THE DETERMINANTS OF TAX REVENUE IN KENYA

by

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DECLARATION

This thesis is my original work and has not been presented for award of a degree in any university

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This thesis has been submitted to the School of Humanities and Social Sciences, Kenyatta University, with our approval as supervisors

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DEDICATION

I would like to dedicate this research work to my dear wife Wairimu,

and children; Muturi, Nawire, Njeri and Namisoho

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ABSTRACT

Several studies have been undertaken on the responsiveness of tax revenues to changes in GDP in Kenya. These studies have found a positive relationship between tax revenues and GDP. However, the studies omit some key determinants of tax revenues, such as the nature of the tax system and institutional, demographic and structural features of the economy. Due to this omission, the estimated income elasticities of tax revenues are unreliable for planning purposes, a situation that might be responsible for recurring budget deficits.

The main objective of this study was to examine the composition of tax revenues and properly estimate income elasticities of various taxes. The study is important because its results can be used to design pro-growth tax policies and implement tax changes that are equity enhancing.

The thesis uses Paul Samuelson's (1955) fundamental general equilibrium analysis of the public sector to derive its main results. In my framework, the demand function for the public good is derived from a constrained model of utility-maximization. In the same vein, tax revenues are taken as functions of household incomes, which paves the way for the estimation of Engel curves for public goods.

The study finds that tax elasticities for total taxes, income taxes, and excise duties with respect to GDP are less than unity. Elasticities of excise duties with respect to the volume of imports and volume of trade are also less than unity, as is the elasticity of import duty

with respect to the volume of trade. On the other hand, growth elasticities for indirect taxes and sales taxes are all greater than one. The elasticity of the direct tax revenue with respect to GDP is found to be unitary.

The estimation results show that total GDP elasticities of tax revenues are less than the elasticities with respect to monetary GDP, suggesting the existence of an underground economy in Kenya over the period analyzed. The study shows that population growth has adverse effects on tax revenues. It is found that tax revenues respond with substantial lags to changes in tax determinants and that tax revenues are sensitive to unusual circumstances. The study concludes that Kenya's tax revenues are only moderately responsive to changes in their determinants. There is therefore the challenge of creating flexibility in the tax system so that tax revenues can increase rapidly as the economy grows.

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OPERATIONAL DEFINITION OF TERMS

Ability-to-Pay principle: the idea that taxpayers should contribute to the cost of government in line with their ability-to-pay so that the tax burden is shared amongst the members of the society justly and equitably.

Benefit received principle: the idea that a taxpayer contributes in line with the benefits received from public services.

Bergson-Samuelson social welfare function: a social welfare function which is directly related to an individual's utility level and is indirectly related to his/her consumption bundles.

Budget deficit: a situation where the government receipts fall short of government expenditure.

Buoyancy of a tax: a situation where tax revenue increases with the growth of its base, but without an extension of the tax coverage or an upward revision of the tax rates.

Cointegration: existence of a long-run economic relationship between variables that becomes stationary on first differencing.

Compliance Cost: the cost incurred by the taxpayer in determining tax liability.

Deadweight loss: the lost value of goods by consumers and producers due to the reduction in the production of the goods due to tax payment.

Deficit financing: efforts taken by the government to obtain funds to cover the budget deficit.

Direct tax: tax imposed on individuals or non individuals.

Disposable personal income: gross personal income less taxes which can be saved or used for consumption.

Diversity of a tax system: a situation where tax revenue is derived from different sources so as to reduce problems encountered by changes in one source.

Domestic borrowing: the act of borrowing money by economic agents from within the economy.

Elasticity of a tax: degree of responsiveness of tax to measures taken by the authorities to increase its yield.

Equity of a tax: the idea that each taxpayer shall contribute a fair share to the cost of government operations.

Fiscal discipline: government adherence to the budgeted expenditure and revenue estimates for a particular fiscal year.

Flat rate tax: tax imposed on individuals without considering their monetary incomes.

Free riding: a situation where everyone would like to have the benefit of the good without sharing the cost of its provision.

