Tax Modernisation Programme (TMP) that was implemented until the NARC political regime in 2003 (Karingi et al, 2005). The basic elements of TMP included: rationalization of the tax structure for equity purposes; raising and maintaining the ratio of revenue to GDP at 24 percent by the year 1999/2000; reduction and rationalization of tax rates as well as the tariffs; sealing leakage loopholes; and reduction of trade taxes and raising consumption taxes in order to promote investment (AfDB, 2010). It was also during this period that the value added tax (VAT) and the Kenya Revenue Authority (KRA) were introduced in 1990 and 1995 respectively.

The second epoch of tax reform is the Revenue Administration Reform and Modernisation Programme (RARMP) that was introduced in the fiscal year 2004/2005 and is currently on-going. The aim of this reform is to transform KRA into a fully integrated, client focused and modern organization. Application of ICT is focused on modernization of tax administration in Kenya with the aim of achieving equity, promoting investment, broadening the tax base, and reducing the burden of tax compliance (AfDB, 2010).

1.1.3 Tax Privileges and Incentives and Revenue Stability in Kenya

Previously, under the old constitution, legislators, constitutional office bearers, university lecturers and senior public servants had enormous tax privileges. Some of these privileges were meant to make up for the low salaries paid to these office holders. However, due to lack of transparency there was misuse as well as abuse of such exemptions. In addition, these benefits were neither considered in cases where these officers demanded for increase in salaries neither were they used to assess the impact of the same on the total revenue (Njeru, 2011).

Tax remissions, write-offs, and exemptions have also been massively abused leading to revenue losses. The main beneficiaries of these benefits were the informed as well as the connected persons (including government ministers). It is however important to note that the spirit of the new constitution is not to eliminate tax waivers and benefits, but to extend these benefits to those who really deserve them. These include support to destitute and aged charities, medical and health services, assistance towards humanitarian crisis, or those disadvantaged in society.

GoK provides a variety of tax incentives especially to businesses with the aim of attracting into the country more foreign direct investment (FDI). It is however estimated that GoK loses over US$ 1.1 billion (Kshs. 100 billion) yearly from all tax exemptions and incentives. In 2007/08 tax incentives related to trade amounted to at least US$ 133 million (Kshs. 12 billion) and could have been as much as US$ 567 million. The economy is thus seriously deprived of much-needed resources for poverty reduction and improvement of population's general welfare (TJN-A & AAI, 2012).

Tax incentives in Kenya are numerous especially concerning the Export Processing Zones (EPZs). A report by IMF (2006) noted that investment incentives especially tax incentives do not necessarily attract foreign investment. To the contrary, foreign firms are mainly concerned about economic and political stability, favorable trade agreements and accessibility to market (TJN-A & AAI, 2012). Table 1 shows the estimates of revenue loss as a result of tax incentives and exemptions in Kenya. The table shows that the accumulated loss- as estimated by KRA- over the 5 fiscal years was Kshs. 166 billion. These losses are averagely 1.7% of the GDP.

Table 1.1: **Estimates of Revenue Losses from Tax Incentives in Kenya (Kshs. Millions)**

Estimates of Revenue Losses from Tax Incentives in Kenya (Kshs. Millions)						
	2003/04	2004/05	2005/06	2006/07	2007/08	**TOTAL**
Investment Incentives						
Industrial Building Allowance	481	1,021	539	298	494	2,833
Mining Operation Deductions	203	715	45	70	215	1,248
Farm Works Allowance	814	1,130	1,256	609	876	4,685
Wear and Tear	19,007	21,294	21,684	11,109	40	73,134
Investment Deductions	4,031	14,703	4,323	4,295	11,842	39,134
Sub-total	24,536	38,863	27,847	16,381	13,467	121,094
Trade Related Incentives						
TREO	2,979	2,537	3,974	7,591	6,149	23,590
MUB	20	310	937	721	96	2,084
EPZ	103	1,712	5,300	6,694	5,804	19,613
Sub-total	3,102	4,559	10,211	15,366	12,049	45,287
Total	**27,638**	**43,422**	**38,058**	**31,747**	**25,516**	**166,381**
Revenue Loss (% of GDP)	**1.43**	**1.66**	**2.08**	**1.85**	**1.29**	

Source: KRA

1.1.4 The Relationship between the Informal Sector and Revenue Stability in Kenya

The informal economy is commonly known by other terms as: underground, shadow, parallel or unrecorded economy (PBO, 2010). Informal economy refers to all commercial activities that take

place unreported for purposes of taxation. It mainly comprises of informal and small businesses, which neither maintain proper transaction records nor make a report on their income to relevant authorities (Ouma, et al, 2007; Cheeseman & Griffiths, 2005). This economy can broadly be categorized into 3 groups: the self-employed such as small enterprises and small scale farmers; owners of small and medium businesses which pay wages to workers, and wage workers such as watchmen, domestic workers, and casual laborers among others.

Kenya's informal sector is huge. It provides employment to about 7.9 million labourers- that is 77% of employment (PBO, 2010). Although a majority of the activities in this sector are marginal and have not attained the minimum tax threshold, some of them are very profitable and therefore can contribute a good amount of tax revenue. The Turnover tax (TOT) was introduced through the 2007 Finance Bill with an aim of taxing the informal sector at a flat tax rate of 3% of annual turnover on businesses below Kshs.5 million. Unfortunately, TOT revenue has performed poorly since its inception because of the challenges encountered by the tax authority when setting recruitment thresholds for the businesses and the general inclination of these businesses to evade taxes (PBO, 2010; Ouma et al, 2007).

Revenue gap has thus remained high in Kenya and the vast informal sector remains largely untaxed while the formal sector bears the largest share of the tax burden. The government can however create a win-win scenario by offering incentives and encouraging registration to the underground workers. If the informal sector prospers, the overall economy as well thrives because of increased revenue as well as the increased economic growth (PBO, 2010).

1.2 Problem Statement

Kenya, just like many developing countries is currently confronted by huge fiscal deficits, declining external assistance and huge debt service charges that are adversely affecting the country's development process. Nevertheless, public expenditure continues to grow exponentially every fiscal year such that, more often revenue growth does not match the government spending pressures.

Taxes constitute the largest sole component of public revenue in Kenya. Despite the fact that Kenya has vast opportunities and a huge potential to raise more revenue through taxation and is one of the high tax-burden countries in the world, tax evasion as well as low compliance levels narrows the tax base while at the same time increasing the enforcement costs. Tax reforms in Kenya have also failed to achieve substantial increase and decrease in tax revenue collected and enforcement costs respectively. Therefore, of concern to policymakers is how Kenya can attain revenue stability and be capable of sustaining her public expenditures- even if the flow of foreign resources one day runs dry. How to achieve revenue stability in Kenya is not clear because there is very little literature on this topic. This study is aimed at analyzing taxation system in Kenya with the intention of determining tax elasticity and tax buoyancy and the determinants of revenue stability in Kenya.

1.3 Research Questions

In the analysis of taxation system and revenue stability in Kenya, the following research questions will be tackled:

i. What is the buoyancy and income elasticity of various taxes in Kenya?

ii. What are the determinants of revenue stability in Kenya?

iii. What policy measures should the government adopt to improve revenue stability in Kenya?

1.4 Objectives of the Study

The overall objective of this study is to analyze the taxation system and determine the determinants of revenue stability in Kenya.

