AN EMPIRICAL ASSESSMENT OF BUOYANCY AND ELASTICITY OF THE KENYAN TAX SYSTEM: 1973 – 2003

BY

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DECLARATION

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

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

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DEDICATION

This research paper is dedicated to my parents, especially my late father, and all family members. It should be an inspiration to the children to work harder and go on to achieve greater things in the field of academics.

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DEFINITIONS OF OPERATIONAL TERMS

Ability-to-pay Principle - Those with equal abilities should pay equal amounts (horizontal equity), while those with unequal abilities should pay in proportion to their abilities (vertical equity).

Ad valorem taxes - Taxes which are based on values or price of a good or service.

Appropriations-in-aid (user-charges) - This term refer to the user charges collected from the services offered by the Government.

Buoyancy - Buoyancy refers to both the automatic and discretionary changes. Automatic increases arise from economic growth while discretionary increases arises from tax changes or changes in regulations such as tax rates, base definition, collection and enforcement procedures.

Dead Weight tax - A dead weight tax is one which, when imposed, causes a change in behaviour on the part of a taxpayer in such a way that the taxpayer ceases to carry on an activity which forms the base on which the tax is levied. It is the social cost incurred by society in the process of transferring purchasing power from the taxpayer to the Government.

Deficit - A situation whereby total government spending exceeds revenue from taxes and appropriations-in-aid (user-charges).

Elasticity - Tax elasticity is a measure of the automatic increase in revenue as the tax base grows without an increase in the rates. It reflects only the built-in-responsiveness of tax revenue to movement in national income.

Fairness - A tax system should have objective rules which introduce certainty and not open to negotiation or arbitrary execution.

Progressive Taxes - Taxes which take an increasingly proportion of an income as the income rises. In such a case the marginal rate of tax

will always be above the average rate of tax.

Regressive Taxes - Taxes which take a decreasing proportion of income. In such a case, the marginal rate is less than the average so that the proportion of income taken in tax falls as income rises.

Taxes - Taxes are compulsory contributions for which no explicit, reciprocal benefit is provided to the taxpayer.

Taxable Capacity - At the micro level, taxable capacity is the extent to which a taxpayer is able to pay the tax assessed on him and yet remains with enough disposable income to enable him to have a decent standard of life to which he and his family are accustomed (Goode, R – 1984). While at the macro level, taxable capacity of a nation is the ability of the Government concerned to realize from the taxpayers the revenues due to it from the taxes it imposes.

Tax Effort - Tax effort is the degree to which taxable capacity is used.

ABSTRACT

One of the most significant dynamics impacting on Kenya's public revenue is the issue of taxation. Taxation is essentially concerned with restructuring the balance between current consumption and current investment, transfer purchasing power from one section of the community to another, besides raising revenue for national development. It thus becomes essential to monitor the progress of tax revenue in relation to changes in the Gross Domestic Product.

The purpose of this study was to empirically analyse the likely behaviour of tax receipts in relation to changes in the tax base in Kenya, taking into account both the automatic and discretionary changes over a period of 30 years. It emphasizes that both buoyancy and elasticity are key analytical tools for designing tax policy and serve to explain the overall tax structure. The study used the Proportional Adjustment method for data analysis because it yielded better estimates of tax elasticity than the Divisia Index method, Dummy Variable approach method, or the Constant Rate Structure which required disaggregated data.

The findings of the study revealed an elasticity estimate of 0.82, which is less than unity, indicative of an inelastic tax structure. It is also a pointer that incomes could be lagging behind GDP growth. Buoyancy estimates on the other hand were 1.0, which is an optimal or fairly buoyant rate.

Policy recommendations based on these findings amongst others include reviewing the tax bases, limiting exemptions in consumption policies and evaluation of non- tax policies that have impacts on

bases such as GDP, interest rates, consumption, imports and inflation. The overall macro-economic environment could be improved through increased standards of literacy, predominant money economy, prevalence of honest and reliable accounting system, degree of voluntary compliance and a political system not dominated by wealthy groups who are acting in their own self interest.

CHAPTER ONE

INTRODUCTION

1.1 Background

1.1.1 Revenue Demand in Kenya

Kenya like many less developed economies is faced with economic challenges that require financial resources to meet her expenditure needs. These challenges include persistent and increasing poverty levels, declining productivity in the real sectors, inadequate skilled human resource, worsening investment environment, depleted infrastructure and limited access to quality social services. This situation is further compounded by the executive factor in decision making that result in aggravated expenditure patterns or distorted policy process.

Currently, sources of Government revenue include appropriations-in-aid, borrowing, grants, dividends from public corporations and taxes. Appropriations-in-aid form a limited proportion of Government revenue. The Government resorts to borrowing whenever there is a deficit, a situation whereby total government spending exceeds revenue from taxes and user charges. In such an event, the Government may resort to either public borrowing through sale of Government bonds and treasury bills in the local money market. Alternatively, the Government could resort to borrowing from external sources such as foreign banks, multilateral financial institutions as well as foreign Governments. Grants or foreign aid is assistance received for which the Government does not need to repay. This source of Government funding has continued to diminish in

significance as friendly Western nations have shifted their funding focus to Eastern Europe and Central Asian countries (Kimuyu et al - 1999). Besides, conditionality lending has meant that aid is a less reliable source of financing the budget.

Dividends from public corporations have also been unreliable owing to the poor performance of these companies. Indeed, some of these public corporations were for years a drain on the treasury as the Government continued to bail them and this has been the reason for divesture (Kimuyu et al, 1999).

Analysis of the Kenya's Budget estimates from 1995/96 to 2003/2004 indicate that tax contributes an increasing percentage of Government revenue (Republic of Kenya, 2004). Of the total Government receipts tax revenue comprises an average of 83.98 percent for the same period.

1.1.2 Importance of taxation

Taxes are compulsory contributions for which no explicit, reciprocal benefit is provided to the taxpayer. This characteristic distinguishes it from a price which is a voluntary payment for a good or service (Goode, 1984)

Taxation is essentially concerned with restructuring the balance between current consumption and current investment, transfer purchasing power from one section of the community to another, besides raising revenue for national development.

For instance, import duties target Balance of Payments (BOP) by seeking to limit volume of imports while promoting exports. On the other hand, excise duties limit consumption of harmful, luxurious

goods such as cigarettes, perfume, and spirits. Ad valorem tax or purchase tax is levied at the wholesale stage exempting basic necessities while VAT is levied at the stage of production and distribution.

Wilford and Wilford (1978:83) assert 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. The most important instrument by which resources may be marshaled is the implementation of an effective tax policy (Wawire, 2000:99).

Taxation is necessary because it would be neither feasible nor desirable to finance government expenditure solely by charges. This is because for public goods, charges for services are infeasible, and for mixed public – private goods, they are undesirable because pricing cannot perform all the allocative and distributive function of taxation (Goode, 1984).

1.1.3 Measures of Productivity of a Tax System

In evaluating the productivity of a tax system, two measures are normally considered, namely, buoyancy or flexibility and elasticity. Buoyancy refers to both the automatic and discretionary changes. Automatic increases arise from economic growth while discretionary increases arise from tax changes or changes in regulations such as tax rates, base definition, collection and enforcement procedures. Tax elasticity is a measure of the automatic increase in revenue as the tax base grows without an increase in the rates. It reflects only the built-in-responsiveness of tax revenue to movement in national income.

An elastic and buoyant tax has elasticity and buoyant coefficient greater than unity. Buoyancy is a useful concept for measuring the performance of both tax policy and administration over time. Buoyancy measures both the soundness of the tax bases and the effectiveness of tax changes in terms of revenue collection. Buoyancy is reduced by slow economic growth, tax evasion, tax exemptions and income tax allowances.

Tax elasticity reflects only the built-in-responsiveness of tax revenue to movement in national income which makes it relevant for forecasting. The tax elasticity coefficient gives an indication to policy makers of whether tax revenues will rise at the same pace as the national income. Tax elasticity which is less than unity means revenue yield reduces as GDP grows while elasticity greater than unity is where revenue rises as GDP increases. In contrast a shrinking economy ensures that potential revenue shrinks faster if the elasticity is greater than unity.

While a high tax buoyancy can make up for low tax elasticity, the returns in revenue from high tax buoyancy will diminish and ultimately be limited when tax rates are too high and cannot be increased further.

The advantages of an elastic tax system include tax revenue growing proportionately faster than income, making it possible to fund growing demands for Government services without politically sensitive tax increases. An elastic tax system is likely to be progressive, perhaps helping to meet vertical equity goals and a progressive tax system should have a tax elasticity greater than unity.

Disadvantages of an elastic tax system include promotion of high rate government expenditure. Revenues from an elastic tax system tend to be volatile, making planning difficult. Also an elastic tax system probably has high marginal tax rates, which in turn may suggest large excess burden or dead weight losses. Inelastic taxes will decline in revenue importance as the tax system grows overtime.

1.1.4 Tax Policy

Tax policy goals include equity or fairness, efficiency, administration feasibility, economic growth, revenue adequacy, tax certainty, political acceptability and justice (Goode, 1984). Fairness implies that the tax system should have objective rules, which introduce certainty and not open to negotiation or arbitrary execution. Tax equity goals is subject to the ability to-pay principle.

This principle holds that those with equal capacity to pay taxes should be taxed equally (Horizontal equity) and those with greater capacity to pay taxes should pay higher taxes (Vertical equity). Tax policy goal of efficiency requires that all economic resources are allocated to the optional uses. Achievement of efficiency imply low dead weight loss. Dead weight loss of a tax is equivalent to the excess burden of the value lost when the economy is operating inefficiently because of imposition of tax (Goode, 1984).

At the micro level, taxable capacity is the extent to which a taxpayer is able to pay the tax assessed and yet remain with enough disposable income to enable a decent standard of life to which the family are accustomed (Goode, 1984). While at the macro level, taxable capacity of a nation is the ability of the government concerned to realize from

the taxpayers the revenues due to it from the taxes it imposes. Tax effort is the degree to which taxable capacity is used.

Administrative feasibility in tax policy has two components, namely tax administration incurred by the Government and compliance costs incurred by the taxpayers. One reason a tax maybe costly to collect is that taxpayers find it possible to evade the tax by not paying it or by paying less than they owe (Leuthhold, 2000).

In addition, complex taxes with lots of exemptions and deductions are more difficult to monitor than simple taxes and may have high compliance costs. Poorly administered taxes normally favour dishonest taxpayers at the expense of honest ones. This is because taxpayers who voluntarily comply with a poorly administered tax, face a heavier tax burden than if the burden was shared with taxpayers that evade the tax. Also tax administration may have negative consequences for both future tax evasion and for the general confidence of the public in the tax system and the Government.

Another source of administration inefficiency is bribery and corruption of tax collectors. In this case, inefficiency arises because bribery cannot be observed without costly monitoring and because potential tax collectors cannot be identified as inherently honest or dishonest. And therefore, in the process of tax collection, there is the self-seeking behaviour characterized by rent seeking, corruption, abuse of power and disloyalty (Jenkins, Koo, Shukla, 2000).

1.1.5 Kenya's Economic Structure

The level of taxable capacity is determined by capital formation, which consists of foreign grants, foreign borrowing and domestic savings. Existing data for Kenya reveal that income is heavily skewed in favour

of the upper class. The bottom 20 percent of the population get only 2.5 percent of the total income while the top 20 percent receive more than 50 percent (Republic of Kenya, 2000).

Kenya's economic structure comprises monetary and non-monetary sectors. In the monetary sector, agriculture continues to be the dominant sector followed by Government services and then manufacturing. It is important to note that the agricultural sector is hard to tax because it is often non-monetized and levying taxes on agricultural inputs is often sensitive. Furthermore, record keeping maybe poor or nonexistent, especially for small producers. Marketing boards are sometimes used to tax agricultural output but revenues are highly unstable due to fluctuations that characterize this sector.

The manufacturing sector is selectively taxed as the Government pursues the economic growth objective. This pursuit involves trade-offs that result in tax exemptions and generous allowances.

The Kenyan economy is also characterized by high population growth rate, an average of 3.8 percent (Republic of Kenya, 2002). High population growth translates into rapid growing labour force, high proportions of children and low proportion of retirees. The age structure of the population has direct implications on the demand for education, social security, healthcare and on the taxes that fund these services.

Social security taxes are not significant in the case of Kenya. It is represented by National Social Security Fund (NSSF), National Hospital Insurance Fund (NHIF), Pension funds and insurance schemes. Social security taxes are limited by high birth rates, low life expectancies and less urbanization. Furthermore, coverage is restricted to those in the formal sector.

Another important feature of Kenya's economy is the openness to trade. The terms of trade continue to show poor performance with a remarkable rise in imports while domestic exports increased only marginally. The trade deficit worsened by 25.7 percent from 113,340 in 2000 to 142,518 million in 2001, subsequently hindering the current account deficit. This was mainly due to weak international demand and lower international commodity prices (Republic of Kenya, 2002).