Graduated Personal Tax: a tax assessed and paid according to actual or presumed income as determined, for example, by number of livestock. It has simple graduation rates according to blocks of taxpayers, that is, a flat money rate within each block up to that level at which income tax become effective.

Hut tax: a tax levied on each hut owned by a person irrespective of ability to pay.

Inflation: persistent increase in the general price level.

Laffer curve: a concave curve drawn by plotting the tax rates against the tax revenues.

Marginal tax cost: addition to cost of levying tax by transferring a unit of resources from private to the public sector.

Marginal tax rate: the proportion of an extra shilling of income that is paid in taxes.

Market failure: a situation in which the conditions necessary to achieve the market efficient solution fail to exist.

Pareto-optimality: a situation where it is impossible to make one person better off without making someone else worse-off.

Private good: a commodity that is rival in consumption such that its consumption by one person renders consumption by another impossible.

Productivity of a tax system: tax yield of a tax system per unit base.

Progressive tax: a situation of increases in tax rate as the amount taxed increases.

Property tax: levies on all categories of real property.

Public Good: a commodity that is non-rival in consumption so that all members of the group can enjoy the same benefits such that one individual's consumption cannot deny others consumption of the same.

Stationary series: time series data where the mean, variance and covariance remain constant over time.

Structural change: the structural transformations that occur in the economy over time.

Tax avoidance: a situation where taxpayer operates within the law and arranges affairs in such a way that the tax liability is reduced by exploiting the existing loopholes in the Tax Act.

Tax base: legal description of the object with reference to which tax applies.

Tax burden: amount paid in form of tax by a taxpayer.

Tax effort: actual revenue obtained by applying a certain tax rate to what would be raised by applying a standard rate, that is, actual tax divided by predicted tax amount.

Tax evasion: an illegal method employed by a taxpayer in order to escape tax liability.

Tax structure: the mix of taxes in the economy.

Tax: a compulsory collection of money or goods from the individuals or non-individuals by the government that is meant to finance the cost of services and government activities, without a definite and direct *quid pro quo* to taxpayer from the government.

Time lag: the difference in time between introduction of policies and their actual implementation or to the time difference between collection and spending of tax revenues.

ACRONYMS

AR	-	Autoregressive
AGOA	-	African Growth and Opportunity Act
ARDL	-	Autoregressive Distributed Lag Model
BOP	-	Balance of Payments
COMESA	-	Common Market for East and Southern Africa
CPI	-	Consumer Price Index
DW	-	Durbin-Watson Statistic
ESAF	-	Enhanced Structural Adjustment Funding
GDP	-	Gross Domestic Product
GNP	-	Gross National Product
GPT	-	Graduated Personal Tax
IDF	-	Import Declaration Form
IMF	-	International Monetary Fund
KIPPRA	-	Kenya Institute for Public Policy Research and Analysis
KRA	-	Kenya Revenue Authority
LDCs	-	Less Developed Countries
MF	-	Ministry of Finance
MNPD	-	Ministry of Planning and National Development
PAY.E	-	Pay-As-You-Earn
PIN	-	Personal Identification Number
SAPs	-	Structural Adjustment Programmes
TMG	-	Tax Modernization Guideline

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TREO	-	Tax Remission for Export Office
UNCTAD	-	United Nations Conference on Trade and Development
VAT	-	Value Added Tax

CHAPTER ONE

INTRODUCTION

1.1 Taxation in the Colonial Period

In the colonial era, the creation of exchange economy in Kenya was a prerequisite for paying taxes in a usable form to enable the government to function (Ehrlich, 1974:337). Consequently, the hut tax was first collected in Kenya in 1902. It was meant to stimulate African households to undertake increased commodity production for sale, raise revenue for the government, and force African men to look for wage employment on European farms (Maxon, 1990:67, Zeleza, 1990:173, Talbott, 1990:86, and Scovill, 1975:45). Any tax exemptions were granted on the basis of incapacity and not lack of income. They were flat rate taxes that were not income responsive. These taxes were inequitable since they did not take into account disparities in incomes received by various groups in the economy.