The specific objectives of the study are:

1. To determine the overall buoyancy and income elasticity of various taxes
2. To identify the determinants revenue stability of the Kenyan economy
3. Draw policy recommendation from the findings of the study on how in future Kenya's revenue stability could be improved.

1.5 Justification of the Study

There is a huge concern by various stakeholders: the civil society, public and government bodies that Kenya does not have a stable revenue base to finance its ever expanding public expenditure. Because of this concern, various government projects have either been shelved or totally discarded. Whether this is the case or not is not clear because there are few (if any) studies on this topic. Emanating from the concern above and given that the stability of revenue flow has huge implications on the government's financial position, this study will endeavor to analyze the country's taxation system and go further to identify the determinants of revenue stability.

Revenue stability of a country is one of the important factors put into consideration by rating agencies in determining the capacity of a government to repay its debts. High revenue volatility is an indication of uncertainty or higher risk related to payment of interest as well as the principal in time, thus low credit rating. This study looks at the determinants of revenue stability which could be manipulated by policy makers to ensure sustainability of revenue in Kenya for both development and recurrent expenditure.

The findings of this study are important since it provides policy recommendations on identifying the determinants of revenue stability that could be manipulated by policy makers in order to achieve revenue stability. The knowledge of tax elasticity and buoyancy as well as the determinants of revenue stability is important to both policy makers as well as the tax authority in Kenya. The Kenya Revenue Authority may use the results of this study to understand the tax structure components that are either elastic or inelastic. This knowledge is important to KRA in the process of determining the right tax structure composition to employ in order to achieve revenue stability. This study will also add to the already existing literature on the same topic while acting as a springboard for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature Review

2.1.1 Techniques of Estimating Elasticity of Tax

There are four techniques that are commonly used to estimate tax elasticity. They include: the proportional adjustment method; divisia index; dummy variable technique and; the constant rate structure.

1. Proportional Adjustment Method (PAM)

This method was used by Sahota (1961); Prest (1962) and Mansfield (1972). According to Wawire (2011), this method isolates data on changes in discretionary revenue based on the government data so as to get a reflection of the revenue that would have been collected if the structure of the base year had been applicable in the entire sample period. Equation 1 is then estimated using the adjusted data as follows:

$$\ln TR_i = \beta_i + \alpha_i \ln Y + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where TR is the tax revenue, Y is the GDP and α_i is the income elasticity of the i^{th} tax.

According to Wawire (2011), the major limitation of the PAM method is that it attributes data on revenue collected to the changes in discretionary policy. It thus relies on estimated tax revenue which in most instances is significantly different from the tax revenue actually collected.

2. Divisia Index

According to Wawire (2011), this method estimates tax elasticity by introducing a proxy for the discretionary tax measures. An estimated tax function is used to derive the index. Time trends are used as proxy for discretionary changes. According to Choudry (1979), the main drawback of this method is that it causes bias and thus the adjusted tax revenue is either underestimated or overestimated.

3. Dummy Variable Technique

The dummy variable technique estimates income elasticity of tax by introducing a dummy variable in the case where the tax policy change was exogenous. According to Wawire (2011), this technique was developed by Singer (1968).

$$\ln TR_p = \beta_p + \alpha_p \ln Y + \Sigma\sigma_i D_i + \varepsilon_p \qquad (2)$$

Where β_p is the coefficient estimates for revenue elasticity. D_i (i = 1, 2, 3…………) is the dummy variable. According to Osoro (1993), summation sign takes into account the likely multiple changes within the period.

According to Wawire (2011), this technique has two shortcomings. First, it is impossible to use this method where there are frequent tax policy changes. Second, it creates a possibility of the occurrence of the problem of multicolinearity because the dummy variables included are more than one.

4. **Constant Rate Structure**

According to Choudry (1975), this technique involves collection of statistics on receipts of actual tax and data on both the monetary value and corresponding revenues of various legal taxes. The products of the tax bracket and the corresponding values of the base year are summed up. Data on simulated tax revenue is regressed on GDP. According to Wawire (2011), the major limitation of this technique is that it is only applicable where; there are few items to be included, the tax rates have a narrow range and data compilation is easy. Another setback of this method is that it requires data that is disaggregated and detailed tax bases for each tax- which may not be obtained easily.

2.1.2 Techniques of Estimating Buoyancy of Tax Revenue

Sen (1999) defines buoyancy as change (percentage) in tax revenue due to a change (percentage) in tax base without correction for any changes in tax structure. It thus measures combined effects of discretionary changes in the tax rates and changes in the tax base.

According to Haughton (1998), tax buoyancy is equal to percentage change in revenue divided by percentage change in base. GDP is taken as the base, although it is possible to have other bases such as (import as tariffs' base and consumption as a base for the sales taxes).

GDP has been used in several studies as one of the determinants of tax revenue. Tax buoyancy was estimated using the model shown in equation (5):

$TR = e^{\alpha}Y^{\beta}e^{z}$ …… (5)

The model is then linearized by taking the logarithms of both sides of the equation (5). Ordinary least squares (OLS) method is then used to estimate equation (6) as follows:

$$\text{Log TR} = \alpha + \beta \log Y + z \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(6)}$$

Where TR is tax revenue; Y = GDP; β is a buoyancy coefficient; α is a constant term; and e is a natural number.

2.1.3 Tax Revenue Stability

Revenue collected from different types of taxes varies from time to time. Revenue stability is important especially to the government in making plans on spending and borrowing for the fiscal year ahead. The coefficient of variation (CV) is used to measure tax revenue stability. CV = standard deviation (of the tax revenue) divided by its mean. It could be calculated for individual revenue sources or for the whole tax revenue (Chang, 1994).

White (1983) introduced the optimal portfolio tax borrowed from the portfolio theory. According to the portfolio theory, diversification reduces variability or risk as long as different stocks do not go in the same direction or changes in different stock prices are not perfectly correlated (Ross, Westerfield & Jordan, 2008). According to Myers and Brealey (1991), a company faces two types of risks: systematic (market) risk and unsystematic (unique) risk. Diversification can help eliminate the unique risk which is mainly as a result of adverse conditions surrounding a particular industry or company.

According to Markowitz (1952), the portfolio theory is based on the primary principle of random walk hypothesis. This principle states that asset prices follow an unpredictable trend which is dependent on the company's long-run nominal growth in earnings per share.

According to White (1983), a good tax structure comprises of taxes that do not have perfect correlation with each other such that fluctuation in revenue is reduced. A combination of components of tax that minimizes tax revenue instability given the growth rate is the optimal portfolio. In such a case, whenever revenue from one tax shrinks, the overall revenue loss to the government is minimized because similar changes have not been experienced in other sources of revenue (White, 1983). White's model assumes that variance of revenue is unpredictable.

2.2 Empirical Literature Review

Several studies have been carried out to estimate tax elasticity as well as buoyancy of various economies. Estimated coefficients of the aforementioned variables differ across studies depending on the estimation methods used, all other factors held constant.

Osoro (1993) evaluated Tanzanian revenue productivity implication under tax reforms. The study used double log-form equation (5) to estimate tax buoyancy and PAM to determine tax revenue elasticity. The study found out that tax buoyancy was 1.06 with an overall elasticity of 0.76. This implied that the tax reforms in Tanzania did not increase tax revenue. The study recommended improvement in tax administration and reduction in tax exemptions granted by the government.