The revenue and expenditure patterns show that public debt together with unfavorable balance of trade payments continue to persist in the Kenyan economy. The growth in current revenue continues to be slower than that of expenditure resulting in increasing persistent deficit. For example, in the 2001/2002 financial years, the current deficit was estimated at Kshs.2152 million. The total stock of outstanding deficit in the same year was Kshs.296,483 million (Republic of Kenya, 2002).

In an attempt to reduce the budget deficit, Kenya has implemented a wide range of fiscal measures, the latest being the structural adjustment programmes (SAPs), which have had a significant effect on the tax system. Efforts to restore the revenue base included the following:

(i) Pricing where budgetary subsidies for consumer goods and public utilities were gradually removed and fees, levies plus charges for public sector services revised upwards as part of the cost recovery measures

(ii) Deregulation of certain sectors of the economy such as exchange rate and foreign exchange market which automatically change the structure of the relevant markets for

goods and services, with such changes consequently affecting the size of the tax base

(iii) Trade liberalization and measures that target import duties and export compensation so as to make industries more competitive.

(iv) Strengthening production incentives by identifying priority areas of investment such as agriculture, manufacturing, construction and tourism.

(v) Developing the tax structure to favour savings and investment, thus placing the greater burden on taxation of consumption.

(vi) Enhancing the tax structure to promote rural-urban balance as well as meeting other goals of equitable distribution of income.

(vii) Enhancing tax efficiency and ensuring that taxes are collectable and enforceable at low cost. Also ensuring that revenues are responsive to changes in GDP so that taxes keep pace with income growth without annual change in rates.

(viii) The formation of Kenya Revenue Authority (KRA) to bring the assessment and collection of taxes under one body. The organization is also charged with the responsibility of facilitating, monitoring taxpayer compliance. The government through this tax collection agency continues to implement reforms to enhance revenue collection.

Despite the measures put in place to reduce the budget deficit, it continued to grow suggesting that the tax system is not revenue productive. It is important to note that the budget deficit is an

important statistic in measuring the impact of Government fiscal policy on an economy.

1.2 Statement of the Problem

The apparent failure of the tax system to generate sufficient revenue to finance recurrent expenditure can be attributed to poor revenue forecasting. It is important to estimate the likely behavior of tax receipts in relation to changes in the tax base. Such estimation is essential for purposes of formulating government budgets and monitoring the progress of tax collections besides other research applications. The national plans, be they yearly or long term, are based on revenue estimates.

Poor revenue forecasting is therefore one of the causes of the persistent large budget deficits. However, an accurate estimation of the optimal level of expenditure requires knowledge of the productivity of the tax system. From a macro perspective, an understanding of tax bases and their relationship with other economic variables in the economy is useful in determining the extent to which tax revenues can be generated in a given economy at a particular time. Insufficient revenue impacts negatively on economic development. This is because persistent fiscal deficits forces the Government to absorb almost all the credit available in the economy, crowding out private investors and causing severe inflation.

In addition to this, it also augments the gestation period of incomplete development projects and results in an overall slowdown in growth. There is now a great demand for the optimization of revenue from various tax sources. In an attempt to raise sufficient revenue, the Government often resorts to ad hoc adjustments of rates and bases of individual taxes and this introduces uncertainty in the tax system.

Uncertainty over rates and bases of individual taxes affect decision making. A tax system that is subject to constant adjustments by policy makers generates uncertainties and has adverse effects on long-term investments as the private sector delays its investment decisions, due to these uncertainties. For example, currently there are changes annually not forgetting midstream changes in supplementary budgets. This uncertainty could be due to the fact that there is no proper model for forecasting and this study enhances acknowledge that will fill this gap.

1.3 Research Questions

Research questions this study answers include the following:

(i) What are the factors influencing the revenue productivity of Kenya's tax system?

(ii) Is Kenya's tax system buoyant and income elastic?

(iii) Is Kenya's tax policy effective?

1.4 Objectives of the Study

The general objective of the study was to evaluate the Kenyan tax structure.

The objectives of the study were as follows:

i) Identify and measure the factors that influence the productivity of Kenya's tax system.

ii) To establish whether Kenya's tax system is buoyant and income elastic

iii) To draw policy recommendation from (i) and (ii) above.

1.5 Significance of the Study

An appraisal of the budgetary process shows that annual expenditure proposals are always anchored on projected revenue, thus the

accuracy of revenue projection is a necessary condition for devising an appropriate framework for fiscal deficit management. This is because the quality of management influences overall macroeconomic performance as well as the distribution of resources between the public and private sectors.

Aggregate tax revenue forecasting plays a crucial role in the process of annual budget formulation. This is because it provides policy makers and fiscal planners with first hand insight and allows them to formulate policy options either to borrow or to use accumulated reserves to balance the budget in the short run as well as fiscal policy interventions to rectify financial anomalies over the medium term. To do this, one has to estimate the elasticity with respect to the aggregate tax base and then forecast revenues for the future.

The analysis of the composition and characteristics of the bases of individual taxes helps policy makers to design better tax systems that are more responsive to income growth and it also assists in identifying a sustainable revenue profile for the country. It will also help in determining appropriate modifications to the existing tax structures and rates as well as areas for improving tax administration.

Such an analysis will permit the identification of the sources of fast revenue growth or conversely, the causes of lagging revenue growth, thereby suggesting measures to adopt to maximize revenue within the existing tax system, and/or the need to activate additional means of revenue generation. Therefore, knowledge of the responsiveness of tax revenue to economic growth is of crucial importance for economic planning purposes since budgetary deficits financed through monetary expansion generally cause inflationary problems.

Buoyancy is useful for measuring the performance of both tax policy and administration overtime. This understanding assists in planning

the necessary tax changes confidently and in seeking the inclusion of the more buoyant sectors of the economy into the tax base.

Tax elasticity is relevant for forecasting because the tax elasticity coefficient gives an indication to policymakers of whether tax revenues will rise at the same pace as the national income.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

Various scholars have conducted studies on taxation. Musgrave (1969) asserted that there exist a relationship between tax structure and level of economic growth and development while policy objectives vary with the stages of development. Economic factors account for the size of different tax bases while political and social factors influence opinions on tax equity.

Musgrave, (1969) divided the period of economic development into two; namely the early period when an economy is relatively underdeveloped and the later period when the economy is developed. During the early period, there is limited scope for the use of direct taxes because the majority of the populace resides in the rural areas and are engaged in subsistence agriculture. Because their incomes are difficult to estimate, tax assessment at this stage is based on presumptions and prone to wide margins of error. This problem necessitates the use of the ability-to-pay principle, effectively limiting personal income taxation to the wage income of civil servants and employees of large firms both of which account for an insignificant proportion of the total working population.

During the early period of economic development, direct taxes in form of company income taxes cannot be important because there are few home-based industries. The same principle applies to excise tax on locally manufactured goods. Both will increase in relative importance as economic development progresses due to the growth or non-static

nature of the bases of these taxes. Also at this stage, several retail outlets make a sales tax system difficult to implement and a multi-stage sales tax system even more so.

At this stage also, taxes are difficult to collect because of the lack of skills and facilities for tax administration. Given this, a complicated tax structure is not feasible and the amount of revenue from personal income tax will depend on taxpayers' compliance and the efficiency of the tax collector.

An important source of Government revenue during the early stage of economic development is the foreign trade sector because exports and imports are readily identifiable and they pass through few ports. However, revenue from export and custom duties is not stable because of periodic fluctuations in the prices of primary products (Musgrave 1969). Economic development brings with it an increase in the share of direct taxes in total revenue. This is consistent with the experience of developed economies in which direct taxes yields more revenue than indirect taxes. For example, personal income tax becomes important as the share of employment as well as the industrial sector increases. Musgrave (1969) noted that at this stage, taxes maybe imposed on firms or individuals, on expenditure or receipts, and factor inputs or products, among others. The study further argued that there would be a tendency to shift from indirect to direct taxes. This theory still represents a benchmark against which country specific empirical evidence may be compared.

Hinrichs (1966) holds an opposite view. According to Hinrich, countries tend to move in the course of development from an early period in which the ratio of direct to indirect tax revenue is higher

through stages in which indirect taxation becomes more important and finally to a stage in which direct taxes are again dominant.

Leuthold (2000) observed that tax structures in developing nations (LDCs) differ markedly from those in developed economies (DCs). These differences were attributed to the structure of the economies, high population growth rate, low literacy plus education levels and openness to trade.

In the early stages of development, the agricultural sector dominates the economy. Agricultural activities include forestry, hunting, fishing, crop cultivation and livestock production. A dominant agriculture sector constraints tax structure in several ways as it is traditionally difficult to tax. Record keeping maybe poor or non-existent especially for small producers. Taxes on the inputs to agriculture such as land or labour are difficult to administer and could be unpopular (Leuthold, 2000).

Most developing nations exhibit demographic structures that consist of high population growth rate characterized by rapid growing labour force, high proportions of children and low proportion of retirees. The age structure of the population has implications on the demand for education, social security, health care etcetera, and thus on the taxes that fund these services.

High population growth rates are also associated with low levels of literacy. Low literacy and education levels make certain types of personal and corporate taxes impossible to implement due to compliance problems (Leuthold, 2000). Leuthold concluded that low literacy levels, poor income reporting and inadequate accounting systems inhibit the use of income reporting which limit the use of

income taxes in LDCs, especially individual income tax. On the other hand, social security taxes are usually not important in LDCs, because social security systems have not yet been developed.

Less developed countries LDCs are distinguished by open economies in which exports and imports constitute a high proportion of GDP. In this case, tariffs on imports are an important source of Government revenue.

2.2 Techniques for estimating Buoyancy and Elasticity of a tax system

Tax buoyancy measures tend to vary from year to year and therefore it is more useful to measure it over a longer period of time. There are a number of different ways to do this. First, Calculate buoyancy for each year and then take the average. This has the disadvantage that it can be heavily influenced by unusually high or low measures and so is the least satisfactory approach.

Second, calculate the growth of tax revenue and of the base (GDP) between the end years and use these to calculate buoyancy. The problem here is that the result is sensitive to the end of years chosen, but it does not have the advantage that one only needs to have data on revenue and GDP for two years appropriately spaced. Third, calculate the growth of tax between the average end years (for example the average of the first three years of the series, compared with the last three years of the series. This is less sensitive to the choice of years than the procedure in the second method but requires more data.

Fourth, regress the log of tax revenue on the GDP, to get the average growth rate of tax revenue. Do the same for the base (for example, GDP). The growth rates are the coefficients of the independent variable. Use these growth rates to calculate buoyancy. This procedure generally yields sensible results, but is least successful in cases where the coefficients in the regressions are not statistically significant or where the growth rate of the base is very small.

Fifth, regress the log of tax revenue on the log of the base (GDP). The coefficient on this log of the base is a measure of the tax buoyancy. This is an elegant approach, although the results are somewhat sensitive to unusual years (outliers) and to the time interval used in the regression.

In adjusting the HTSTD to discretionary effects, the common practice has been to use the Proportional Adjustment technique (PA), The Constant Rate Structure (CRS), The Divisia Index Approach (DI), and the Dummy variable Approach (DVA). The PA and CRS approaches apply the adjusted HTSTD while the DI and DVA apply the unadjusted HTSTD. Each of the four methods is analysed below:

(a) Proportional Adjustment (PA)

This was originally developed by Prest(1962) and has since been used by Mansfield(1972), Jeetun(1978), Sury(1985), Gillani(1986), Lambert & Suckling (1986) and Osoro (1993).

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. This series is further adjusted by excluding the continuing impact of each discretionary change on future year's tax revenue. Estimation

and separation of discretionary effects from the tax revenue is done as follows:

$$T_{1,j} = T_{j-1} \quad x \quad \frac{T_{j-2,j-1}}{T_{j-1}} \quad - - - \quad \frac{T_{2,3}}{T_3} \times \frac{T_{1,2}}{T_2} \quad \text{.....(2)}$$

where $T_{1,j}$ = Actual yield in the j^{th} year

T_{1-j} = tax collections of the j^{th} year adjusted to the structure of the i^{th} year chosen as the base year.

T_{j-1} , $j = T_j - D_j$

Where D_j = the revenue effect of discretionary changes in the j^{th} year.

The resulting series shows only the tax revenue which would have accrued without discretionary changes and this can now be applied to give the elasticity coefficient. The Proportional Adjustment is preferred in cases where full and reliable information of the discretionary tax revenue effects exist. Its weakness lies on its over reliance on budget estimates of discretionary effects of the tax yield which tend to differ substantially from the actual taxes collected.

(b) The Constant Rate Structure (CRS)

It involves the generation of a simulated tax revenue series on the basis of the effective tax rate for a given reference year and estimates of the tax base for subsequent years.