To raise more revenue and add a greater degree of equity, the colonial government introduced Graduated Personal Tax (GPT). The GPT evolved from the Native Hut and Poll Tax Ordinance of 1910 (Scovill, 1975:45). The ordinance imposed a flat rate poll tax on all males, sixteen years and over, and a hut tax that depended on the number of units a person owned. A person was subject to paying either of the two taxes but not both. The hut tax was a graduated tax since the number of huts owned by a man was positively correlated to his income. In 1916, the poll tax and hut taxes were increased in order to meet high cost of the First World War.

Throughout the colonial era, especially between 1925 and 1936, the principal source of central government revenue was taxation (Ogot, 1974:277). The principal taxes were customs duties, import duties, and African hut and poll tax. However, during this period, the Europeans who were the main beneficiaries of the economy were reluctant to tax themselves (Ogot, 1974:277), which is why a poll tax on non-native was introduced much later. In 1937, the Income Tax Act was introduced through the East African income legislation to govern taxation (Simiyu, 1999:46).

1.2 Taxation after Independence

After independence in 1963, the Kenya government opted to increase expenditures on development and social services and at the same time pay debts. Consequently, taxes were increased steadily across the board (King, 1979:61). Progressive taxation measures were proposed (Republic of Kenya, 1965:16). The measures aimed at narrowing the gap between the rich and the poor and raise more revenue for use in provision of public goods with the aim of eradicating poverty, disease and ignorance. The measures also included the imposition of tax on idle resources and under-developed land (Republic of Kenya, 1965:53).

In 1964, the hut tax was abolished. However, the municipal councils continued to levy flat rate poll taxes while the central government levied a mild graduated personal tax (Scovill, 1975:46). Within the same year, the old poll tax, African District Council taxes, and government personal levies were replaced by the GPT. The GPT was solely a local government tax levy. The local councils had the responsibility of assessing and collecting

tax from the residents. The local government only coordinated these activities (Scovil, 1975:46). In 1968, the minimum poll tax rate on GPT was abolished after the government realized that it was unfair to tax individuals who did not have monetary income.

In 1970, collection of taxes in the rural areas was taken over by the central government, while the urban councils continued to collect and retain tax revenues from the residents. Prior to the take over, GPT was the major source of income for local governments and provided 40 per cent of tax revenue. However, it provided only about 5 per cent of total government revenue after the take over (Scovill, 1975:47). The GPT was abolished in 1973 due to its regressive nature, a part from being considered a mark of colonialism.

To recover the lost revenue as a result of abolishing GPT, sales tax was introduced in 1973 by the central government. The sales tax was later replaced by the Value Added Tax (VAT) in 1990. The argument for the replacement was that VAT had the capacity to increase government revenue because it was broad-based and a more flexible tax than sales tax. Other taxes that have been introduced over time and are in force today include income tax, corporate taxes, excise duties, catering levies, import duties, export duties, and property taxes.

Kenya has not had a major tax reform except for the introduction of VAT in 1990 and the establishment of Kenya Revenue Authority (KRA) in 1995, which is charged with the task of improving tax collection through efficient administration, assessment, collection,

and enforcement of tax laws and policies. Currently, tax assessment is done according to the ability-to-pay and the benefit principles of taxation. The two methods of assessment apply to direct taxes only. The KRA officers carry out the assessment after receiving tax returns from taxpayers. Tax collection involve either direct payments by the tax payers to the KRA or the use of Pay-As-You Earn (PAYE) method, which is a system of collecting tax from employees at the source for onward transmission by employers to the KRA.

Other sources of government revenue include fees, fines, penalties, gifts, grants, revenue from public commercial enterprises and utilities, special assessment fees and receipts from the printing press for the issue of new paper money.