Milambo (2001) using the method of Divisia Index studied revenue productivity in Zambia. The study found buoyancy of 2.0 and elasticity of 1.15. These findings were an indication that tax reforms indeed improved the overall tax revenue productivity.

Twerefou et al (2009) estimated the elasticity of Ghana's tax system using the Dummy Variable Technique on data for the period 1970 to 2007. The study found that Ghana's overall tax system was elastic and buoyant in the long run. The study also found that the economy had huge potential revenue from the untaxed sectors. The study found the overall tax elasticity to be 1.03.

Ayoki et al (2005) used PAM to research on the impact of tax reforms on DRM in Uganda. The study found that there was an increase of tax-to-income elasticity after reforms to 1.082 from 0.706 before the reforms. It also showed that there was also an increase in indirect taxes from 1.037 to 1.3 after the reforms. The study concluded that tax reforms were important to the economy and there is need for more improvement.

Obeng and Brafu-Insaidoo (2008) researched on how tariff revenue was affected by import liberalization for the period (1966-2003) in Ghana. The findings indicated that the overall elasticity and buoyancy was 0.282 and 0.556 respectively. For the period prior to import liberalization (1965-1982), estimated elasticity was 0.814 while buoyancy was 0.33. During the post import liberalization period (1983-2003), elasticity and buoyancy were 0.049 and 0.313 respectively. The results indicate that during the entire period of study, duty buoyancy exceeded duty elasticity meaning that DTMs improved – over the period- tariff revenue mobilization.

Ariyo (1997) examined - for the period (1970-1990) – productivity of the tax system of Nigeria using the Dummy Variable technique. The aim of the study was to accurately estimate the sustainable revenue profile of Nigeria. During SAPs and the oil boom, slope dummy equations were used. The study found a satisfactory overall tax productivity level although there were variations in tax revenue level by source. It however, noted that during periods of oil boom, laxity was experienced in tax administration on non-oil sources. The study proposed the need for improvement in tax system information in order to facilitate macro-economic planning.

There are several studies that have been carried out to estimate revenue stability using different econometric techniques. A lot of literature on revenue stability is mainly carried out either on stability or volatility of revenue. White (1983) introduced the optimal portfolio tax. A combination of components of tax that minimizes tax revenue instability given the growth rate is the optimal portfolio. A good tax structure should comprise taxes that do not have perfect correlation with each other so that fluctuation in revenue is reduced. In such a case, whenever revenue from one tax shrinks, the overall revenue loss to the government is minimized because similar changes have not been experienced in other sources of revenue (White, 1983). White's model assumes that variance of revenue is unpredictable.

Campbell and Fox (1984), contrary to White's (1983) assumption, suggested that to some extent variance of revenue is predictable. They estimated income elasticities of taxable commodities in Tennessee. The study took into account changes in tax bases as a result of business cycles. Their study concluded that there is no single commodity which dominates revenue stability or growth and that short-run elasticities' response to business cycles was strong and varied across various

commodities. This study is however criticized because it uses the fixed coefficient model (FCM) to determine income elasticity.

Braun and Otsuka (1999) used the random coefficient model (RCM) to study growth and stability of revenue. Their study found out that the short-run elasticities response to business cycles was strong and varied across commodities. The study also found out that no single commodity dominated growth or stability of revenue. This study not only recommends explicit modeling for economic conditions, but also the continual adjustment of the tax portfolio.

Groves and Kahn (1952) used the log-log regression technique to estimate income elasticities of tax revenues to changes in income over time. Their study considered revenue stability as a state of adequacy- such that the government is in a position to generate real revenue at a constant rate over time through its tax system. The study found out that the federal system of taxation was less stable than the local and state systems of taxation.

Wagner (2005) carried out a study on the tax system of North Carolina to examine both short-run and long-run elasticities of different sources of revenue. The study found out that personal income tax was likely to increase cyclical variability of revenue. On the other hand, motor fuel taxes and corporate income tax was observed to enhance revenue stability both in the short-run and long-run. The study also noted the importance of savings and rainy day funds in the reduction of the effects of economic downturns on revenue.

Carroll and Stater (2008) focusing on nonprofit organizations, investigated whether revenue diversification would increase revenue-structure stability. They concluded that diversification of

revenue sources indeed reduced revenue volatility of the non-profit organizations because they equalize their reliance on investment, contributions and earned income. this positive relationship implies that an organization's revenue is more stable if its portfolio is more diversified.

Ebeke and Ehrhart (2010) carried out a study among 103 developing countries to find out whether adoption of VAT in these countries was effective in stabilizing tax revenue for the period (1980-2008). The study found that with the adoption of VAT, tax revenue instability significantly went down. It concluded that countries with VAT experience 30% to 40% lower revenue instability than those countries without VAT system.

2.2.1 Empirical Literature from Kenya

Moyi and Muriithi (2003) examined tax elasticity and buoyancy in Kenya in order to find out whether tax reforms were effective in creating tax policies which would make individual tax revenues responsive to changes in GDP (income). The findings showed that there was in fact a positive relationship between tax reforms and the overall tax system as well as individual tax yields. However, the study concluded that VAT response to income changes failed regardless of the positive impact of reforms.

Adari (1997) studied the introduction of VAT (which replaced sales tax) in Kenya in 1990. The study examined the structure, performance and administration of VAT. Estimated coefficients of buoyancy and elasticity were less than one indicating a low responsiveness of VAT revenue to changes in income. The findings suggested there could be deficiencies as well as laxity in VAT administration in Kenya. However, this study in its estimation of elasticity and buoyancy totally disregarded time series properties in the data and did not adjust for the unusual properties.

Okello (2001) analyzed excise taxes in Kenya in order to investigate the extent to which these taxes have: achieved substantial increase in government revenue, promoted equity and discouraged consumption of harmful products. The study estimated the elasticity and buoyancy of excise taxes. The results indicate presence of additional revenue due to excise taxes on beer (except Guinness) and cigarettes. In Kenya, excise tax revenue amounts to up to 4.5 percent of GDP and its income elasticity is close to unity.

Wawire (2000) estimated income elasticity and the tax buoyancy of the tax system in Kenya using total GDP. The study regressed tax revenues from different sources on their respective tax bases. The findings of the study implied that Kenya's tax system did not raise the necessary revenue. However, this study had shortcomings. For instance it disregarded the data's time series properties. Second, it failed to disaggregate data on tax revenue by source. Third, it overlooked the possibility that tax revenue productivity could have been affected by unusual circumstances.

Ole (1975) examined income elasticity of Kenya's tax structure between 1962/3 to 1972/3. The results indicated that for the period of study, there was income inelasticity (0.81) of the tax structure. The study recommended for urgent reforms in the tax structure in order to improve its overall productivity. The findings also pointed out that the tax structure in Kenya was not buoyant thus requiring the country to seek foreign assistance to bridge its budget deficit.

Njoroge (1993) study focused on revenue productivity of Kenya's tax reforms for the period (1972/73- 1990/91). After adjusting for discretionary changes on tax revenues, tax revenue was then regressed on GDP (income). The study period was divided into 2 to ease the analysis of the impact of tax reforms in Kenya on individual tax revenues. For the period (1972-1981) the total

tax structure had an income elasticity of 0.67- this meant that tax revenue was income inelastic. Estimates of individual taxes elasticity were: import duties 0.45, income tax 0.93 and sales tax 0.6. In the same period, buoyancy of the tax system was 1.19. For the period (1982-1991), buoyancy was 1.00 while the overall tax elasticity was 0.86. The study recommended for constant review of the tax system in line with structural changes in the economy because the system failed to meet its objective.