It is clearly the most accurate of the four methods provided that both the tax and its base are defined narrowly enough to permit application of the reference year rates to later year tax bases with a certain degree of confidence. For instance, this method cannot be applied to broad

tax categories such as excise or customs, but to individual products within these categories.

It is evident, however, that such a procedure will usually be extremely cumbersome if it is applied to the full range of tax instruments that exists in any country, and that its data requirements are necessarily very heavy indeed.

As a consequence, the CRS method is rarely used for analytical purposes, and is normally relevant only when substantial changes are being considered in the tax structure. This method is useful, in cases where revenue neutral tax simplifications are being worked out.

If there is data on income bracket (or commodity) rates and sufficiently disaggregated information on the growth and distribution of the reported tax bases, then a constant rate base representing a hypothetical tax revenue under a system assumed to remain unchanged during the period under review can be constructed as shown below:

$$T^*_t = \sum_{i=0}^{n} (R_{io})(B_{it})$$

Where

T^* = adjusted HTSTD to discretionary changes.

R_{io} = the base-year statutory tax rate on the i^{th} income bracket (or commodity) in the t^{th} year

h = number of income brackets (or commodities)

(c) The Dummy Variable Approach (DVA)

This involves the introduction of a dummy variable for each exogenous tax policy change. It was used by Chand and Wolf (1973), Khan (1973) and Artus (1974). The dummy variable is used as a

proxy for each of the DTMs to estimate tax elasticity by means of a single –equation model of the form:

$$\text{Log } T = \beta_o + \beta_1 \text{ Log } Y + \beta_2 D_i$$

where

D_i – dummy which take 0 before the discharge and 1 after.

β_1 = elasticity coefficient

It is simple to use since it does not require the adjustment of tax revenue data. However, it is not very effective when discretionary changes have been so frequent in the past, since it lead to an excessive reduction in the degrees of freedom and thereby to the efficiency of the estimators. Moreover, it creates a potential multi-co linearity problem from the inclusion of more than one dummy variable into the tax function.

(d) Divisia Index Approach

Like the dummy variable approach this method introduces a proxy for discretionary tax measures. And it has been used by Choudry (1979). The divisa index is used in the measurement of technical change. The effects of technical change in production are taken to be the same as the effects of discretionary changes in revenue for yields. Discretionary changes cause increases in tax yield over and above those arising from automatic growth in the tax bases just like technical change causes changes in total productivity over and above those from the increase in factor inputs. The growth in revenue maps the upward movement along the tax yield curve caused by increases in the tax bases.

These movements can be represented by the elasticity of the tax yield because its an aggregate measure of automatic growth in bases. Divisia index is equal to the percentage increase in total tax yield owing to the automatic increase in the tax bases. The index is derived from the aggregate tax function analogous to production function which must possess the invariance property, i.e. if no discretionary measures exist then there is no discretionary revenue change and the growth in tax bases.

For this invariant property the necessary and sufficient conditions for the divisia index are:

(i) Existence of a well defined continuously differentiable aggregate function f $(x_i(t), \ldots\ldots\ldots x_k(t)$

(ii) The function (f) is homogenous of degree one.

The method uses time trends as proxies for discretionary changes and this is a major point of weakness in as much as it introduces some bias in the estimation of discretionary measures leading to either an over estimation or underestimation of the adjusted tax revenue. Also the formula derived to estimate the tax elasticity is a line integral and in practical application, its discrete version is used causing bias in estimation of revenue impact of discretionary changes.

However, it provides estimates of the discretionary changes especially where the revenue effects of discretionary measures are not available.

To establish an exact relationship between the adjusted tax data and the economic variables i.e. proxy base. There was need to determine the bases using the national accounts.

The study is based on the assumption that the following national account component corresponds most closely to the base for a particular tax. The various taxes are assumed to relate to the following proxy bases:

Overall tax system is related to GDP, while Import duty is related to total imports, whereas Excise tax is related to Private consumption and VAT/Sales tax is related to Private consumption and Direct taxes is related to Domestic income at factor cost.

(i) Adjusted series for years n-2 equals

$$AT_{n-2} = T_{n-2} * \left[\frac{T_n}{T_n - D_n}\right] * \left[\frac{T_{n-1}}{(T_{n-1} - D_{n-1})}\right]$$

Tax changes in current year

Tax changes introduced in previous year

This would adjust the tax revenues from year n-2 to the account year's tax structure by taking into account the tax changes in the previous year and in the current year. For example:

$$\text{Tax changes in current year} = \frac{\text{Revenue Year 5}}{\text{Revenue Year 5-discretionary year5}}$$

Tax changes introduced in the previous year are given by: (coefficient of change of T_{n-1}) * (cumulative coefficient of change of T_n). The series is then built up.

(ii) Thereafter we use the regression equation to determine the elasticity. The real numbers are converted in Log form and then regressed.

The general form of the forecasting model is expressed as:

$AT_j = \alpha + \beta Y_j$

Where AT_j = adjusted tax revenues in year j

Y_j = the tax base in year j

α = coefficient to be estimated

β = coefficient to be estimated

Alternatively, the same relationship maybe expressed in log terms.

$L_n AT_j = Y + \delta * L_n Y_j$

where:

$$\delta = \left[\frac{\Delta AT_j}{AT_j}\right] \Big/ \left[\frac{\Delta Y_j}{Y_j}\right] = \left[\frac{\%AT_j}{\%Y_j}\right]$$

The advantage of using log form is that the coefficient of Y_j, δ becomes the tax elasticity.

The estimated elasticity can be used to forecast the future revenue stream. For example, forecast tax revenue for year 2004 would be given by = [Tax revenue of 2003] + [Δ in GDP from 2003 to 2004]* Elasticity.

The Steps used to derive the series are as follows:

(i) Compilation of actual revenue collections throughout the period – 1973 – 2003.
Tax revenue over 30 years to give:

$T_1, T_2, T_3 \ldots\ldots\ldots\ldots\ldots T_{30}, T_{31}, \ldots\ldots T_{n-1}, T_n$

(ii) Compute data series for discretionary changes
$D_1, D_2 \ldots\ldots\ldots\ldots\ldots D_{30}, D_{31}\ldots\ldots D_{n-1}---D_n$

(iii) Adjust actual tax revenue series using discretionary change coefficient. For the thirty-third year (2003) no adjustment is needed since the tax collection includes discretionary changes. In other words, the tax revenue in the 33rd year reflects the current tax structure.

In order to reflect the current tax system, the adjustment for the year n-1 was as follows:

$$AT_{n-1} = T_{n-1} * \left[\frac{T_n}{T_n - D_n} \right]$$

where AT_{n-1} - adjusted series for T_{n-1}

2.3 Empirical Literature

2.3.1 Literature Across Africa

Various studies have been conducted on the productivity of tax systems of different countries using elasticity and buoyancy as indicators of productivity. For example in Nigeria, Zimbabwe, Ghana, Uganda, Malawi, Tanzania and Zambia.

Ghai (1965) devised a method for calculating the income elasticity of the Ugandan tax structure. The study suggested that a more promising avenue to increasing the elasticity of the entire tax was to operate through tax bases especially through indirect taxes.

Osoro (1993) estimated the revenue productivity implication of tax reforms in Tanzania. The study concluded that tax reforms had failed to raise revenue productivity and that the predicted response of tax base to income must be seriously considered.

Osoro (1995) blended the analysis of revenue productivity with that of tax exemptions for Tanzania. For the period 1979-89, the study found that the overall elasticities was 0.80, while for 1962-90, it was 0.76 with a buoyancy of 1.06. The inelasticity in the tax system was attributed to poor tax administration and numerous exemptions.

Chidakwa (1996) evaluated the Zimbabwean tax system for the period 1968/69 – 1990/91 using ordinary least squares, and the error correction model. Data was transformed by the Proportional Adjustment method. The study revealed that productivity of some taxes improved after independence in 1980 while others worsened.

Ariyo (1997) analysed the productivity of the Nigerian tax system between 1970-1990. Although the productivity appeared satisfactory, the results indicated wide variations in the level of productivity by tax source. This was attributed to laxity in the administration of non-oil tax sources during the oil boom periods.

Kusi (1998) studied tax reform and revenue productivity of Ghana for the period 1970-1993. The data for 1970/ 1982 showed buoyancy of 0.72 and elasticity of 0.71. The data after reforms covering 1983-

1993 showed increased buoyancy and elasticity of 1.29 and 1.22. The results showed that tax reforms contributed greatly to the growth of revenue productivity from 1983-1993.

Chipeta (1998) analysed tax reforms and tax yield in Malawi for the period 1970-1994. The results indicated buoyancy of 0.95 and elasticity of 0.6. This was due to the generally low base to income elasticities implying that tax bases have grown less rapidly than GDP.

Milambo (2001) studied the Zambia case for the period 1981-1999 using the Divisia Index approach. The results showed elasticity of 1.15 and buoyancy of 2.0 confirming that tax reforms had improved the productivity of the overall tax system.

2.3.2 Specific Literature on Kenya

A number of studies have been carried out on the Kenyan tax system, some focusing on individual tax bases and others on the overall tax system. Highlights of such studies include the following:

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

Ole (1975) analyzed the income elasticity of the tax structure between 1962-1973. The results showed that the tax structure was not very buoyant but the country could rely on foreign assistance to fill the deficit.. He recommended that the system required urgent reforms to improve its productivity.

Mwega (1986) used a computable general equilibrium model to study the incidence of taxes, levies and transfers in Kenya. The incidence of the system of taxes and levies on income was found to be mixed, but broadly had a progressive impact on household income. The system became unambiguously progressive when voluntary income transfers were taken into consideration. A sensitivity experiment in which production parameters were radically changed did not change these conclusions.

Mwarania (1988) evaluating the problems of increased expenditures as compared to revenues reported that collection administration was inefficient. Also the revenue base of taxpayers was narrow because of low incomes of the majority of Kenyans.

Kiptui (1989) followed the Oliver - Tanzi proposal of measuring the bi-directional effects of inflation and fiscal deficits. The study reported that inflation in Less Developed Countries is caused by fall in real value of revenues due to lags in collection. This fall becomes a contributory factor in the inflation process when the affected Governments continue to finance deficits through printing of money.

Wawire (1991) identified major economic factors that influence the capacity to levy and to pay taxes in Kenya. Relative influences of these factors on tax revenue were then measured using regression methods. On the basis of empirical evidence, the study concluded that an increase in the volume of international trade, manufacturing, mining, quarrying, building and construction increases the tax ratio (Tax/GDP). However, the tax ratio was inversely correlated with GDP shares of agriculture, forestry and fishing sectors implying regressivity of agricultural based taxes.

Njoroge (1993) studied revenue productivity of tax reforms in Kenya for the period 1972/73 to 1990/91. The study observed that the Government, faced with a persistent and growing deficit was implementing various tax reforms. But alongside such revenue shortfalls, there was the general belief among citizens that they were overtaxed, implying the presence of inappropriate expenditure patterns. Analysis of data for the period1972 to 1981 showed income elasticity of the total structure was 0.67.

Those of individual taxes were divergent with that of sale tax showing a rate of 0.60, import tax – 0.45 and income tax was 0.93. An overall elasticity of 0.67 implied that the Government received a decreasing share of raising national income in tax revenues. Buoyancy for the overall tax system for the same period was 1.19, implying that for every 10 percent rise in national income, total tax revenue rose by 11.99 percent. The period 1982-1991 showed overall elasticity of 0.86 while buoyancy was 1.0 percent. The study concluded that from a revenue aspect, the tax system did not meet its targets. Therefore the tax system required constant review as the structure of the economy changes.

Adari (1997) focused on the introduction of VAT to replace sales tax in 1990. The study analyzed the structure, administration and performance of VAT. The estimated buoyancy and elasticity for VAT was less than unity. The low response of the VAT revenue to changes in income was attributed to the low tax-to-base elasticity, suggesting some laxity and deficiencies in the tax administration.

Mwanzia (1997) studied the impact of tax reforms on buoyancy and elasticity of the Kenyan tax system for the period 1972/73 to 1995/96. The tax system was found to be the inelastic to income and

this was attributed mainly to the inelasticity of the base to tax. The inelastic base was as a result of generous tax allowances and exemptions. In addition to this the underground economy represented by informal sector and black market was also a major factor in limiting the effectiveness of tax reforms. The study concluded that in order to improve productivity measures targeting tax administration should be intensified.

Wangombe, (1999) analyzed the revenue productivity and some administrative factors of the Kenyan tax system for the period 1989-1998. This study was motivated by the role played by budgets in initiating growth and maintaining political power. Buoyancy estimates for the total tax system was 1.26 while the elasticity was 1.27. The study concluded that the tax system in general was both elastic and buoyant for the period 1989-1998 implying that tax reforms had greatly improved productivity. Discretionary tax measures had a very small effect on tax productivity implying that efficiency had improved compared to previous studies.