1.3 Taxation and Economic Development

The major aim of most governments in developing countries is to stimulate and guide their economic and social development. These governments continue to reach out for the goal of government promoted and directed development. Kaldor (1964:253) pointed out the importance of government revenue in accelerating economic development. Whatever the prevailing ideology or political situation of a particular country, it must steadily expand a host of non-revenue yielding services such as education, health, infrastructure, and social security. Toye (1978:1) asserted that the link between taxation and economic development is a link between a universal desire and a form of government action that is believed to be a means to that end. Wildford and Wilford (1978a: 83) asserted that one of the most important policy upon which most economists agree is that emerging nations

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must increasingly mobilize their own internal resources to provide economic growth. The most important instrument by which resources are marshaled is through the implementation of an effective tax policy.

Currently, tax revenues play a vital role in Kenya's economic development. This is evidenced by the attention problems of taxation have received over the years. The Economic Recovery Strategy for wealth and employment creation (2000) paper, the Seventh and the Eighth National Development Plans (1994 - 196 and 2002 - 2008 respectively) and Tax Management Administration Guidelines (1986) contain reforms in all areas of tax policy. They emphasize the need to raise more revenue without increasing the burden of taxation on those who are already contributing to the exchequer. The tax measures contained in the Tax Management Administration Guidelines consist of broadening the tax base to include additional sector activities and strengthen tax administration.

These measures were adopted after the government realized that the present tax structure does not raise adequate revenues thereby encouraging domestic borrowing and seeking external finance, which are only temporary measures of deficit financing. Moreover, external funds can no longer be relied on due to donor conditions and the increasing interest to channel funds to Eastern Europe after the cold war (Gelb, 1993:43). Furthermore, potential sources for domestic borrowing are few and external grants reduce autonomy and increase political and economic dependence. The alternatives are therefore

to raise money through taxation, curtail desired government expenditures, or continuously revise the tax structure.

The main shortcoming of Kenya's tax structure since independence has been its over-dependence on a small number of sources of tax revenue, namely trade taxes, sales tax and income tax (Ole, 1975, Wawire, 1991 and 2000, Muriithi and Moyi, 2003). The trade taxes, sales tax/VAT on various imported products are vulnerable to external events because their prices are determined in the world market and tend to be volatile. This has resulted in inadequate tax revenues and continuous existence of budget deficits.

The sources of inadequacy of revenue from taxation include tax structure that is not buoyant or income-elastic, a long time lag between government revenue collection and spending, lack of fiscal discipline, and reluctance of the government to control its expenditures, and lack of information about the behaviour of Kenya's tax revenue functions. The later formed the thrust of this study. The behaviour of Kenya's tax revenue functions receives special attention in this thesis.

1.4 The Statement of the Problem

Several studies have been undertaken on the response of tax revenues to changes in GDP (Ghai 1965, Ole 1975, Wilford and Wilford 1978a and 1978b, Osoro, 1993 and 1995, Ariyo, 1997, Muriithi and Moyi, 2003). In Kenya, such studies have found a positive relationship between tax revenues and GDP. However, these studies omitted some key determinants of tax revenues, such as the nature of the tax system, and institutional,

demographic and structural features of the economy. Specific determinants that are usually omitted include; introduction of new taxes, international trade effects, population, establishment of Kenya Revenue Authority (KRA), introduction of Structural Adjustment Programmes (SAPs), trade and financial liberalization, privatization, tax evasion, tax avoidance, tax exemptions, unusual circumstances, discretionary changes in the tax bases, tax rates, tax legislation, tax administration, and collection techniques. Furthermore, the literature survey shows that no study has ever assessed the determinants of per capita tax revenues in Kenyan context, and yet per capita figures are the ones that translate into tax revenues. Furthermore, these studies did not incorporate population as a key determinant of tax revenues.

Examples of unusual circumstances that have been experienced in the economy which might have determined tax revenues include coffee and tea booms, oil shocks, drought, labour unrest, 1982 coup *d'etat* attempt, political uncertainty in the wake of multi-party elections, tribal clashes of 1991/92, and power rationing in 2000; while examples of new taxes that have been introduced include sales tax in 1973, customs and excise taxes in 1978, VAT in 1990, and excise tax on petroleum products in 1994/95.