Wawire (2011) used Samuelson's fundamental general equilibrium model of public sector to establish VAT revenue determinants and determine how VAT structure responds to changes in its own tax bases. The results indicate that VAT growth elasticities were all more than unity. The estimated results showed that monetary GDP elasticity of VAT revenues was greater than the total GDP elasticity implying the existence of informal economy in Kenya during the study's period. The study also found that revenues from VAT responded to the changes in its own determinants with substantial lags. The VAT revenues were also found to be sensitive to certain unusual circumstances. The study concluded that it was difficult to create a stable system of VAT such that tax revenues could rapidly increase with economic growth.

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework: The Portfolio Theory

This study is based on the portfolio theory framework. According to the portfolio theory, diversification reduces variability or risk as long as different stocks do not go in the same direction or changes in different stock prices are not perfectly correlated (Ross, Westerfield & Jordan, 2008). According to Myers and Brealey (1991), a company faces two types of risks: systematic (market) risk and unsystematic (unique) risk. Diversification can help eliminate the unique risk which is mainly as a result of adverse conditions surrounding a particular industry or company. Diversification however does not eliminate the market risk because it involves wide perils in the economy that affect all businesses. For a portfolio that is well-diversified, the only risk that matters is the unique risk. The market risk of such a portfolio is equal to the average beta (measure of market movement) (Ross, Westerfield & Jordan, 2008).

In public finance, the concept of diversification of revenue is analogous to investment diversification. According to Bartle et al (2003), diversification of revenue sources can either be a strategic policy or a deliberate action aimed at widening the tax base to provide for flexibility and stability in financial management, in order to improve fiscal performance. This study considers various tax bases or revenue sources as investment portfolio of the government while each tax is viewed as a security in the portfolio. Tax revenue variability is similar to market returns volatility concept in corporate finance (Yan, 2008). Revenue diversification in public finance is related to the coefficient of correlation between various taxes. A good tax structure

should comprise taxes that do not have perfect correlation with each other so that fluctuation in revenue is reduced. In such a case, whenever revenue from one tax shrinks, the overall revenue loss to the government is minimized because similar changes have not been experienced in other sources of revenue (White, 1983).

In public finance, revenue variability is largely dependent on the tax revenues' income elasticity. Each tax's income elasticity depicts that different tax revenues have different sensitivity degrees to the general conditions in the economy. Individual tax revenue's income elasticity is compared to the market risk of each security in the case of investment portfolio (Yan, 2008). According to Merriman & Dye (2004), it is assumed that a revenue system that is inelastic will generally lead to a revenue system that is cyclically stable. Therefore, if the tax structure is modified such that it includes low elastic taxes, then there could be a reduction in revenue risk associated with economic cycles. The trade-off however is that during periods of economic boom, there will be minimal revenue growth (Yan, 2008).

Budget stabilization funds also known as the rainy day funds are another approach towards attainment of revenue stabilization goal. These funds are in the form of financial reserves. With the stabilization funds, highly elastic revenue portfolio could still be chosen such that in the case of high economic growth, the higher revenue surplus brought by the highly elastic tax structure is set aside for the lean years (Wagner, 1999). Rainy day funds are however influenced by political involvement in practice and the elected leaders tend to forego savings for current spending (Hou, 2002).

3.2 Empirical Model

3.2.1 Revenue Stability

Based on the portfolio theory framework, revenue instability is a function of revenue diversification.

RS = f (RVD) ……. (i)

In this study equation (i) is augmented to include the following variables: economic base instability, population, population squared and revenue capacity.

RS = f (EBS, RVD, POPL, POPLSQ, RVC) ……. (ii)

Where: RS: revenue instability

EBS: economic base instability

RVD: revenue diversification

POPL: population

POPLSQ: population square

RVC: revenue capacity

Revenue stability can be measured using the deterministic trend model assuming that data on tax revenue is stationary. However it is most likely that there would be presence of unit roots in the time-series of various tax revenues. Dickey- Fuller unit root test is thus applied to determine

whether or not the data is stationary. If the time series data is non-stationary, then it is inappropriate to use the deterministic trend model (Braun, 1988).

Examination of sample as well as the partial autocorrelations is carried out on the time-series data. In case of a stationary autoregressive process, then the series' sample autocorrelations rapidly die out. Conversely, sample autocorrelations die out slowly in the case of a non-stationary process. The next important step is to determine the number of lags appropriate for the model. In most cases, one year lag is the most appropriate. The Dickey-Fuller model is thus reduced to the random walk model- a special non- stationary case (Woodridge, 2004).

Another way of measuring revenue stability is by assuming that data on tax revenue is non-stationary. To introduce stationarity, the data is first differenced. The autoregressive integrated moving average (ARIMA) process is the best model to measure stability in the case of non-stationary data (Braun, 1988; Woodridge, 2004; Saikkonen & Luukkonen, 1993).

3.2.2.1 Description of Variables

a) *Revenue Instability*

Revenue instability is used in a similar manner as in the case of financial risk. It is the variability of tax revenue in the short run. It is the degree of deviation of actual revenue from the predicted revenue. Revenue instability increases with increase in this variation (White, 1983). This study uses the following method to measure revenue instability:

Overall Instability of Tax Structure

Unit standard deviation measures a single tax's instability (Braun, 1988). Therefore to measure instability of the whole tax structure, variance (σ_i^2) of the individual taxes as well as the covariance, σ_{ij} between taxes is taken into account. Covariance is expressed as: σ_{ij} = Þ$_{ij}\sigma_i\sigma_j$.

Revenue instability at a certain time is defined as:

$$RS = \sum_{i=1}^{n}\sum_{j=1}^{n} R_i R_j \rho_{ij}\, \sigma_i \sigma_j \ldots\ldots\ldots\ldots\ldots\ldots (ii)$$

R_i and R_j represent revenue levels from taxes i and j respectively

σ_i and σ_j represent standard deviation of tax i and j respectively

ρ_{ij} is the coefficient of correlation between taxes i and j

b) *Economic Base Instability*

Economic base instability is measured using the employment's coefficient of variation. The following equation defines economic base instability:

$$EBS_k = \sqrt{\frac{\sum_{i=1}^{T}\left[\frac{E_t^k - \hat{E}_t^k}{\bar{E}_t^k}\right]2}{T-1}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iii)$$

Where EBS_k is economic instability in Kenya

E^k_t is the observed employment in period t for that country

$\hat{E}^k_t$ is the predicted (by trend equation) employment in the country in period t

$\bar{E}^k_t$ represents arithmetic average of respective time series

T represents time periods used in the study

c) *Revenue Diversification*

According to Chang (1994), the Hirschman- Herfindahl Index (HHI), widely used in research on industrial organization concentration, is used to measure revenue diversification that would be risk- reducing. This study incorporated six categories of revenue including the non-tax revenue as defined by equation (vii):

$$RVD = \left[\frac{1-\sum R_i^2}{0.8}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iv)$$

Where R_i is the share of revenue. According to Chang (1994), the measured degree of diversification is dependent on the number of sources of revenue as well as the proportion of individual type of revenue. A high value of RVD implies that the measured degree of diversification is dependent on the number of sources of revenue as well as the proportion of individual type of revenue. A high value of RVD implies that revenue diversification is great among revenue structure (Yan, 2008; Houghton, 1998).