Muriithi and Moyi (2003) studied tax reforms and revenue mobilization in Kenya for the period 1996 to 2003. In the said period there was implementation of tax modernization programme to ensure that the revenue structure was flexible enough to guarantee increased revenues during the growth process without the necessity of resorting to discretionary financing. The findings suggest 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 an inelastic situation for indirect taxes.

2.4 Overview of Literature

The period covered by the previous studies were characterized by different economic circumstances and there is therefore the need to capture the impact of the current macro-economic factors on revenue productivity; This study goes a step further, by consolidating the years of study from 1973 – 2003 to capture both past and present conditions. The analysis, therefore, forms a stronger comparative basis than previous studies.

The literature examined various techniques used for adjusting tax revenue statistics in order to estimate elasticity. The models are based on time series data thereby giving the name Historical Time Series Tax Data (HTSTD). In order to estimate elasticity there is the need to isolate the effect of discretionary changes in tax policy on tax revenue. These changes are known as discretionary tax measures (DTMs).

There are two types of GDP based tax forecasting models, namely dynamic and static. The dynamic models are comprehensive by their nature, taking into account the responses of tax bases when discretionary changes are introduced into the tax system. However, in order to capture such linkages, these sophisticated econometric models require a relatively large amount of solid disaggregated information and sophisticated computer skills. The static models are often used because of information constraints and limited sophisticated computer skills. They are based upon predetermined paradigms for different types of tax and data is obtained from macroeconomic variables derived from national accounts.

However these historical data series of tax revenue have embedded in them the effects of increases in national income or expenditures, as well as discretionary changes made in the tax system over time. There is therefore, the need to segregate the pure response of tax revenues to increases in income or expenditure from changes in revenue brought about by discretionary changes. The various methods examined were constant rate structure (CRS) the Divisia Index technique (D.I.), the Dummy variable approach (DV) and the Proportional Adjustment Technique (PA).

Of the various methods, Choudry (1979) carried out a detailed comparison of them and concluded that the P.A. technique is superior. This is because the study revealed that the elasticity estimates based on the CRS are uniformly smaller than those of any other three methods. The P.A. method reported results closer to the D.I. method. Analytically the D.I. and P.A. are similar. However, the study concluded that the P.A. method is superior to the D.I. which in turn is superior to the CRS.

Nevertheless the choice of P.A. method should be determined by the availability of data and type and frequency of the changes. This is because the findings depend on specific conditions and structure of the economic structure and cannot be generalized.

The constant rate structure method, which involves the generation of a simulated tax revenue series on the basis of the effective tax rate for a given reference year and estimates of the tax base for subsequent years, is clearly the most accurate provided that both the tax and its base are defined narrowly enough to permit application of the reference year rates to later year tax bases with a certain degree of confidence. It is evident, however, that such a procedure will usually

be extremely cumbersome if it is applied to the full range of tax instruments that exists in any country, and that its data requirements are necessarily very heavy indeed. As a consequence, the constant rate structure method is rarely used for analytical purposes, and is normally relevant only when substantial changes are being considered in the tax structure.

For most analytical work, therefore, recourse is taken to one of the other three methods. Of these, the Divisia index and the econometric methods are least demanding in terms of data requirements, since they rely mainly on actual tax collections and tax base measures at fairly aggregative levels. Nevertheless, they are both subject to certain weakness, which need to be noted. As far as the Divisia index is concerned, its computation is predicated on the conditions that the underlying tax function is continuously differentiable and homogenous, preferably linear homogenous. Although these may not seem to be particularly demanding conditions, there are serious doubts about their validity when the aggregate tax to which it is being applied comprises of a non-constant set of items on which taxes are being levied.

The econometric models, which rely mainly on using dummy variables to capture discretionary changes in tax rates and tax structures, cannot be used if discretionary tax changes have been made frequently in the past, since it leads to an excessive reduction in the degrees of freedom and thereby to the efficiency of the estimators. Even if the number of such discretionary changes is relatively small, serious problems can rise in the specification of the estimation equations unless there is information on the nature of the tax changes and the extent to which their effects are independent of one another.

CHAPTER THREE

THEORETICAL FRAMEWORK AND METHODOLOGY

3.1 Theoretical framework

Conventionally, the elasticity of total tax revenue in relation to income has been presented in aggregate models as a single number. However, the overall tax elasticity is a weighted average of the sum of the elasticities of individual taxes that respond in diverse ways to changes in income. Therefore an evaluation of the overall tax elasticity consists of individual tax elasticities.

Mansfield (1972) has defined these elasticities as follows:

(i) Elasticity of total tax revenue to income,

$$ET_t Y = \frac{\Delta T_t}{\Delta Y} \cdot \frac{Y}{T_t}$$

(ii) Elasticity of Kth individual tax to income

$E_{T_K} Y = \frac{\Delta T_K}{\Delta Y} \cdot \frac{Y}{T_K}$. It is a measure of the effect of economic growth on a particular sector of the economy. This elasticity is affected by the economic structure.

(iii) Elasticity of Kth individual tax to base.

$E_{T_K} B_K = \frac{\Delta T_K}{\Delta B_K} \cdot \frac{B_K}{T_K}$. It is a function of the legal structure and tax compliance and thus, it is a measure of the effectiveness of tax policy.

(iv) Elasticity of k^{th} individual base to income

$$E_{BK}Y = \frac{\Delta_{BK}}{\Delta_y} \bullet \frac{Y}{B_K}$$

where:

E_T	=	tax elasticity
T_t	=	total tax revenue
T_k	=	revenue from k^{th} tax
Y	=	income (GDP)
B_K	=	Base of k^{th} tax
Δ	=	change in the variable

Given these definitions of elasticity, the elasticity of total tax revenue to income is equal to the weighted sum of individual tax elasticities as shown below:

$$ET_tY = \frac{T_I}{T_t}\left(\frac{T_t}{\Delta Y} \cdot \frac{Y}{T_I}\right) + \ldots\ldots\ldots + \frac{T_K}{T_t}\left(\frac{\Delta T_K}{\Delta Y} \cdot \frac{Y}{T_k}\right) + \ldots\ldots + \frac{T_N}{T_t}\left(\frac{\Delta T_N}{\Delta Y} \cdot \frac{Y}{T_n}\right) \quad \ldots.(3.1)$$

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

$$E_{T_{KY}} = \left(\frac{\Delta T}{\Delta B_K} \cdot \frac{B_K}{T_K}\right)\left(\frac{\Delta B_K}{\Delta Y} \cdot \frac{Y}{B_K}\right)$$

Analysis of the income elasticity of a tax system permits identification of the sources of fast revenue growth or conversely the cause of lagging revenue growth. It also permits the identification of that part of revenue growth within the control of the Government. The tax constituent of elasticity may be raised by an improvement in administration. In this sense the tax-to-base constituent of elasticity is partly within the control of the Government.

On the other hand, the growth of the tax base lies outside the control of the Government apart from the influence of the tax policy itself, and is largely determined by the structure of the economy.

Tax buoyancy can be expressed as follows:

$E_{TY}^{b} = \frac{\Delta T^{b}}{\Delta Y} \cdot \frac{Y}{T^{b}}$, where:

E_{TY}^{b}	=	buoyancy of tax revenue to income
T^{b}	=	Total tax revenue
ΔT^{b}	=	% change of total tax revenue
Y	=	income or GDP
ΔY	=	% change in income or GDP

Buoyancy may be better expressed by breaking down the total tax system into individual taxes such as:

(i)	T_1^{b}	=	VAT
(ii)	T_2^{b}	=	Customs and excise taxes
(iii)	T_3^{b}	=	Motor vehicle taxes
(iv)	T_4^{b}	=	Income tax/ Direct tax

Symbolically total tax revenue would comprise the component taxes.

$$T^{b} = T_1^{b} + T_2^{b} + T_3^{b} + T_4^{b} \quad \text{..... (3.2)}$$

$$\Delta T^{b} = \Delta T_1^{b} + \Delta T_2^{b} + \Delta T_3^{b} + \Delta T_4^{b} \quad \text{.....(3.3)}$$

$$E_{TY}^{b} = \frac{\left(\Delta T_1^{b} + \Delta T_2^{b} + \Delta T_3^{b} + \Delta_4^{b}\right)}{\Delta Y} \cdot \frac{Y}{T_1^{b}} \quad \text{..... (3.4)}$$

$$E^b_{TY} = \left[\frac{\Delta T^b_1}{\Delta Y} \cdot \frac{Y}{T^b}\right] + \left[\frac{\Delta T^b_2}{\Delta Y} \cdot \frac{Y}{T^b}\right] + \left[\frac{\Delta T^b_3}{\Delta Y} \cdot \frac{Y}{T^b}\right] + \left[\frac{\Delta T^b_4}{\Delta Y} \cdot \frac{Y}{T^b}\right] \quad \text{..... (3.5)}$$

$$E^b_{TY} = \frac{T^b_1}{T^b}\left[\frac{\Delta T^b_1}{\Delta Y} \cdot \frac{Y}{T^b_1}\right] + \frac{T^b_2}{T^b}\left[\frac{\Delta T^b_2}{\Delta Y} \cdot \frac{Y}{T^b_2}\right] + \frac{T^b_3}{T^b}\left[\frac{\Delta T^b_3}{\Delta Y} \cdot \frac{Y}{T^b_3}\right] + \frac{T^b_4}{T^b}\left[\frac{\Delta T^b_4}{\Delta Y} \cdot \frac{Y}{T^b}\right] \quad \text{.....(3.6)}$$

where: $E^b_{T_1Y}$ $E^b_{T_2Y}$ $E^b_{T_3Y}$ $E^b_{T_4Y}$ stand for buoyancy of tax revenue (i), (iii), (iii), iv) respectively. Then

$$E^b_{T_T} = \frac{T^b_1}{T} \cdot E^b_{T_1Y} + \frac{T^b_2}{T} \cdot E^b_{T_2Y} \div \frac{T^b_3}{T} \cdot E^b_{T_3Y} + \frac{T^b_4}{T} \cdot E^b_{T_4Y} \quad \text{..... (3.7)}$$

However, previous studies have adopted various statistical methods. This includes Mansfield (1972), Rao (1979) and Osoro (1991) among others. According to Osoro (1991) buoyancy can be measured by the following equation: $TR = a\ Y^b e_r$

where TR = total tax revenue

Y = GDP at current prices

e_r = error term

a = coefficient

A log transformation of equation 1 enable us to derive the elasticity coefficient. This is represented as $\log TR = \log a + b_{\log} Y + e_r$.

Where b provides an estimate of tax buoyancy. It measures in percentage terms the total response of tax revenues to changes in national income. Total response takes into account both increases in income and discretionary changes in tax rates bases.

However, concerning elasticity, the built-in-flexibility is altered from time to time by legislative changes in the tax structure. This is further complicated if the tax base itself is not precisely measurable and recourse has to be taken to using proxy measures. To measure

elasticity, it is necessary to isolate the effect of discretionary change in tax policy on tax revenue. Two models based on time series data have been used to estimate elasticity. These are Historical Time Series Tax Data adjusted to discretionary tax measures (HTSTD) Historical Time Series Tax Data with time trends or dummy variables as proxies for (HTSTD)

The adjusted HTSTD approach attempts to eliminate discretionary tax changes from the HTSTD and then uses the adjusted HTSTD to estimate tax elasticity by using single-equation model given below:

$\text{Log } T_i^* = + \log a + b_i \log Y + e$

where:

T^* = adjusted HTSTD to discretionary tax changes

Y = tax base or GDP

e = disturbance term or error

b_i = tax elasticity

The underlying functional relationship of the single-equation model is given as shown below:

$$T_1^* = aY^{bi}e^e$$

To estimate elasticity of tax to income where there have been discretionary changes in tax policy, the model was modified to correct for such policy changes.

The procedure entails adjusting historical tax revenue series to eliminate the effects on tax revenue of all factors apart from GDP.

3.2 Methodology

This study uses static GDP base forecasting model applying the Proportional Adjustment method (P.A.). The GDP based model captures or reflect the existence of exemptions and tax holidays within the overall tax system.

This method yields better estimates of tax elasticity than either the Divisia index or the economic methods. It does not require disaggregated data on tax rates and tax bases, which are necessary for the CRS on the hand, it cannot use only the actual tax collection as is possible with the Divisia Index. It requires the use of budget estimates of tax yield arising out of discretionary changes.

This method is based on the construction of revenue series by adjusting for the effects of discretionary changes introduced in tax systems over time. This approach requires only basic information about revenue collections for constructing the adjusted tax base series. The adjusted tax revenue will respond to changes in national income or expenditure only because the tax system is assumed to remain unchanged over the study period.

The best ex-ante estimation made by the government was used for the discretionary values (D_n) (Jenkins, Yan Kuo, Sukla 2000). This was done by isolating the data on discretionary revenue changes using budget proposals or estimates in the various annual budget speeches presented to parliament.