Due to the omission of some of the determinants of tax revenues and per capita tax revenues, the estimated income elasticities of tax revenues are often inaccurate and unreliable for planning purposes, a situation that might be the cause of recurring budget deficits. This is because these factors that are often omitted, if their effects are significant,

may change the slopes and/or the intercepts of the tax revenue functions making it difficult to predict accurately the tax revenues.

Furthermore, studies that have been done on this topic use annual total GDP data while tax revenue data are collected and reported as per fiscal year, which starts on 1st July each calendar year and ends on 30th June the following calendar year. It is therefore key that any study to identify the determinants of tax revenues should use average GDP. Moreover, it is also important to assess the response of tax revenues to changes in monetary GDP. This would indicate the extent to which monetization of the economy and subsequent reduction in black market activities would affect tax revenues. This study therefore answers the questions posed in the section that follows.

1.5 Research Questions

The study answers the following research questions:

i) What changes in the composition of tax revenue have occurred in Kenya since 1963?

ii) What are the determinants of tax revenues in Kenya?

iii) Has the tax structure responded to changes in the taxable capacity over time?

iv) What are the expected tax revenues over the next decade or so?

1.6 Objectives of the Study

The objectives of the study were to:

i) Examine the composition of tax revenues, relating it to the relative levels of taxation.

ii) Identify the determinants of tax revenues and estimate tax revenue functions.

iii) Assess whether the Kenyan tax structure has responded to changes in the taxable capacity over time.

iv) Predict revenues from various taxes for the next decade.

v) Draw policy implications from the research findings.

1.7 Significance of the Study

The study contributes to the existing literature on the tax structure in Kenya. The results could be used to design growth-oriented programmes and carry out tax changes that are growth enhancing. The study provides an empirical groundwork on Kenya's tax revenue structures upon which prudent tax measures could be based. It identifies the determinants of tax revenues which when properly understood, documented, and captured in relevant tax revenue models, would make it possible to estimate accurately tax revenues within a specified period of time. The study also stimulates further research in the area of taxation.

The study brings together comprehensive evidence on the determinants of tax revenues in Kenya. It provides an informed basis for taking action on tax policy in addition to filling the gap about what is currently known about tax revenue functions in Kenya. The study can generate debate on the type of taxes to be encouraged and those to be abolished and

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the determinants of tax revenues to include in tax models so as to predict tax revenues accurately.

The study is timely given the current effort to change the constitution, change government structures, privatize state enterprises, rationalize the budget, eradicate poverty, reform tax structure and continue with the structural adjustment process.

1.8 Scope and Organization of the Study

The study is limited to the period 1963/64 to 2003/04 for a number of reasons. This period is long enough to capture the responsiveness of tax revenues to changes in their determinants. Furthermore, the government had the opportunity to devise its own tax policies within this period.

It was within this period that the economy grew rapidly up to early 1970's. After the magical growth rate, it started experiencing fiscal strains, with expenditure rising more rapidly than domestic revenues due to large-scale infrastructure investment and other social expenditures. The economy also experienced persistent shocks such as the oil price crises of 1973 and 1979 that had far reaching repercussion on growth and fiscal deficits. It is possible in this period, to capture the effects on tax revenues of such events like trade liberalization, privatization, tax modernization programme and the establishment of KRA.

During the study period, several taxes were introduced whose effects on tax revenues are captured. For example, in 1973 sales tax was introduced, in 1978, Customs and Excise Tax Act Cap 472 commenced, in the fiscal year 1984/85, sales tax on domestic manufactures was separated from the one on imports, VAT Act Cap 476 started operating on 1st January 1990, and in 1994 excise tax on petroleum products was introduced.

In a nutshell, this period is significant because it coincides with import substitution industrialization strategy, the onset of debt crisis in 1970's, the SAPs in 1980's, the liberalization policies of 1990's, and multiparty era of 1990's and 2000's.