If RVD is one (1), it means there is maximum diversification of revenue categories and zero (0) implies reliance on only one revenue category by the government.

d) *Revenue Capacity*

Revenue capacity is measured using the logarithm of the country's per capita income. This is because it provides a good base upon which taxes are collected. Therefore, it defines the country's overall wealth as well as its tax capacity (Braun, 1988).

e) *Population*

Population is used as a measure of the size of the country. The variable of population is represented in a quadratic form because the relationship between revenue instability and population could be quadratic in nature. The size of population could act as a proxy for diversity of economy (Yan, 2008).

3.2.2 Tax Elasticity

To measure tax elasticity, this study uses the PAM method adapted from Mansfield (1972) as illustrated by equation 1:

$$\ln TR_i = \beta_i + \alpha_i \ln Y + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where TR is the tax revenue, Y is the GDP and α_i is the income elasticity of the i^{th} tax

α_1 is the percentage change in tax revenue a result of 1% change in income.

3.2.3 Tax Buoyancy

Tax buoyancy is estimated using the model adapted from Houghton (1998) as shown below:

$$T = e^{\propto} Y^{\beta} e^{z} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

To linearize the equation logarithm on both sides of the equation is taken. Tax buoyancy is thus estimated using equation 6 as follows:

$$\text{Log TR} = \alpha + \beta \log Y + z \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

Where TR is tax revenue; Y = GDP; β is a buoyancy coefficient; α is a constant term; and e is a natural number. OLS method is then used to estimate equation (6).

3.3 Data Sources

Data used in this study was obtained from the World Bank database, Statistical Abstracts, Economic Surveys and KRA Statistical Bulletins. The sample period of the study was for the fiscal years 1991/92 to 2011/12.

CHAPTER FOUR

EMPIRICAL ANALYIS

4.1 Introduction

In this chapter the empirical analysis of the study is discussed. It contains tests for the time series properties of the variables used in the model, cointegration test and the error correction model. It is also contains the diagnostic tests as well as discussion of findings of the study.

4.2 Test for the Time Series Properties of the Variables

Given that this study used time series data, stationarity tests were carried out to check for the presence of unit roots. Presence of unit root in some variables may result to spurious regression. This means a regression with significant t-statistics and high R^2 but whose results have no economic meaning. The Augmented Dickey Fuller (ADF) test was used in this study to test for the presence of unit root in variables.

4.2.1 Test for Unit Root

The classical regression model assumes that both the dependent and the independent variables' sequences be stationary. Tests for unit roots were carried out for all variables using the ADF test. The Schwarz Information Criterion (SIC) was used to determine the number of lags that were optimal in the ADF test. The Table 4.1 represents results of the ADF test.

Table 4.1: ADF Unit Root Test for Variables in Levels

Variables	Lags	ADF	Probability	Decision
Log of GDP	1	1.107	0.9953	Non- Stationary
Log of Income Tax	1	-0.395	0.9109	Non- Stationary
Log of VAT	4	1.627	0.9979	Non- Stationary
Log of Tax on other Goods and Services	1	-0.011	0.9576	Non- Stationary
Log of Tax on International Trade	3	0.262	0.9755	Non- Stationary
Log of Property Tax	2	-0.272	0.9294	Non- Stationary
Log of Non-Tax Revenue	0	-3.906	0.002	Stationary
Log of Total Tax	4	2.001	0.9987	Non- Stationary
Log of Revenue Instability	1	-1.532	0.5175	Non- Stationary
Log of Economic Base Instability	1	0.006	0.959	Non- Stationary
Log of Revenue Diversification	0	-4.953	0	Stationary
Log of Population	2	-3.222	0.0188	Stationary
Log of Population Square	2	-3.300	0.0149	Stationary
Log of Revenue Capacity	4	0.465	0.9838	Non- Stationary

Table 4.1 shows that all the variables were non- stationary in their respective levels except for the logarithm of the non- tax revenue and revenue diversification.

The null hypothesis (H_0) and the alternative hypothesis (H_A) for the stationarity test were taken to be: H_0: a unit root is present or the data is not stationary

H_A: a unit root is not present or the data is stationary

To reject the null hypothesis the absolute value of the test statistic ought to have been greater than the absolute value of the critical value at a given percentage level of significance. At 1% level of significance the null hypotheses for revenue diversification, population and population square as well as that of the logarithm of non- tax revenue were rejected based on the MacKinnon approximate probability values. These variables were therefore stationary at levels.

Table 4.2:ADF Unit Root Test for Variables in Difference

Variables	**Lags**	**ADF**	**Probability**	**Decision**
Log of GDP	0	-3.295	0.0151**	Stationary I (1)
Log of Income Tax	0	-3.658	0.0047**	Stationary I (1)
Log of VAT	0	-4.689	0.0001***	Stationary I (1)
Log of Tax on other Goods and Services	0	-3.925	0.0019***	Stationary I (1)
Log of Tax on International Trade	0	-3.720	0.0038**	Stationary I (1)
Log of Property Tax	0	-2.863	0.0498*	Stationary I (1)
Log of Non-Tax Revenue	0	-3.906	0.0020***	Stationary I (0)
Log of Total Tax	0	-2.77	0.0627*	Stationary I (1)
Log of Revenue Instability	0	-3.878	0.0022***	Stationary I (1)
Log of Economic Base Instability	0	-4.186	0.0007***	Stationary I(1)
Log of Revenue Diversification	0	-4.953	0.0000***	Stationary I (0)

Log of Population	0	-3.222	0.0188**	Stationary I (0)
Log of Population Square	0	-3.300	0.0149**	Stationary I (0)
Log of Revenue Capacity	0	-4.771	0.0001***	Stationary I (2)

****** Means stationary at 5% level, *** stationary at 1% and * stationary at 10% level of significant. I (0), I (1) and I (2) means integrated of order 0, 1 and 2 respectively.

The null hypothesis, H_0: a unit root was present, was rejected in the first difference for all the variables except for the revenue capacity which was differenced twice and the logarithm of non-tax revenue, population, population square and revenue diversification which were stationary at levels. The null hypothesis was rejected at 1% level for all variables except for the logarithms of GDP, income tax and tax on international trade which was rejected at 5% level and logarithms of property tax and the total tax which was rejected at 10% level.

The non- stationarity of various variables prompted the use of Engel and Granger (1987) cointegration technique in order to avoid the problem of non-sense regression. The error correction model was used to obtain both the short-run and long-run relationship between variables.

4.3 Revenue Instability

4.3.1 Cointegration Analysis

The cointegration test indicated presence of a long-run relationship between the variables included in the model. There was no unit root in the regression residual thus the endogenous variable- revenue instability (RS), had a long run relationship with the independent variables that

is, economic base instability, revenue diversification, revenue capacity, population and population square. Table 4.3 shows the presence of long-run relationship between the endogenous variable (RS) and the exogenous variables.

Table 4.3: Cointegration - Revenue Instability

Variable	**Lag(s)**	**ADF**	**Probability**	**Decision**
Residual, e	2	-2.793	0.0593*	Stationary

* Means stationary at 10% level of significance.