The adjusted series for the year n-2 equals the actual tax revenue for year 2 times the cumulative adjusted coefficient:

$$AT_{n-2} = T_{n-2} * \left[\frac{T_n}{(T_n - D_n}\right] * \left[\frac{T_{n-1}}{(T_{n-1} - D_{n-1})}\right]$$

Tax changes in Current year

Tax changes introduced in previous years

This adjusted the tax revenues from year n-2 to the current year's tax structure by taking into account the tax changes in the previous year and the current year. The expression was expanded for subsequent years.

Factoring out discretionary changes, the calculation of the value of elasticities E_{TY} for the particular tax, say income Y in year 2001 was as follows:

$$E_{TY} = \left[\frac{AT_2 - AT_1}{Y_2 - Y_1}\right] * \left[\frac{Y_1}{AT_1}\right]$$

And there after give the breakdown of elasticity of individual tax to income.

(a) Elasticity of k^{th} individual tax to income:

$$E_{T_{ky}} = \frac{\Delta T_K}{\Delta Y} \bullet \frac{Y}{T_K}$$

(b) Elasticity of k^{th} individual tax to base:

$$E_{TK\,B_K} = \frac{\Delta T_K}{\Delta B_K} \bullet \frac{B_K}{T_k}$$

(c) Elasticity of k^{th} individual base to income

$$E_{B_k Y} = \frac{\Delta B_K}{\Delta Y} \bullet \frac{Y}{B_K}$$

(d) Elasticity of total tax revenue to income

$$E_{T_t Y} = \frac{\Delta T_t}{\Delta_Y} \bullet \frac{Y}{T_K}$$

where:

T_t - total tax revenue

T_k - revenue from k^{th} tax

Y - Income (GDP

B_k - base of k^{th} tax

Δ - the iscrete change in the variable associated with it

And the buoyancy E^b of the same tax in year 2 can be expressed as follows:

$$E^b = \left[\frac{T_2 - T_1}{Y_2 - Y_1}\right] * \left[\frac{Y_1}{T_1}\right]$$

In other words, if unadjusted tax revenue was used to regress on the respective GDP, the result was buoyancy. However, when an adjusted tax revenue stream was employed the result was tax elasticity coefficient.

3.3 Justification of Method Adopted by the Study

Published data was used in the study. Various Government publications such as the annual statistical abstracts, Economic Surveys, Budget estimates, Central Bank Statistics was used.

The proportional adjustment technique is a static GDP based tax forecasting model using regression analysis. Regression analysis is

useful for forecasting, segmentation and estimating the effects of elements of the different tax bases. This is because the basic purpose of regression analysis is to estimate the relationship between variables. The static forecasting model applied was more suitable to the available data in Kenya as it required only basic information about revenue collections which were readily available.

The constant rate method (CRS) required a detailed tax base series for all the individual taxes, which was difficult to obtain from the existing data sources. Besides, it was difficult to get the same tax base over the years. This method could have been used if only the number of items was small, the range of tax rates was narrow and the data could be compiled relatively easily.

The Divisia Index approach (DI) uses time trends as proxies for discretionary changes and this is its major point of weakness. The formula derived to estimate the tax elasticity is a line integral and in practical application, its discrete version was to be used thereby causing bias in estimation of revenue impact of discretionary changes.

The Dummy variable approach is not very effective when discretionary changes have been so frequent in the past. Besides, it creates a potential multicollinearity problem from the inclusion of more than one dummy variable into the tax function. And since, there have been frequent discretionary changes in the past, this method could not be used.

Dynamic models are more comprehensive by their nature. They also take into account the responses of tax bases when discretionary changes are introduced into the tax system. These models consider the expected behavioural responses of economic sectors to the

introduction of new taxes or to changes in the existing tax laws. Therefore, tax bases are not assumed to be fixed when forecasting future revenue flows, as the basis are supposed to respond to the new tax regime.

Unlike dynamic models, the P.A. technique being a static model does not provide feedback between taxes and bases as the bases are considered predetermined. Essentially, this technique estimates what the tax receipts would be in the absence of discretionary changes. The validity of this technique is contingent on the assumption that discretionary changes are more or less progressive than the tax structure that they modified (Leuthold and N'Guessan, 1986: page 23 Chipeta (1998). This assumption is not likely to hold. According to the available statistics, there are no data on revenue receipts directly and strictly attributable to discretionary changes in tax policy apart from estimates derived from the budget programmes.

The approach is highly aggregative than other methods that decompose the elements of productivity measurement and thereby provide a better insight into how each component affects the overall productivity of a tax system. The P.A. method is unable to completely adjust the HTSTD to discretionary changes. The method uses budget estimates of discretionary tax changes which is limiting. The technique incorporates only the discretionary tax changes resulting from changes in statutory tax rates, thereby ignoring the own-and cross- DTMs indirect responses of tax revenues and the impact of changes in the degree of tax evasion, administration efficiency, tax bases and tax credit plus allowances. However, given the nature of the existing published data, as found in Budget speeches, Revenue Estimates, Statistical Abstracts and Economic Surveys, this was the most appropriate method to derive the estimates.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Stationarity Analysis

A common assumption in many time series techniques is that the data are stationary. A stationary process has the property that the mean, variance and autocorrelation structure do not change overtime (Maddala, 1988). Stationarity is therefore a stochastic process whose joint distribution of observations is not a function of time. It is called weak stationarity if only mean and standard deviation do not change with time, or strong stationarity if all possible probability distributions involving values of time series are independent of time translations. The stationarity of the time series data was checked by the ADF and PP teats for unit root.

The table below presents the unit root test for the variables

Table 4.1: Unit-Root Test Using ADF and PP tests

Variables	ADF Test		PP Test		Order of Integration
	Levels	First Difference	Levels	First Difference	
Adjusted Direct Tax	0.88	-2.96	-1.17	-4.40	1
Adjusted VAT/Sales	3.52	-3.72	-3.90	-7.24	1
Adjusted Import Duty	0.63	-5.12	0.08	-7.24	1
Adjusted Excise Duty	-0.57	-3.66	-.03	-4.54	1
Overall Tax System	-0.91	-2.91	-1.27	-4.53	1
Actual Excise Tax	-0.87	-5.72	-1.16	-10.3	1
Actual Import Duty	-1.01	-4.54	-0.88	-5.34	1
Actual Traffic Act	-0.47	-4.78	-0.06	-7.04	1
Actual VAT/Sales	-2.48	-3.82	-2.82	-6.99	1
Domestic Factor Income	-1.14	-2.60	-1.29	-4.85	1
Gross Domestic Product	-1.74	-1.95	-1.54	-2.10	1
Imports	0.16	-3.96	-0.99	-7.15	1
Final Private Consumption	-0.66	-5.91	-0.84	-12.21	1

Source: own construction

NB: Mackinnon critical values for rejection of hypothesis of a unit root are found in the appendix A.10 and Table 4.2.

As shown in the table, the hypothesis of unit root cannot be rejected in all cases using ADF. However, this is not true when the Phillip Perron Test (PP) was used. A close check at the order of integration using (PP) gives consistent results i.e. all the variables are one (1). This is justified by the value of tau-statistics which are greater than the critical values (in absolute terms).

4.2 Cointegration Analysis

The results for stationarity test indicate that all variables have a unit or are integrated of order one one (1) thus it becomes necessary to undertake test for cointegration. The aim of this is to establish whether there is a long run relationship amongst or between non-stationary variables. If there is some tendency for some linear relationship to hold amongst a set of variables over long period, cointegration test help to discover it. The test for cointegration used in this study are similar to the unit root test performed on the variables but this time the test is applied on regression residuals from each regression.

Table 4.2: ADF Test on Residual at Levels

VARIABLES		ADF TEST ON	VALUES			REJECTED/ ACCEPTED
DEPENDENT	INDEPENDENT	RESIDUALS (Levels)	1%	5%	10%	COINTEGRATION
Adjusted Direct Tax	GDP	-2.26	-3.69	-2.97	-2.62	Reject
Adjusted Import Tax	GDP	-4.25	-3.69	-2.97	-2.62	Accept
Adjusted Excise Tax	GDP	-2.11	-3.69	-2.97	-2.62	Reject
Adjusted VAT/Sales	GDP	-2.12	-3.69	-2.97	-2.62	Reject
Overall Tax System	GDP	-2.27	-3.69	-2.97	-2.62	Reject
Adjusted Direct Tax	Domestic factor Income	-2.04	-3.69	-2.97	-2.62	Reject
Adjusted Import Tax	Imports	-2.87	-3.69	-2.97	-2.62	Reject
Adjusted Excise Duty	Private consumption	-2.82	-3.69	-2.97	-2.62	Reject
Adjusted VAT/Sales	Private consumption	-2.56	-3.69	-2.97	-2.62	Reject
Domestic factor income	GDP	-1.49	-3.69	-2.97	-2.62	Reject
Imports	GDP	-1.78	-3.69	-2.97	-2.62	Reject
Private consumption	GDP	-3.91	-3.69	-2.97	-2.62	Reject
Private consumption	GDP	-3.91	-3.69	-2.97	-2.62	Accept
Actual Direct tax	GDP	-2.27	-3.69	-2.97	-2.62	Reject
Actual Import duty	GDP	-3.27	-3.69	-2.97	-2.62	Accept
Actual Excise Duty	GDP	-3.52	-3.69	-2.97	-2.62	Accept
Actual VAT/Sales tax	GDP	-2.52	-3.69	-2.97	-2.62	Reject
Actual Traffic Act	GDP	-2.68	-3.69	-2.97	-2.62	Reject
Actual Total Tax	GDP	-2.68	-3.69	-2.97	-2.62	Reject

Source: own construction using Econometric package

- All the variables in tax to base regression are not cointegrated i.e. no tax variable is cointegrated to its base.

- In the base to income regression, Final Private Consumption is cointegrated to the Base while Domestic Factor Income and Imports are not cointegrated.

In the regression involving adjusted taxes and the GDP, all the variables are not cointegrated to GDP except Adjusted Import Duty. Finally, in the Buoyancy regression Actual Import Duty and Actual Excise Duty are cointegrated to GDP while the other three variables are not.

4.3 Diagnostic Tests

(a) Ramsey Test Results

In testing for model stability, Ramsey reset test developed by Ramsey (1969) was adopted. It tests whether or not the coefficients are significant.

4.3: Ramsey Reset Tests

Dependent Variable	Independent Variable	F-statistic	Probability	Log Likelihood	Probability
Adjusted Direct tax	GDP	0.178	0.677	0.197	0.657
Adjusted Import Duty	GDP	0.922	0.345	1.007	0.316
Adjusted Excise Duty	GDP	19.58	0.000	16.360	0.000
Adjusted VAT/Sales	GDP	41.48	0.000	27.922	0
Overall Tax System	GDP	0.109	0.744	0.121	0.728
Adjusted Direct tax	Domestic factor Income	0.003	0.951	0.004	0.948
Adjusted Import tax	Imports	1.101	0.303	1.199	0.235
Adjusted Excise tax	Private Consumption	0.000	0.978	0.000	0.976
Adjusted	Private	41.196	0.000	27.796	0

Dependent Variable	Independent Variable	F-statistic	Probability	Log Likelihood	Probability
VAT/Sales	Consumption				
Domestic factor Income	GDP	0.103	0.750	0.115	0.735
Imports	GDP	16.732	0.000	14.467	0.000
Private Consumption	GDP	0.035	0.853	0.039	0.843
Private Consumption	GDP	0.035	0.853	0.039	0.843
Direct Tax	GDP	01.09	0.744	0.121	0.728
Actual Import Duty	GDP	0.088	0.768	0.098	0.754
Actual Excise duty	GDP	2.075	0.161	2.221	0.136
Actual VAT/Sales	GDP	11.35	0.002	10.524	0.001
Actual Total Tax	GDP	0.056	0.815	0.062	0.803

Source: own construction

It shows that almost all the regression are stable as reflected by value of F-statistics and the log-livelihood ratio (Results are in A.11 and Table 4.3.

(b) Normality Tests

The assumption of normality is necessary for conducting the statistical test of significance of parameter estimate and for constructing confidence levels. This test provide information on the structure of the equation residuals.