The study is organized in five chapters. The foregoing chapter introduced the study by highlighting its principal objectives. Chapter two is devoted to review of relevant literature and ends by presenting the theoretical framework. Chapter three highlights research design and methodology. Empirical results are presented and discussed in chapter four, while chapter five concludes the study. Bibliography and appendices are at the end.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This section reviews empirical studies that have been done on the responsiveness of tax revenues to changes in their determinants. The section focuses on the estimating models that have been used and ends with a theoretical framework for this study.

2.2 Determinants of Tax Revenue

(a) Gross Domestic Product

Several studies have used GDP as a determinant of tax revenue. Such studies include Ole (1975), Wilford and Wilford (1978a and 1978b), Rao (1979), Omoruyi (1983), Asher (1989), Osoro (1993 and 1995), Ariyo (1997) and Muriithi and Moyi, (2003). In these studies, the following model was used to estimate tax buoyancy.

$$\mathbf{T = e^{\alpha} Y^{\beta}} \qquad (2.1)$$

Where T = tax revenue

Y = income (GDP)

α = constant term

β = buoyancy coefficient

e = natural number

The double-log version of equation (2.1) is estimated using OLS. Two estimating techniques for tax revenue elasticity have been suggested. Sahota (1961) and Prest (1962),

suggested the proportional adjustment method which was later described by Mansfield (1972) and used by Omoruyi (1983), Osoro (1993), and Ariyo (1997). The method involves isolating the data on discretionary revenue changes based on data provided by the government. The resulting data reflect only what the collections would have been if the base year structure had been in force throughout the sample period (Osoro, 1993:13). The adjusted data is then used to estimate equation (2.2) that follows.

$$\mathbf{InT}_p = \alpha_p + \beta_p \mathbf{InY} + \varepsilon_p \quad \text{.....(2.2)}$$

Where β_p provides an estimate of the income elasticity of the p^{th} tax.

There are several shortcomings of proportional adjustment method as cited by Ariyo (1997:20). To start with, data on revenue receipts directly and strictly attributable to discretionary changes in tax policy are not available. In fact, it relies on budget estimates for discretionary effects of tax revenue, which tends to differ substantially from the actual tax revenue collected. The approach assumes that the discretionary changes are as progressive as the underlying tax structure, hence it is contingent on the assumption that discretionary changes are more or less progressive than the tax structure they modify (Leuthold and N'Guessan, 1986 and Chipeta, 1998). Further, the approach is highly aggregative compared to other methods highlighted in this section.

The second method for estimating income elasticity of a tax is to use the dummy variable technique developed by Singer (1968). The method introduces a dummy variable into

equation (2.2) for each year in which there was an exogenous tax policy change. The resulting estimating model becomes:

$$\mathbf{InT}_p = \alpha_p + \beta_p \mathbf{InY} + \sum \sigma_i D_i + \varepsilon_p \quad \text{.....} \quad (2.3)$$

Where the dummy variable D_i (i = 1, 2, ...) takes the value of zero (0) before the discretionary change and one (1) after the change. The coefficient β_p estimates the revenue elasticity. The summation accounts for the possibility of multiple changes in the period (Wilford and Wilford, 1978a: 98, and Osoro, 1993:14,). However, Ariyo (1997:25) suggested additional modifications to models (2.2) and (2.3). The first modification is the introduction of a one-year lag in GDP. The argument is that new policy guidelines contained in a budget speech may not be implemented until the relevant circulars are issued. The one-year lag in income (GDP) added to equations (2.2) and (2.3) captures the potential effects on tax revenues due to implementation time lag. If there are pronounced administrative lags or delayed remittances, the lagged value will be more significantly associated with the dependent variable in each equation.