Table 4.4: Cointegration Regression Results: RS

Variable- Revenue Instability (RS)	**Co-efficient**	**t-statistic**	**p>/t/**
Economic Base Instability (EBS)	-273415.6	-2.46	0.026
Revenue Diversification (RVD)	35.47	0.62	0.543
Revenue Capacity (RVC)	87.377	-0.67	0.515
Population (POPL)	2388.239	1.22	0.242
Population Square (POPLSQ)	-437.42	-1.31	0.207
Constant	-702.33	-0.19	0.853

Table 4.4 shows the long run relationship between the dependent variable and the independent variables. Regression results indicated that among all the exogenous variables included in the study, only economic base instability had a significant impact on revenue instability in the long-run. The absolute t-statistic of economic base instability was equal to 2.46 and thus it was

significant. Increase in economic base instability by 1% resulted to a decrease in revenue instability by 273415%. The sign of the coefficient of EBS was negative contrary to the expectation. This discrepancy however could be explained by the fact that increase in employment level in the country do not necessarily amount to increase in a country's revenue stability. More people may have been employed in the informal sector- which is hard to tax- thus resulting to unimproved revenue stability.

4.3.2 Error Correction Model (ECM)

The ECM links both the short-run and the long run dynamics of the model. The ECM was developed by running a regression of the stationary endogenous variable against stationary exogenous variables and the error correction term (ECT). The results are reported in Table 4.5.

Table 4.5: The Error Correction Model- RS

L1 RS	**Coefficient**	**t- statistic**	**P-value**
L1 EBS	-76247.84	-1.23	0.249
L4 RVC	85.76	1.66	0.131
L2POPL	-7.38	-0.00	0.997
L2POPLSQUARE	-3.16	-0.01	0.993
RVD	3.945	0.18	0.864
L2ERRORV	0.121	0.04	0.969
Constant	49.71	0.02	0.987

R-Squared = 0.4721; Adjusted R-Squared = 0.1201; F- Statistic = 2.34

The ECM model, illustrated in Table 4.5, showed that in the short- run none of the explanatory variables in the model had a significant impact on the explained variable. Although population and population square had a negative impact on revenue instability, the impact was insignificant. The impact of revenue capacity and revenue diversification on revenue instability was positive contrary to the theoretical expectation. As is the case of the portfolio theory, revenue diversification was expected to reduce revenue instability and thus it should have had a positive impact on the country's revenue stability. The results could be explained by the low levels of revenue share from individual sources of income.

Increase in revenue capacity (logarithm of per capita income) was expected to reduce the country's revenue instability. This implies that in normal circumstances it should improve the country's revenue stability. The results of this study however could be explained by such factors as high levels of tax evasion and avoidance in Kenya. Despite improvement in a country's revenue capacity, there could be minimal or no increase at all on the overall revenue collected. Given vastness of the informal sector in Kenya and the fact that it is very difficult and expensive to tax this sector, improvement in revenue capacity in Kenya does not necessarily translate to significant reduction in revenue instability.

4.3.3 Diagnostic Tests

4.3.3.1 Ramsey RESET Test

The Ramsey Regression Specification Error Test (RESET) was used to test whether the model was correctly specified. The null hypothesis H_O: Model has no omitted variable. Since the p-value critical was greater than that of the model, the null hypothesis was rejected. This implies

that the model does not have a specification problem, that is, there were no omitted variables. This is shown in Table 4.6.

Table 4.6: Ramsey RESET Test

Null Hypothesis, H_0: Model has no omitted variables

Alternative Hypothesis, H_A: Model has omitted variables

$$F(3,6) = 0.44$$

$$Prob > F = 0.7354$$

4.3.3.2 Breusch- Godfrey LM Test for Autocorrelation

The p-value was greater than the chi-square implying that there was no serial correlation as shown in Table 4.7.

Table 4.7: Breusch- Godfrey LM Test for Autocorrelation-RS

H_0: no serial correlation

H_A: Presence of serial correlation

Lags(p)	Chi^2	Df	Prob > chi^2
1	0.515	1	0.4732

4.3.3.3 Breusch- Pagan/ Cook- Weisberg Test for Heteroskedasticity

In the presence of heteroskedasticity results of OLS estimates are inefficient. Given that the p-value was greater than the chi-square, the null hypothesis of constant variance was not rejected. The results implied that the error terms had a constant variance, hence are homoscedastic. The test results are shown in Table 4.8.

Table 4.8: Breush- Pagan/ Cook- Weisberg Test for Heteroskedasticity

Null Hypothesis, H_0: Constant Variance

Alternative Hypothesis, H_a: No Constant Variance

Chi2 (1) = 0.19

Prob > Chi2 = 0.6623

4.4 Tax Buoyancy

Tax buoyancy was defined in equation (6) as:

$$\text{Ln } TR = \alpha + \beta \text{Ln} Y + z$$

4.4.1 Cointegration Analysis

The finding of the study indicated that there is a long run relationship between total revenue and GDP in Kenya. The error term of the regression residual was found to be stationary, thus total revenue and GDP were co-integrated. Table 4.9 shows the cointegration analysis results.

Table 4.9: Cointegration Test- Buoyancy

Variable	Lag(s)	ADF	Probability	Decision
Residual (error t)	1	-4.730	0.0001	Stationary Co-integrated

Table 4.10: Cointegration Results- Regression

Variable- Log Total Tax	**Coefficient**	**t-Statistic**	**P> /t/**
Log GDP	3.622	17.99	0.000
Constant	-88.083	-15.79	0.000

F (1, 20) R-Squared = 0.9418

Prob > F = 0.000 Adjusted R-Squared = 0.9398

The tax buoyancy in Kenya was 3.622. The results indicate that one percent increase in the country's national income results to 3.622 percent increase in the total tax revenue in the long run. The results indicate that the tax revenue is highly buoyant- given that the coefficient is more than unit. The results indicate that in the long- run buoyancy of tax revenue is significant.

4.4.2 The Error Correction Model - Buoyancy

Table 4.11: The ECM Results

Variable L4logTR	Coefficient	t-Statistic	P>/t/
L1logGDP	1.114	0.69	0.502
L1errort	0.220	0.69	0.504
Constant	0.090	1.24	0.236

F (2, 14) = 0.30; R-Squared = 0.0412; Prob > F = 0.7449; Adjusted R-Squared = -0.0958

The ECM results indicated that there was no significant short-run relationship between GDP and the overall tax revenue. This implies that there was no short run tax buoyancy.

4.4.3 Diagnostic Tests

The diagnostic tests results indicated that the model was properly fitted; there was neither autocorrelation nor heteroskedasticity. These resulted are presented in the appendix.

4.5 Tax Elasticity

This study used GDP as the base for all the sources of revenue.

4.5.1 Cointegration Tests - Elasticity

All the tests for cointegration depicted existence of long-run relationship between various individual sources of revenue and the national income except for the property tax. The results

indicated that in the long run these sources of revenue were responsive to changes in GDP level.

Table 4.12 shows various tests for cointegration.