Table 4.4: Arch Residual Tests

Dependent Variable	Independent Variable	F-Statistic	Probability	Obs*R-Squared	Probability
Adjusted Direct Tax	GDP	6.110	0.200	0.352	0.021
Adjusted Import Duty	GDP	0.059	0.810	0.063	0.802
Adjusted Excise Tax	GDP	9.263	0.005	7.408	0.006
Adjusted VAT/Sales	GDP	6.111	0.020	5.352	0.020
Adjusted Overall Tax	GDP	1.346	0.256	1.377	0.240
Adjusted Direct Tax	Domestic Factor Income	6.686	0.015	5.756	0.016
Adjusted Import Duty	Imports	12.036	0.001	8.942	0.003
Adjusted Excise Tax	Private Consumption	0.051	0.822	0.055	0.814
Adjusted VAT/Sales	Private Consumption	0.152	0.699	0.163	0.687
Domestic factor Income	GDP	5.257	0.299	4.726	0.030
Imports	GDP	0.511	0.481	0.539	0.463
Private Consumption	GDP	0.013	0.908	0.015	0.904
Private Consumption	GDP	0.013	0.908	0.015	0.904
Actual Tax	GDP	5.818	0.023	5.141	0.023
Actual Import Duty	GDP	0.114	0.738	0.122	0.727
Actual Excise Duty	GDP	0.071	0.791	0.077	0.782
Actual VAT/Sales	GDP	7.672	0.010	6.417	0.011
Actual Traffic Act	GDP	5.711	0.024	5.063	0.024
Actual Total Tax	GDP	3.998	0.055	3.740	0.053

Table 4.5: Jarque Bera Tests

Dependent Variable	Independent Variable	Statistics	Probability
Adjusted direct tax	GDP	3.7	0.04
Adjusted import duty	GDP	2	0.26
Adjusted excise duty	GDP	4.03	0.09
Adjusted VAT/sales	GDP	3.27	0.84
Adjusted overall tax	GDP	8.2	0.66
Adjusted direct tax	Domestic factor Income	6.97	0.15
Adjusted import duty	Imports	0.21	0.98
Adjusted excise tax	Private Consumption	57.06	0
Adjusted VAT/sales	Private Consumption	0.81	0.95
Domestic factor income	GDP	2.9	0.19
Imports	GDP	0.87	0.64
Final private consumption	GDP	4.18	0
Final private consumption	GDP	4.18	0
Actual Direct Tax	GDP	4.41	0.11
Actual import duty	GDP	2531	0
Actual excise duty	GDP	110.9	0.00
Actual VAT/sales	GDP	0.08	0.96
Actual traffic tax	GDP	1.74	0.41
Actual total tax	GDP	1.03	0.6

Source: Own construction

The application of this test shows that the Jarque-Bera statistics ranges from 0.07 to 110.9 and the probability of obtaining such statistics under the normality assumption range from 0.11-0. 96. The results show that most of the variables are normally distributed.

4.4 Econometric Results

The results, presented in table 4.6 depict the estimates for elasticity for individual taxes and for the overall tax system.

Elasticity estimate was 0.82, an inelastic structure, though because it is less than unity, its an indication that incomes could be lagging behind GDP growth.

Table 4.6: Elasticity of Overall Tax System

TAX	ELASTICITY	t-STATISTIC	Probability Value	DW
Direct Taxes	1.0	48.42	1.22	0.60
Import Taxes	0.8	38.42	1.00	1.57
Excise Duties	0.9	26.53	1.09	0.46
Sales Tax/VAT	0.4	9.51	0.57	0.52
Traffic Act	-	-	-	-
Overall	0.8	55.97	0.99	1.16

Source: own construction

NB: Raw results see appendix II (Tables A.3, A.4, A.5 and A.7).

For the period under study, the GDP based model reflect the existence of exemptions and tax holidays within the tax system.

This is evident from the elasticity of direct taxes which is unity compared to the rest that bear the heavier burden of exemptions, credits and allowances. The estimates also revealed that changes in total revenue were to a large extent explained by variations in GDP given the high adjusted R^2 of 0.99.

Table 4.7 below shows the results for buoyancy estimates.

Table 4.7: Buoyancy of Main Taxes and Total Tax System

Tax	Buoyancy	T-Statistic	Probability Values R^2	DW
Direct Tax	1.06	50.79	1.30	0.65
Import Duty	0.97	38.36	1.19	1.14
Excise Tax	1.14	11.24	1.53	1.89
Sales Tax/Vat	0.84	23.70	1.05	0.59
Traffic	0.76	32.29	0.94	1.37
Overall	1.00	54.15	1.24	0.81

Source: own construction

NB: Raw results see appendix II table A.6 and A.7.

The buoyancy for the overall tax system is 1.00, an optimal or unit buoyant rate.

The fairly buoyant structure reveals the fact that discretionary measures that have been implemented have been very effective in raising additional revenue.

In order to identify the individual performance of the various tax handles, the individual elasticity estimates were computed. The results are presented in tables 4.8 and 4.9 (Appendix II: Tables A.3, A.4, A.5 and A.7.

The elasticities computed were of three types: tax to income, tax-to-base and base-to-income.

Table 4.8: Kenya: Elasticity of Main Taxes and Total Tax System

Tax	Tax To Income	Tax To Base	Base To Income
Direct Taxes	1.00	0.99	1.00
Import Duties	0.82	0.79	1.03
Excise Duties	0.89	0.80	0.99
Sales Tax/Vat	0.41	0.36	0.99
Traffic Act	0	0	0
Overall	0.82	0	0

Source: own construction

NB: Raw data see Appendix II Tables A.3, A.4, A.5 and A.7

From table 4.8, a number of observations can be made. For the tax-to-income, elasticity is lowest for sales tax/VAT among the tax handles, implying that revenue from this tax consists of a decreasing proportion of increase in GDP, which shows an inelastic structure. The estimates for import duties and excise tax are inelastic. While that of direct taxes is unitary. The tax to base elasticities are inelastic for sales tax/VAT and excise duties. The base to income elasticity estimates are unitary for direct taxes, import and excise duties depicting responsive bases to growth in GDP.

Table 4.9 that follows shows a decomposition of elasticity into tax to base and base to income.

Table 4.9: Decomposition of Elasticity

	Tax to Base Elasticity	t-Statistics	R2	DW	Base to income Elasticity	t - Statistic	R2	DW
Direct Taxes	0.99	39.39	0.98	0.52	1.00	74.16	0.99	0.66
Import Duties	0.79	32.46	0.97	1.56	1.03	44.55	0.98	0.89
Excise Tax	0.80	8.60	0.73	0.60	0.99	15.32	0.89	2.05
Sales Tax/Vat	0.36	7.02	0.63	0.79	0.99	15.32	0.89	2.05

The tax to base elasticity is within the control of the tax authority while the base-to-income elasticity is within the direct control of the central government.

4.5 Discussion of Results

(a) Direct Taxes

The results showed tax-to-income elasticity of 1.00, tax-to-base elasticity of 0.99 and base-to-income elasticity of 1.00 on average, a unitary structure. The high adjusted R^2 of 0.98 is an indication that

the revenue changes are to a large extent explained by variations in GDP and domestic factor incomes.

The buoyancy for the same period was 1.06, which is a reflection of the buoyant tax system and this therefore means that it is responsive to the changes in GDP as well as the various discretionary measures that have been implemented over time. This is quite impressive against the background of structural reforms that had adverse effects on incomes prompting the use of discretionary measures that cushion the low-income earners. Besides, there have been generous tax expenditures in form of 10 year tax holiday for a class of investors, capital allowances and personal reliefs (Republic of Kenya, 2002).

(b) Import Duties

sults revealed a tax-to-income elasticity of 0.82, a tax to-base :ity of 0.79 and a base-to-income one of 1.032. The elasticity is :t unity for the first two types of elasticities though there is usly the need for further intervention to improve elasticity for rt duties. This is crucial given that it is a convenient tax handle cially for an open economy like that of Kenya. On the other hand, base-to-income elasticity was unity implying an elastic system for orts in relation to changes in GDP. The buoyancy estimate for import duty was 0.97, almost unity, therefore it is fairly responsive to the GDP and other discretionary measures that have been enforced in that sector.

(c) Excise Duties.

The tax-to–income elasticity estimate was 0.89, the tax-to-base estimate was 0.99. The results show an inelastic structure and there is need for urgent measures to improve the elasticity to at least an

index of unity. Excise duties are also a convenient tax handle and are characterized by fairly low administrative costs. The buoyancy was 1.14, which is quite impressive as it confirms the fact that the discretionary measures in place were effective in raising additional revenue.

(d) Sales Taxes/VAT

The results show an inelastic situation for the tax-to-income elasticity, an estimate of 0.41 and tax-to-base inelasticity estimate of 0.36. The proxy base used was final private consumption. The inelasticity of this tax give an indication that the tax is not responsive to income nor to its base which could be attributed to either tax evasion, skewed consumption patterns or inappropriate tax thresholds. Generally, there is need for urgent intervention policy measures to improve the elasticity. In contrast, the base-to-income elasticity estimate was inelastic (0.99), an indication that final consumption responds to changes in GDP. The buoyancy results showed an index of 0.84, which is inelastic, a revelation of the fact that discretionary measures in place have not been effective in raising additional revenue but there is need to increase intervention efforts in this sector in order to increase the buoyancy.

(e) Traffic Act

It was not possible to compute any elasticity estimate for this tax handle, as it was not possible to approximate its proxy base in the National Accounts System. It was opted not to use final consumption due to the fact that motor vehicle owners form a small proportion of final consumption and use of secondhand motor vehicles is quite prevalent. Besides the use of discretionary measures in this sector

were not obvious from the statistical data used and therefore it was not possible to compute any adjusted traffic act data necessary for computing elasticity. The buoyancy result was 0.76, which seems inelastic, but there is need for more intervention measures to improve the buoyancy.

(f) A comparison with previous studies

Most of the studies reviewed in the literature did not decompose the tax elasticity into tax-to-income and base-to-income elasticity to facilitate analysis. Instead the studies analysed the elasticity and buoyancy of the overall tax system. This study however decomposed the tax elasticity and also analysed the overall tax structure.

For the purpose of comparison we will use the overall elasticity and buoyancy. This study reports a tax-to-income elasticity of 0.81 and a buoyancy of 1.00. This does not deviate from the previous studies, an implication that there is need for further reforms. For example, the study by Njoroge(1993) showed an elasticity of 0.67 and a buoyancy of 1.19.

Wangombe(1999) also came up with elasticity of 1.27 and a buoyancy of 1.26. On the other hand studies from outside Kenya show almost similar results. Kusi's study on Ghana as well as Chipeta's study onMalawi both reflect inelastic structures.Buoyancy reported for Ghana was 0.71 while that of Malawi was 0.95. For elasticity they had 0.72 and 0.6 respectively. Osoro's study on "Revenue Productivity Implications of Tax Reforms in Tanzania" reported a buoyancy of 1.06 and elasticity of 0.8.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATIONS

5.1 Conclusion

The elasticity and buoyancy results indicate that the tax structure is inelastic and buoyant and there is need for further reforms to enhance the productivity of the tax system. Taking optimal or neutral buoyancy and elasticity show that effects of discretionary changes on tax collection are not significant.

To improve the built–in flexibility and effectiveness of discretionary measures, there is need to apply policies that improve tax base, the levels of tax rates, or the limited use of differentiated rates, administrative efficiency and the compliance rate.

5.2 Policy Implications

It is important to note that revenue stability is crucial in order to maintain continuity of the fiscal policies of the government. Therefore it is important to identify and include the more buoyant sectors into the base. Its therefore imperative for the tax policy units to be strengthened to enable them undertake continuous evaluation of the tax bases, relative magnitude of the elasticities of demand and supply and frequent appraisal of the tax handles.

The use of inflation-adjusted base should be strengthened. This is because inflation affect depreciation allowances, accounts receivable and payable as well as cost of goods sold, together with repatriated foreign income. In addition the lag duration of collection should be kept to the optimal minimum.

The levels of tax rates in the overall tax system should be evaluated to ensure continuous rise of progressive tax structure which allows revenue to automatically rise with the increase in income. However, if an increase in wages and salaries is restrained below inflation, the base may not grow by the same amount as the growth in National Income.

There is need to increase the utilization of Withholding Tax (WHT) and presumptive taxes. Rather than resort to the suspension of presumptive taxes whenever the agricultural sector is in depression, the better option is to keep it at the optimal minimum. In order to increase elasticity there is need to increase rates of tax on commodities whose consumption is expanding fast. For example communication, various cosmetics, artificial herbal products amongst others . In addition the use of specific rates should be minimized while the use of Ad valorem tax should be increased as it allows the tax revenue to increase at the same pace as the price level, and thereby keeping the real tax value unchanged. It is advisable to convert most import and excise duties to ad valorem rates to prevent their erosion by inflation.

Excise taxes should be imposed on commodities with a high-income elasticity of demand. Concerning corporate tax, the use of flat rate should be continued. However, in setting the flat rate, the government should try to avoid discouraging investment from abroad and therefore choose a rate no higher than those prevailing in the main industrial countries but which are close to the rates in neighbouring countries.

The administrative efficiency directly affect revenue collection and there is need to continuously improve methods of revenue collection in terms of technical staff and resources used.