The second modification involves the introduction of a slope dummy in equation (2.3). The argument is that over a long period of time or under unusual circumstances, not only do the intercepts change but also their slopes may change (Koutsoyiannis, 1988:282 - 283). Ariyo (1997) argued that policy proposals in the budget are based on the performance of each tax revenue source in the preceding period. Those that perform above expectation are given more ambitious targets in the new fiscal year and put under great surveillance. Ariyo's (1997:25) non-dummy and dummy models are given as:

$$\mathbf{InT_t = \beta_0 + \beta_1 InY_t + \beta_2 lnY_{t-1}} \quad \text{..... (2.4)}$$

$$\mathbf{InT_t = \beta_0 + \beta_1 InY_t + \beta_2 lnY_{t-1} + \beta_3 D_1 + \beta_4 D_2} \quad \text{..... (2.5)}$$

Where Y_{t-1} = previous level of income (GDP)

T_t = total tax revenue

Y_t = income (GDP)

t = year

D_1 = intercept dummy

D_2 = slope dummy ($D_2 = D_1 * Y_t$)

Khan (1973) has applied this method in estimating the responsiveness of tax yields to increases in national income and tax revenue forecasting. The shortcomings of this technique are that the method becomes impossible to use where tax policy changes are too frequent and also creates a potential multicolinearity problem from the inclusion of more than one dummy variable into the tax function.

The third method of estimating tax elasticity, as used by Andersen (1973) for Denmark and Choudhry (1975) for west Malaysia, is the Constant Rate Structure. The method involves collecting statistics on actual tax receipts and data on monetary value of the legal tax bases and corresponding revenues. The tax bracket of the base year is then multiplied by the corresponding base values and the products summed up. The simulated tax revenue data is then regressed on GDP. However this method can only be applied if the number of items is small, the range of tax rates is narrow and the data can be compiled easily. Furthermore, this

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method requires highly dis-aggregated data and detailed tax base series for all individual taxes and this could be difficult to obtain, besides getting the same tax base over time.

The fourth method of estimating elasticity of a tax is the Divisia Index, which introduces a proxy for discretionary tax measures. The index measures the technical change, which is taken as the effects of discretionary changes in tax yields. The index is derived from the estimated tax function analogous to the production function. The tax function must be well defined, continuously differentiable and homogeneous of degree one. The method is best suited where the revenue effects of discretionary measures are not available. It uses time trends as proxies for discretionary changes. This is its major weakness because it introduces bias, leading to either an overestimation or underestimation of the adjusted tax revenues (Choudhry, 1979).

Choudhry (1979) carried out a detailed comparison of these methods. The study concluded that the Proportional Adjustment method was more superior compared to the Dummy Variable Approach, Divisia Index method, and Constant Rate Structure method. The study found that the Constant Rate Structure method had the smallest elasticity estimates. This was probably due the generation of a simulated tax revenue series on the basis of the effective tax rate for a given reference year.

The studies that have measured the impact of GDP on tax revenues include Wilford and Wilford (1978a) who estimated income-elasticity and buoyancy of the tax revenue in Central America for the period 1955 to 1974, using an exponential tax revenue function.

The study found that income elasticity of the tax revenue was less than unity. This suggested that the tax structure was stable and therefore tax revenue grew less than proportionately in response to growth in income.

Osoro (1993) examined the revenue productivity implications of tax reforms in Tanzania. In the study, the tax buoyancy was estimated using double log form equation (2.2) and tax revenue elasticity using the proportional adjustment method (equation 2.4). The argument for the use of proportional method was that a series of discretionary changes had taken place during the sample period, 1979 to 1989, making the use of dummy variable technique impossible to apply (Osoro 1993:14). For the study period, the overall elasticity was 0.76 with buoyancy of 1.06. The study concluded that the tax reforms in Tanzania had failed to raise tax revenues. These results were attributed to the government granting numerous tax exemptions and poor tax administration.