Table 4.12: Cointegration Tests for Various Sources of Revenue

Variable (log of income tax)	Lag(s)	ADF	Probability	Decision
Residual (error m)	1	-5.615	0.0000	Stationary/ Co-integrated

Variable (log of VAT)	Lag(s)	ADF	Probability	Decision
Residual (error a)	1	-5.829	0.0000	Stationary/ Co-integrated

Variable (log of tax on other goods and services)	Lag(s)	ADF	Probability	Decision
Residual (error o)	4	-2.985	0.0363	Stationary/ Co-integrated

Variable (log of tax on international trade)	Lag(s)	ADF	Probability	Decision
Residual (error i)	1	-3.365	0.0122	Stationary/ Co-integrated

Variable (log of property tax)	Lag(s)	ADF	Probability	Decision
Residual (error p)	2	-2.493	0.1171	Non-stationary/ no cointegration

Variable (Log of non-tax revenue)	Lag(s)	ADF	Probability	Decision
Residual (error n)	0	-4..737	0.0001	Stationary/ Co-integrated

Table 4.13 shows the cointegration results

4.5.2: Cointegration Results

Table 4.13: Cointegration Results

Variable Log Income Tax	Coefficient	t-Statistic	P>/t/	F (1, 20) R-Squared = 0.9606 Adjusted R-Squared = 0.9587
Log GDP	3.820	22.09	0.000	
Constant	-94.53	-19.73	0.000	

Variable Log VAT	Coefficient	t-Statistic	P> /t/	F (1, 20) R-Squared = 0.6720 Adjusted R-Squared = 0.6556
Log GDP	5.427	6.40	0.000	
Constant	-136.714	-5.95	0.000	

Variable Log on tax on other goods and services	Coefficient	t-Statistic	p> /t/	F(1, 20) = 630.62 R-Squared = 0.9693 Adjusted R-Squared = 0.9677
Log GDP	2.326	25.11	0.000	
Constant	-53.600	-20.88	0.000	

Variable of Log of property tax	Coefficient	t-statistic	P>/t/	F (1, 20) = 26.21 Prob > F = 0.0001 R- Squared = 0.5672
Log GDP	2.762	5.12	0.000	
Constant	-71.506	-4.78	0.0001	

Table 4.13 (continued)

Variable Log of tax on international trade	Coefficient	t--Statistic	P>/t/	F (1, 20) = 68.76 R-Squared = 0.7747 Adjusted R- Squared = 0.7634
Log GDP	3.709	8.29	0.000	
Constant	-92.653	-7.48	0.000	

Variable of the log of non- tax revenue	Coefficient	t-Statistic	P> /t/	F (1, 20) = 6.97 Prob > F = 0.0157 R-Squared = 0.2584 Adj-R-Squared = 0.2214
Log of GDP	1.4967	2.64	0.016	
Constant	-31.608	-2.01	0.058	

Table 4.14: The ECM- Elasticity

L log Income tax	**Coefficient**	**t- Statistic**	**p>/t/**	F (2, 17) = 1.35 Prob > F = 0.2860 R- Squared = 0.1369 Adjusted R- Squared = 0.0354
L1 Log GDP	0.1978	0.15	0.883	
L error m	0.3201	1.63	0.121	
Constant	0.1285	2.59	0.019	

L log VAT	**Coefficient**	**t- Statistic**	**P>/t/**	F (2, 14) = 0.63 Prob > F = 0.5460 R-Squared = 0.0827 Adjusted R-Squared = -0.0483
L1 Log GDP	7.454	0.83	0.418	
L error a	0.5070	1.07	0.303	
Constant	-0.1008	-0.24	0.812	

L log of tax on International trade	**Coefficient**	**t-Statistic**	**P>/t/**	F (2, 15) = 0.35 Prob > F = 0.7103 R-Squared = 0.0446 Adjusted R-Squared= -0.0828
L1 log GDP	-3.503	-0.84	0.416	
L error i	-0.1391	0.44	0.665	
Constant	0.3146	1.70	0.109	

Table 4.14 (continued)

L Log of Tax on other goods and services	Coefficient	t-Statistic	P>/t/	F (2, 15) = 2.05 Prob > F = 0.1629 R-Squared = 0.2149 Adjusted Squared = 0.1103
L1Log GDP	1.0538	1.01	0.327	
L error o	-0.353	-1.65	0.120	
Constant	0.046	1.12	0.281	

L Log of property tax	Coefficient	t-Statistic	P>/t/	F (2, 16) = 0.08 Prob > F = 0.9198 R-Squared = 0.0104 Adjusted R-Squared = -0.1133
L1 Log GDP	0.2053	0.05	0.959	
L error p	0.06545	0.41	0.690	
Constant	0.0323	0.21	0.835	

L Log of Non-Tax Revenue	Coefficient	t-Statistic	P> /t/	F (2, 17) = 38.83 Prob > F = 0.000 R-Squared = 0.8204 Adjusted R-Squared = 0.7993
L1 Log GDP	8.920	3.28	0.004	
L error n	0.8278	7.44	0.000	
Constant	9.639	95.81	0.000	

Table 4.14 shows that in the short-run only tax on international trade and tax on other goods and services are elastic. Income tax, VAT, property tax and the non-tax revenue are not elastic in the short- run.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary

Taxation is the main weapon used by the government to raise it revenue. Kenya, like many other developing countries, is faced by huge fiscal deficits, declining external assistance and huge debt service charges that impede development process. This study set out to analyze taxation system in Kenya with special focus on the tax buoyancy and tax elasticity for the period 1991/92 to 2011/12. The study also sought to identify the determinants of revenue instability in Kenya.

Tax buoyancy was calculated using the double log method. Long run tax buoyancy was found to be 3.622. The study found that there was no short-run buoyancy in Kenya for the period studied.

Tax elasticities for different sources of revenue were also calculated using the proportional adjustment method adapted from Mansfield (1972). GDP was used as the base for all the sources of revenue. Although in the short run tax on international trade and tax on other goods and services were found to be elastic, their income elasticity was insignificant. On the other hand income tax, VAT, property tax and the non-tax revenue did not have short- run income elasticity. In the long run however, all the sources of revenue except property tax were found to be income elastic. The long run income elasticities of income tax, VAT, tax on other goods and services, tax on international trade and the non-tax revenue were found to be: 3.82, 5.427, 2.326, 3.709 and 1.497 respectively. The findings of the study indicate that the aforementioned sources of revenue were highly elastic in the long run.

To identify the determinants of revenue stability, this study applied OLS method. Revenue instability, the dependent variable, was regressed against revenue diversification, revenue capacity, economic base instability and the quadratic form of population. The study found that the impact of the exogenous variables on the endogenous variable was not significant in the short run. In the long run, only economic base instability had a significant impact on revenue instability. The sign of the coefficient was however negative contrary to the expectation. Population, population square, revenue capacity and revenue diversification do not have a significant impact on the country's revenue instability in the long run.

5.2 Conclusion

Econometric analysis of the study revealed high overall tax buoyancy in the long-run. However, in the short run the tax system was not buoyant. This implies that in the long run, overall tax is highly responsive to changes in the national income. Tax elasticities of all taxes except property tax were found to be elastic in the long run. This implies that these taxes are highly responsive to percentage changes in GDP. Therefore, fluctuations in GDP are likely to result into fluctuations in the amount of revenue collected from these sources.