The tax system should be transparent so that it is easy to administer and simple for the taxpayers to comprehend with so as to discourage rent seeking behavior among the tax officers and avoid tax evasion. Therefore, the simpler and the more transparent a tax system, the lower its administration and compliance costs. Such systems help to create an economic environment that is conducive to greater social justice.

The base-to-income elasticity is within the control of the government and its important to increase the use of favourable policies that improve revenue productivity. The macroeconomic environment affect GDP, inflation, consumption, imports, exports, factor incomes and real costs. There is need to pursue favourable policies affecting foreign trade sector, inflation, price changes, devaluation of the domestic currency and change the structure of the relevant markets for goods and services.

Inflation affect depreciation allowances, accounts receivable and payable, costs of goods sold, and repatriated foreign income amongs other items.

Consumption policies may curtail the capacity of the base to increase, For example a multitude of exemptions together with the existence of a high small business threshold greatly limits the revenue generation from Sale /VAT and Excise tax. Concerning trade taxes (Excise and Import duty) the use of slab rates and exemptions further erodes potential tax revenue. In addition, the use of income tax exemptions

and allowances also erode the base. Therefore there is need to use them with reservations.

There is urgent need to review the tax expenditure analysis in order to improve the base. This is because the incentives have been directed towards investments rather than production itself due to the fact that capital is considered especially scarce and is regarded as a strategic factor closely associated with entrepreneurship. Such incentives currently in use such as accelerated depreciation and tax credits for eligible investments and tax holidays for export processing zones need to be reviewed.

Concerning management of fiscal policy there is need to anticipate and incorporate the behavioral responses to changes in the tax laws. Taxes, such as an income tax or a tax on goods and services with an inelastic demand and supply, tend to have a smaller impact on producers and consumer behaviour and therefore cause less of a distortion in the economy.

In addition, there is need to continuously evaluate the impact of non-tax policies that have an impact on the bases such as imports, final consumption, GDP, interest rates and inflation. The economy conditions of major trading partners need to be assessed on a continuous basis. So is the impact of deregulation as this automatically changes the structure of markets and final consumption.

Finally, in order to improve the macro-economic environment, there is need for increased standards of literacy, predominant money economy, prevalence of honest and reliable accounting system, degree

of voluntary compliance and a political system not dominated by wealthy groups who are acting in their self-interest.

5.3 Limitations of the Study

This study adopted Proportional Adjusted method to modify the HTSTD to correct for discretionary measures. It is therefore not sufficient to gauge the nature or results using the same data if the other three methods were also used namely, Constant Rate structure, Divisia Index or the Dummy Variable Approach.

Perhaps if the four methods are applied the results could be different. There is need to apply the other three methods and gauge the extent of applicability of available data.

The proxy bases used were as per the national accounts and it is not clear whether they precisely relate to the various taxes. The elasticity for traffic act taxes could not be estimated because it was not possible to identify its proxy base with precision.

5.4 Areas for further research

Due to limited time, the study did not anayse the impact of tax reforms on the tax structure. The period from 1990 to date has been characterized by various tax reforms, culminating into the formation of Kenya Revenue Authority in 1995, an effort to improve the institution of taxation in the country. There is need to undertake an empirical assessment of buoyancy and elasticity of the system for the period before and after the various tax reforms in Kenya.

In addition, the study did not analyse the impact of Tax Expenditures. Tax expenditures is a process of quantifying and evaluating the

impact of tax policies brought about by exemptions and incentives so provided within the tax system.

Tax expenditure occurs when some fiscal advantage is conferred on a group of individuals or a particular activity, by reducing or eliminating tax liability rather than by direct cash subsidy. They are in the form of tax allowances, reliefs, special exemptions, deductions or credits.

Tax allowances maybe a form of public welfare as well as a form of public expenditure. Tax reliefs are intended to exempt those on the lowest incomes from tax altogether, and are viewed as fiscal subsidies or fiscal benefits analogous to cash benefits or public services. It is a means of achieving social policy objectives through the tax system. Special exemptions, deductions and credits are other forms of reliefs which are used to achieve social policy objectives.

There is need to develop a Tax Expenditure Budget which may provide estimates of the costs of the major tax relief, allowance and exemption programmes. This would enhance tax planning and revenue forecasting.

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Table A.1: Actual Taxes and Actual Bases

1986	385735	246710	100900	241750	12336	987431	987431	5874	2585	4851	1337893
1987	454479	273686	118600	310250	13190	1170205	1170205	6559	2807	5351	1430881
1988	512025	300279	135100	351300	16015	1314719	1314719	7551	4696	6130	1765144
1989	599153	347968	149358	323739	16615	1436833	1436833	8643	5557	7030	2238628
1990	713084	334680	18564	421850	15093	1503271	1503271	9777	6083	8207	2545630
1991	851395	255939	340460	335630	16313	1799737	1799737	11062	6972	9540	2645913
1992	998525	459150	418355	406536	16258	2298824	2298824	12807	8487	10986	2954863
1993	1838365	739639	556267	651250	19534	3805055	3805055	19004	9845	13509	5056418
1994	2175292	929914	966613	675000	21299	4768118	4768118	20034	11444	16112	5753424
1995	2404116	1058784	1130592	737557	22971	5354020	5354020	22783	15623	22785	7758424
1996	2418751	1112703	1184361	727094	35934	5478843	5478843	26398	17972	22481	8424308
1997	2778895	1228353	141981	887400	41640	5078269	5078269	31372	22659	26813	9889433
1998	2761745	1422196	1436658	1055742	41728	6718069	6718069	34606	2662	29826	10320029
1999	2992500	1532500	1577500	1120831	43750	7267081	7267081	38019	27020	31953	12390193
2000	2671447	1440187	1415900	1311300	52450	6891284	6891284	38938	30493	34272	14505411
2001	2793098	1582450	1603847	1316273	34777	7330445	7330445	38938	34280	38501	12885502
2002	3337214	1760403	1784206	1325115	57250	8264188	8264188	38938	34659	42546	14092200
Total	33004835	16522739	13772928	14167474	549099	78017075	78017075	401113	262958	361240	125314017

Source: Adjusted Data (own computation derived from Actual data)

Table A.2: Adjusted Data (Adjusted Taxes)

Year	Direct Taxes	Import Duties	Export Tax	VAT	Traffic Act	Totals (1+2+3+4)	GDP	Private Consumption	Domestic Factor Income	Imports
	1	2	3	4	5					
1973	31250	36405	16445	31000	0	115100	952	533	739	228552
1974	39400	28203	16466	39100	0	1233169	1065	628	895	383875
1975	44757	28584	15763	54394	0	143498	1197	787	1028	362586
1976	53629	27816	17852	50630	0	149927	1454	877	1263	406997
1977	68320	54831	24337	71789	0	219277	1860	1067	1620	531448
1978	72487	53503	26963	71561	0	224514	2058	1249	2058	661125
1979	82949	54143	31600	109317	0	278008	2277	1450	2277	620156
1980	89477	68151	35797	100914	0	294339	2629	1641	2626	930127
1981	96849	87483	30371	131189	0	345892	3025	1910	3023	955905
1982	108929	77200	37286	117498	0	340913	3411	2177	3420	960127
1983	108564	79400	41091	162562	0	391617	3826	2295	3560	985621
1984	141448	71076	39720	164095	0	416339	4246	2331	3661	1097206
1985	160318	106881	44923	196637	0	508759	4810	2172	4177	1196000
1986	174140	124474	47216	135454	0	481284	5874	2585	4851	1337893
1987	205174	138084	55499	168792	0	567549	6559	2807	5351	1430881
1988	231153	150669	58588	183332	0	623742	7551	4696	6130	1765144
1989	268230	169580	51328	168476	0	657617	8643	5557	7030	2238628
1990	316548	178699	54870	192372	0	742489	9777	6083	8207	2545630
1991	374839	144666	96444	129341	0	745290	11062	6972	9540	2645913
1992	453176	205660	117660	138785	0	915281	12807	8487	10986	2954863
1993	800430	300300	139600	206178	0	1446508	19004	9845	13509	5056418
1994	933806	326234	238640	204738	0	1703418	20034	11444	16112	5753424
1995	992971	374953	274828	227747	0	1870499	22783	15623	22785	7758424
1996	992779	400705	287898	208706	0	1890088	26398	17972	22481	8424308
1997	1141052	456836	329908	245334	0	2173130	31372	22659	26813	9889433
1998	1136268	524874	333994	262957	0	2258093	34606	2662	29826	10320029
1999	1254907	568166	364412	248234	0	2435719	38019	27020	31953	12390193
2000	1097209	551645	328273	208816	0	2185943	38938	30493	34272	14505411
2001	1118423	608512	354459	200849	0	2282243	38938	34280	38501	12885502
2002	1336300	676941	342036	202198	0	2558375	38938	34659	42546	14092200
Total	**13925782**	**6674673**	**3855167**	**4632998**	**0**	**29088620**	**4001113**	**262958**	**361240**	**125314017**

Source: Republic of Kenya [1969-2004), Economic Surveys

APPENDIX II:

REGRESSION RESULTS (Method: Least Squares) (Sample Size: 30 Observations) (Sample period: 1973-2002)

Table A.3: Tax-to-Income Elasticity

Dependent Variable	Independent Variable	Adjusted R2	Ser of Regression	DW	F-Statistic	Log GDP co-efficient	Constant Co-efficient	Log GDP Statistic	Constant t-Statistic	Log GDP Standard Error	Constant Standard Error
Adjusted Direct Tax	GDP	0.98	0.14	0.6	2344.45	1	3.52	48.42	18.97	0.02	0.19
Adjusted Import Duty	GDP	0.98	0.13	1.57	1476.38	0.82	4.56	38.42	23.8	0.02	0.19
Adjusted Excise Duty	GDP	0.96	0.21	0.46	703.71	0.89	3.33	26.53	11.12	0.03	0.3
Adjusted VAT/Sales	GDP	0.76	0.28	0.52	90.49	0.41	8.17	6.51	21.08	0.04	0.39
Overall Tax Systems	GDP	0.99	0.09	1.16	3132.47	0.82	6.08	55.97	46.37	0.01	0.13

Source: Own Construction

Table A.4: Tax-to-Base Elasticity

Dependent	Independent	Adjusted R2	Ser of Regression	DW	F-Statistic	Log Domestic Factor Income	Constant Co-efficient	Log DFY t-Statistic	Constant t-Statistic	Log DFY Standard Error
Adjusted Direct Tax	Dometic Factor Incon	0.98	0.17	0.51	1551.62	0.99	3.71	39.39	16.62	0.03
Adjusted Import Duty	Imports	0.97	0.16	1.51	1053.92	0.79	0.41	32.46	1.17	0.02
Adjusted Excise Duty	Private Consumption	0.85	0.42	1.43	172.04	0.8	4.5	13.11	0.51	0.06
Adjusted VAT/Sales	Private Consumption	0.62	0.35	0.79	49.34	0.36	8.883	7.02	20.5	0.05

Source: Own Construction

Table A.5: Base-to-Income Elasticity

Dependent Variable	Independent Variable	Adjusted R2	Ser of Regression	DW	F-Statistic	Log GDP co-efficient	Constant Co-efficient	Log GDP Statistic
Domestic Factor Income	GDP	0.99	0.08	0.65	5500.096	1	-0.14	74.16
Imports	GDP	0.99	0.15	0.88	1984.42	1.03	5.37	44.55
Final Private Consumption	GDP	0.89	0.42	2.05	234.69	0.99	-0.46	15.32
Final Private Consumption	GDP	0.89	0.42	2.05	234.69	0.99	-0.46	15.32

Source: Own Construction

Table A.6: Bouyancy

Dependent Variable	Independent Variable	Adjusted R2	Ser of Regression	DW	F-Statistic	Log GDP co-efficient	Constant Co-efficient	Log GDP Statistic	Constant t-Statistic	Log GDP Standard Error
Actual Direct Taxt	GDP	0.99	0.13	0.65	2580.67	1.06	3.79	50.8	20.24	0.02
Actual Import Duty	GDP	0.98	0.17	1.13	1471.22	0.97	4	38.36	17.64	0.03
Actual Excise Duty	GDP	0.81	0.66	1.89	126.22	1.14	1.93	11.23	2.13	0.1
Actual VAT/Sales	GDP	0.95	0.23	0.58	561.85	0.84	5.15	23.7	16.17	0.03
Traffic Act	GDP	0.97	0.15	1.37	1042.65	0.76	2.68	32.29	12.68	0.02