The econometric analysis of the determinants of revenue instability revealed a positive and insignificant impact of revenue diversification on revenue instability that is contrary to the portfolio theory assumption that diversification results into decrease in revenue instability. These results could be explained by low levels of revenue share from the individual sources of revenue. Economic base instability is the only variable that exhibited a significant impact on revenue instability in the long run. The sign of the coefficient of EBS was negative contrary to the

expectation. This discrepancy however could be explained by the fact that increase in employment level in the country do not necessarily amount to improvement in a country's revenue stability. More people may have been employed in the informal sector- which is hard to tax- thus resulting to unimproved revenue stability.

5.3 Policy Recommendations

The overall tax buoyancy was 3.622 in the long run. This implied that in the long run tax revenue was responsive to changes in national income. Therefore, policy makers should aim at enhancing factors that promote GDP which will in turn result to increase tax revenue collected in the long run. Lack of short run tax buoyancy implies that policy makers need not worry much about the fluctuations in GDP in the short run given that these changes do not affect the tax revenue collected.

Similarly, long run income elasticities of taxes imply that various individual taxes collected were responsive to changes in the national income. All the sources of income except the property tax could be improved by improving the percentage change in GDP level in Kenya.

In the case of revenue stability all the factors used to determine revenue instability in the country did not exhibit short run relationship with the endogenous variable. On the other hand, the long run relationship between revenue instability and the endogenous variables except economic base instability was insignificant. Therefore as a policy measure the relevant authorities should seek to establish whether there is leakage in revenue collection and match it up with improvement of such factors as economic base stability, revenue diversification and revenue capacity.

The revenue authority should look into the best way to tax the informal sector, which remains largely untaxed, which could be result into improvement of the determinants of revenue stability. Despite diversification of revenue sources, the revenue authority should seek to improve the amount of revenue collected from the different sources while minimizing the tax administration costs.

5.4 Limitations of the Study

This study was not without limitations. One major limitation of this study was inadequacy as well as inconsistency of data. The data used in this study dated from year 1991 to 2012, thus the number of observations was only 22.Use of less observations in the study had its own implications. Data on tax from various sources was also inconsistent, that is, data from Economic Surveys, KRA publications and the World Bank database differed a great deal.

Another limitation of the study was that various variables; revenue instability, economic base instability and revenue diversification had to be computed from various other data. In determining the determinants of revenue stability, revenue instability was used as the dependent variable because it was easier to calculate than the former.

5.5 Areas for Further Research

This study focused on tax buoyancy, tax elasticities and the determinants of revenue stability in Kenya. GDP was used as the base in calculation of tax buoyancy and elasticities. Revenue diversification, economic base instability, revenue capacity and the quadratic form of population were considered in determining the determinants of revenue instability.

Further studies could be carried out focusing on the impact of the informal sector on revenue stability in Kenya. The informal sector is vast and remains largely untaxed in Kenya.

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APPENDIX 1:

Year	Revenue Instability	Economic Base Instability	Revenue Diversification	Population	Population Square	Revenue Capacity
1991	476.01	0.0051	0.77	3.3	10.89	5.857933
1992	503.36	0.0052	0.82	3.2	10.24	5.799093
1993	618.7	0.0054	0.95	3.2	10.24	5.598422
1994	648.23	0.0052	0.95	3.2	10.24	5.560682
1995	671.52	0.0051	0.96	3.0	9	5.598422
1996	674.93	0.005	0.97	2.9	8.41	5.828946
1997	688.6	0.005	0.96	2.8	7.84	5.966147
1998	677.87	0.005	0.08	2.7	7.29	6.086775
1999	722.48	0.0049	1	2.6	6.76	6.086775
2000	728.18	0.0049	0.97	2.6	6.76	6.040255
2001	733.08	0.0048	0.96	2.7	7.29	6.016157
2002	729.8	0.0048	0.95	2.7	7.29	5.966147
2003	750.13	0.0048	0.94	2.7	7.29	6.040255
2004	781.92	0.0047	0.96	2.7	7.29	6.131227
2005	788.17	0.0045	0.95	2.7	7.29	6.253829
2006	821.29	0.0044	0.94	2.7	7.29	6.345636
2007	847.96	0.0042	0.94	2.7	7.29	6.49224
2008	855.83	0.0042	0.9	2.7	7.29	6.60665
2009	866.01	0.0042	0.91	2.7	7.29	6.659294
2010	896.49	0.0041	0.9	2.7	7.29	6.697034
2011	921.46	0.004	0.88	2.7	7.29	6.709304
2012	960.24	0.004	0.9	2.7	7.29	6.709304

Source: Own computation

APPENDIX 2: Revenue Composition in Kenya

YEAR	Income Tax	VAT	Tax on Other Goods and Services	Tax on International Trade	Property Tax	Non Tax Revenue	Total Tax	Total Revenue
1991	19986	927.77	22720.54	2506.01	186.24	5850.21	44076.79	**49927**
1992	20071	1107.14	26505.68	4059.37	246.27	7850.33	51989.67	**59840**
1993	33752	14750.6	25311.7	6323.4	154	15058.04	80291.96	**95350**
1994	45360	14845.1	28321.8	15097.9	87	18354.28	103711.75	**122066.03**
1995	48259	21075.1	37483.03	19316.5	56	22883.83	126189.59	**149073.42**
1996	48470	29850.1	42987.7	12340.7	48.44	30399	133696.92	**164095.92**
1997	56174	34468.1	41225.01	18371.1	43.83	19780.1	150281.94	**170062.04**
1998	55235	39204.8	38437	24277.7	64.28	2762.74	157218.54	**159981.28**
1999	53556	40944.2	39331	26333	82.44	36840.13	160246.63	**197086.76**
2000	56246	50220.9	41179.1	27274.5	84.76	24817.88	175005.22	**199823.1**
2001	60936	50871.7	41179.1	27302.3	88.94	26673.29	180378.03	**207051.32**
2002	70140	56135.3	45389.69	24396.1	71.66	18016.29	196132.97	**214149.26**
2003	77410	58853.4	51249.11	30264	130.65	15105.72	217906.86	**233012.58**
2004	99312	75995.7	57490.46	30831.7	192.34	21060.06	264762.64	**294611.43**
2005	114629	79925.9	61709.65	29861.4	189.59	20747.14	288668.86	**314557.9**
2006	130719	96497	77945.48	40235	253.06	25425.91	346563.14	**371989.05**
2007	165078	111905	80736.09	45857.8	331.9	33085.44	408444.66	**441530.1**
2008	194155	126854	93051.89	49094	327.52	20782.75	486151.7	**488934.45**
2009	219497	141971	99335.01	57205.8	269.37	19311.72	523633.34	**542945.06**
2010	272264	171881	108701.5	66670.5	352.1	24741.25	626668.74	**651409.99**
2011	329938	177826	108765	77952.2	557.32	31097.74	703450.53	**734548.27**
2012	403638	231855	120618.1	98783.6	653.73	48741.29	866347.65	**915088.93**

Source: KRA Publications, Economic Surveys (1991- 2012)

APPENDIX 3: Diagnostic Tests for Tax Buoyancy

Ramsey RESET test using powers of the fitted values of L4logt
Ho: Model has no omitted variables
F(3, 11) = 0.16
Prob > F = 0.9198

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	3.281	1	0.0701

H0: no serial correlation

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of L4logt
chi2(1) = 2.47
Prob > chi2 = 0.1159

Skewness/Kurtosis tests for Normality

			joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2) Prob>
L4logt	17	0.0101	0.0233	9.46 0.0088
L1logy	20	0.8805	0.2388	1.56 0.4583