Source: Own Construction

Table A.7: Summarised Regression Results

		VARIABLES			
	DEPENDENT	INDEPENDENT	ADJUSTED R_2	SER	DW
Tax to income	Adjusted Direct Tax	G.D.P.	0.98	0.14	0.26
	Adjusted Import Duty	G.D.P.	0.98	0.13	1.57
	Adjusted Excise Duty	G.D.P.	0.96	0.21	0.46
	Adjusted VAT/Sales	G.D.P.	0.76	0.28	0.52
	Overall Tax System	G.D.P.	0.99	0.09	1.16
Tax to Base	Adjusted Direct Tax	Domestic factor income	0.98	0.17	0.5
	Adjusted Import Duty	Imports	0.97	0.16	1.51
	Adjusted Excise Duty	Private consumption	0.85	0.42	1.43
	Adjusted VAT/Sales	Private consumption	0.62	0.35	0.79
Base to Income	Domestic factor income	G.D.P.	0.99	0.08	0.65
	Imports	G.D.P.	0.99	0.15	0.88
	Final private consumption	G.D.P.	0.89	0.42	2.05
	Final private consumption	G.D.P.	0.89	0.42	2.05
Buoyancy	Actual Direct Tax	G.D.P.	0.99	0.13	0.65
	Actual Import Duty	G.D.P.	0.98	0.17	1.13
	Actual Excise Duty	G.D.P.	0.81	0.66	1.89
	Actual VAT/Sales	G.D.P.	0.95	0.23	0.58
	Traffic Act	G.D.P.	0.97	0.15	1.37
	Actual Total Tax	G.D.P.	0.99	0.12	1.8

Source: Own Construction

APPENDIX III

UNIT ROOT TEST RESULTS

Table A.8: Unit Root Test Using ADF (Augmented Dickey Fuller)

VARIABLES	ADF TEST LEVELS	CRITICAL VALUES			ADF TEST FIRST DIFFERENCE	CRITICAL VALUES		
		1%	2%	10%		1%	5%	10%
Adjusted Tax Direct	-0.880705	-3.6852	-2.9705	-2.6242	-2.96725	-3.6959	-2.975	-2.6265
Adjusted Tax Import	-0.637352	-3.6852	-2.9705	-2.6242	-5.122788	-3.6959	-2.975	-2.6265
Adjusted Excise Duty	0.575475	-3.6852	-2.9705	-2.6242	-3.663719	-3.6959	-2.975	-2.6265
Adjusted VAT/Sales	-3.52494	-3.6852	-2.9705	-2.6242	-3.72327	-3.6959	-2.975	-2.6265
Actual Direct Tax	-0.910069	-3.6852	-2.9705	-2.6242	-2915126	-3.6959	-2.975	-2.6265
Actual Import Duty	-1.014359	-3.6852	-2.9705	-2.6242	-4.548328	-3.6959	-2.975	-2.6265
Actual Excise Duty	-0.876701	-3.6852	-2.9705	-2.6242	-5.72992	-3.6959	-2.975	-2.6265
Actual VAT/Sales	-2.487099	-3.6852	-2.9705	-2.6242	-3.824116	-3.6959	-2.975	-2.6265
Actual Traffic Act	-0.476676	-3.6852	-2.9705	-2.6242	-4.789918	-3.6959	-2.975	-2.6265
Imports	-0.166992	-3.6852	-2.9705	-2.6242	-3.966055	-3.6959	-2.975	-2.6265
Domestic Factor Income	-1.144641	-3.6852	-2.9705	-2.6242	-2.609493	-3.6959	-2.975	-2.6265
Final Private Income	-0.664856	-3.6852	-2.9705	-2.6242	-5.918464	-3.6959	-2.975	-2.6265
Log of GDO	-1.749309	-3.6852	-2.9705	-2.6242	-1.959187	-3.6959	-2.975	-2.6265

Source: Own Construction

Table A.9: Unit Root Tests using pp (Phillip Perron)

VARIABLES	PHILLIP PERROW TEST (Levels)	CRITICAL VALUES			PHILIP PERROW TESTS (First Difference)	CRITICAL VALUES		
		1%	2%	10%		1%	5%	10%
Adjusted Tax Direct	-1.177777	-3.6752	-2.9665	-2.622	-4.401031	-3.6852	-2.971	-2.6242
Adjusted Tax Import	0.082407	-3.6752	-2.9665	-2.622	-7.241707	-3.6852	-2.971	-2.6242
Adjusted Excise Duty	-0.37273	-3.6752	-2.9665	-2.622	-4.540122	-3.6852	-2.971	-2.6242
Adjusted VAT/Sales	-3.909879	-3.6752	-2.9665	-2.622	-7.245312	-3.6852	-2.971	-2.6242
Actual Direct Tax	-1.278879	-3.6752	-2.9665	-2.622	-4.530118	-3.6852	-2.971	-2.6242
Actual Import Duty	-0.880896	-3.6752	-2.9665	-2.622	-5.348655	-3.6852	-2.971	-2.6242
Actual Excise Duty	-1.167967	-3.6752	-2.9665	-2.622	-10.30138	-3.6852	-2.971	-2.6242
Actual VAT/Sales	-2.82812	-3.6752	-2.9665	-2.622	-6.999566	-3.6852	-2.971	-2.6242
Actual Traffic Act	-0.067802	-3.6752	-2.9665	-2.622	-7.046274	-3.6852	-2.971	-2.6242
Imports	-0.990159	-3.6752	-2.9665	-2.622	-7.159528	-3.6852	-2.971	-2.6242
Domestic Factor Income	-1.297386	-3.6752	-2.9665	-2.622	-4.854728	-3.6852	-2.971	-2.6242
Final Private Income	-0.845812	-3.6752	-2.9665	-2.622	-12.21827	-3.6852	-2.971	-2.6242
Log of GDO	-1.549694	-3.6752	-2.9665	-2.622	-2.108144	-3.6852	-2.971	-2.6242

Source: Own Construction

Table A.10: Summary of Cointegraton using ADF

	VARIABLES		ADF TEST ON RESIDUALS	CRITICAL VALUES			REJECT/ACCEPT COINTEGRATION
	DEPENDENT	INDEPENDENT		1%	5%	10%	
Tax to income	Adjusted Direct Tax	G.D.P.	-2.26156	-3.6852	-2.9705	-2.6242	Reject
	Adjusted Import Duty	G.D.P.	-4.254052	-3.6852	-2.9705	-2.6242	Accept
	Adjusted Excise Duty	G.D.P.	-2.115753	-3.6852	-2.9705	-2.6242	Reject
	Adjusted VAT/Sales	G.D.P.	-2.118883	-3.6852	-2.9705	-2.6242	Reject
	Overall Tax System	G.D.P.	-2.272266	-3.6852	-2.9705	-2.6242	Reject
Tax to Base	Adjusted Direct Tax	Domestic factor income	-2.044092	-3.6852	-2.9705	-2.6242	Reject
	Adjusted Import Duty	Imports	-2.872823	-3.6852	-2.9705	-2.6242	Reject
	Adjusted Excise Duty	Private consumption	-2.820153	-3.6852	-2.9705	-2.6242	Reject
	Adjusted VAT/Sales	Private consumption	2.561368	-3.6852	-2.9705	-2.6242	Reject
Base to Income	Domestic factor income	G.D.P.	-1.493999	-3.6852	-2.9705	-2.6242	Reject
	Imports	G.D.P.	-1.777844	-3.6852	-2.9705	-2.6242	Reject
	Final private consumption	G.D.P.	-3.914585	-3.6852	-2.9705	-2.6242	Reject
	Final private consumption	G.D.P.	-3.914585	-3.6852	-2.9705	-2.6242	Accept
Buoyancy	Actual Direct Tax	G.D.P.	-2.272266	-3.6852	-2.9705	-2.6242	Reject
	Actual Import Duty	G.D.P.	-3.267768	-3.6852	-2.9705	-2.6242	Accept
	Actual Excise Duty	G.D.P.	-3.521924	-3.6852	-2.9705	-2.6242	Accept
	Actual VAT/Sales	G.D.P.	-2.516097	-3.6852	-2.9705	-2.6242	Reject
	Traffic Act	G.D.P.	-2.682279	-3.6852	-2.9705	-2.6242	Reject
	Actual Total Tax	G.D.P.	-2.682279	-3.6852	-2.9705	-2.6242	Reject

Source: Own Construction

APPENDIX IV

DIAGNOSTIC TESTS

Table A.11: Ramsey Reset Tests

	VARIABLES		F-STATISTIC	PROBABILITY	LOG LIKELIHOOD RATIO	PROBABILITY
	DEPENDENT	INDEPENDENT				
Tax to income	Adjusted Direct Tax	G.D.P.	0.177885	0.676536	0.197002	0.657152
	Adjusted Import Duty	G.D.P.	0.922126	0.345439	1.007476	0.315508
	Adjusted Excise Duty	G.D.P.	19.58023	0.000143	16.36018	0.00052
	Adjusted VAT/Sales	G.D.P.	41.482	0.000001	27.922.2	0
	Overall Tax System	G.D.P.	0.109253	0.743548	0.121147	0.727794
Tax to Base	Adjusted Direct Tax	Domestic factor income	0.003791	0.951361	0.004211	0.948257
	Adjusted Import Duty	Imports	1010128	0.303288	1.199348	0.23452
	Adjusted Excise Duty	Private consumption	0.000785	0.977855	0.000872	0.97644
	Adjusted VAT/Sales	Private consumption	41.1955	0.000001	27.79625	0
Base to Income	Domestic factor income	G.D.P.	0.103346	0.750327	0.114609	0.734956
	Imports	G.D.P.	16.73154	0.000348	14.46698	0.000143
	Private consumption	G.D.P.	0.035129	0.852728	0.039006	0.843436
	Private consumption	G.D.P.	0.035129	0.852728	0.039006	0.845436
Buoyancy	Direct Tax	G.D.P.	0.109253	0.743548	0.121147	0.727794
	Actual Import Duty	G.D.P.	0.088502	0.768367	0.098175	0.754031
	Actual Excise Duty	G.D.P.	2.074821	0.161244	2.22107	0.136139
	Actual VAT/Sales	G.D.P.	11.3462	0.002287	10.52456	0.001178
	Actual Total Tax	G.D.P.	0.055844	0.814972	0.061985	0.803385

Table A.12: Arch Residual Test

Dependent Variable	Independent Variable	F-Statistics	Probability	Obs*R-Squared	Probability
Adjusted Direct Tax	GDP	6.110754	0.2003	5.352094	0.020697
Adjusted Import Duty	GDP	0.058886	0.810099	0.063111	0.801646
Adjusted Excise Duty	GDP	9.263459	0.005162	7.408017	0.006493
Adjusted AT/Sales Tax	GDP	6.111135	0.020027	5.352366	0.020694
Adjusted Overall Tax	GDP	1.34613	0.256112	1.377182	0.240582
Adjusted Direct Tax	Domestic Factor Income	6.685793	0.015437	5.75579	0.016435
Adjusted Import Duty	Imports	12.03613	0.001767	8.941661	0.002787
Adjusted Excise Duty	Private Consumption	0.05142	0.822318	0.055124	0.814375
Adjusted VAT/Sales Tax	Private Consumption	0.152298	0.699411	0.162661	0.686718
Domestic Factor Income	GDP	5.256889	0.29877	4.726116	0.029708
Imports	GDP	0.51102	0.480833	0.538678	0.462981
Private Consumption	GDP	0.013541	0.908224	0.014537	0.904033
Private Consumption	GDP	0.013541	0.908224	0.014537	0.904033
Actual Direct Tax	GDP	5.818478	0.022926	5.14149	0.023361
Actual Import Duty	GDP	0.114144	0.738088	0.122083	0.726786
Actual Excise Duty	GDP	0.07176	0.790827	0.076871	0.781583
Actual VAT/Sales Tax	GDP	7.672351	0.010019	6.417164	0.011302
Actual Traffic Act	GDP	5.710904	0.024105	5.063028	0.024442
Actual Total Tax	GDP	3.997986	0.05571	3.740294	0.053115

Source: *Own Construction*

Table a.13: Jarque Bera Tests

Dependent Variable	Independent Variable	F-Statistics	Probability
Adjusted Direct Tax	GDP	3.7	0.04
Adjusted Import Duty	GDP	2	0.26
Adjusted Excise Duty	GDP	4.03	0.09
Adjusted AT/Sales Tax	GDP	3.27	0.84
Adjusted Overall Tax	GDP	8.2	0.66
Adjusted Direct Tax	Domestic Factor Income	6.97	0.15
Adjusted Import Duty	Imports	0.21	0.98
Adjusted Excise Duty	Private Consumption	57.06	0
Adjusted VAT/Sales Tax	Private Consumption	0.81	0.95
Domestic Factor Income	GDP	2.9	0.19
Imports	GDP	0.87	0.64
Final Private Consumption	GDP	4.18	0
Final Private Consumption	GDP	4.18	0
Actual Direct Tax	GDP	4.41	0.11
Actual Import Duty	GDP	2531	0
Actual Excise Duty	GDP	110.9	0.0001
Actual VAT/Sales Tax	GDP	0.077	0.96
Actual Traffic Act	GDP	1.74	0.41
Actual Total Tax	GDP	1.03	0.6

Source: Own Construction