Ariyo (1997) evaluated the productivity of the Nigerian tax system for the period 1970 - 1990. The aim was to devise a reasonable accurate estimation of Nigeria's sustainable revenue profile. In the study, tax buoyancy and tax revenue elasticity were estimated using equation (2.4) and (2.5) respectively. The slope dummy equations were used for the oil boom and SAPs. It was found that on the overall, productivity level was satisfactory. However, the results indicated wide variations in the level of tax revenue by tax source. The variations were attributed to the laxity in administration of non-oil tax sources during the oil boom periods. Significant reduction in public expenditure and prudent management of financial resources were suggested as solutions to the fiscal deficit. The study further

asserted that there was need to improve the tax information system to enhance the evaluation of its performance and facilitate adequate macro-economic planning and implementation (Ariyo, 1997:33)

Chipeta (1998) evaluated effects of tax reforms on tax yields in Malawi for the period 1970 to 1994. The results indicated buoyancy of 0.95 and an elasticity of 0.6. The study concluded that the tax bases had grown less rapidly than GDP. Kusi (1998) studied tax reform and revenue productivity of Ghana for the period 1970 to 1993. Results showed a pre-reform buoyancy of 0.72 and elasticity of 0.71 for the period 1970 to 1982. The period after reform, 1983 to 1993, showed increased buoyancy of 1.29 and elasticity of 1.22. The study concluded that the reforms had contributed significantly to tax revenue productivity from 1983 to 1993.

Milambo (2001) used the Divisia Index method to study the revenue productivity of the Zambian tax structure for the period 1981 to 1999. The results showed elasticity of 1.15 and buoyancy of 2.0, which confirmed that tax reforms had improved the revenue productivity of the overall tax system. However, these results were not reliable because time trends were used as proxies for discretionary changes and this was the study's major weakness.

In relation to Kenya, Ole (1975) estimated income elasticity of tax structure for the period 1962/63 to 1972/73. Tax revenue was regressed on income without adjusting for unusual observations. The results showed that the tax structure was income inelastic (0.81) for the period studied. The study recommended that the system required urgent reforms to improve

its productivity. The results also implied that Kenya's tax structure was not buoyant and therefore the country would require foreign assistance to close the budget deficit.

Njoroge (1993) studied the revenue productivity of tax reforms in Kenya for the period 1972/73 to 1990/91. Tax revenue was regressed on income after adjusting tax revenues for discretionary changes. The period of study was divided into two to make it easier to analyze the effects of tax reforms on revenues from various taxes. Income elasticity of total tax structure was found to be 0.67 for the period 1972 to 1981. This meant that the government received a decreasing share of rising GDP as tax revenues. The elasticity estimates for individual taxes were as follows: sales tax 0.6, import duties 0.45 and income tax 0.93. The buoyancy for the overall tax system for the same period was 1.19, implying that the tax system was quite buoyant. For the period 1982 to 1991, Njoroge (1993) found that the overall elasticity was 0.86 while buoyancy was 1.00. The study concluded that from a revenue point of view, the system did not meet its target, hence it required constant review as the structure of the economy changes. However, the results could not be relied upon because the study never took into account time series properties of the data.

Adari (1997) study focused on the introduction of value added tax (VAT) in Kenya that replaced sales tax in 1990. The study analyzed the structure, administration and performance of VAT. The estimated buoyancy and elasticity coefficients were less than unity implying a low response of revenue from VAT to changes in GDP. This suggested the presence of laxity and deficiencies in VAT administration. However, the estimation of buoyancy and elasticity coefficients were done in total disregard of the time series properties and without

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taking care of unusual observations in the data. Therefore, the results were not reliable for planning purposes.

Wawire (2000) used total GDP to estimate the tax buoyancy and income-elasticity of Kenya's tax system. Tax revenues from various sources were regressed on their tax bases. Based on empirical evidence, the study concluded that the tax system had failed to raise necessary revenues. However, the shortcomings of the study were, first, it never considered other important determinants of tax revenues, for example, unusual circumstances that could have affected tax revenue productivity. Second, it never disaggregated tax revenue data by source hence it was difficult to say which taxes and bases contributed more to the exchequer. Third, it never took into account the time series properties of the data.

Muriithi and Moyi (2003) applied the concepts of tax buoyancy and elasticity to determine whether the tax reforms in Kenya achieved the objective of creating tax policies that made yield of individual taxes responsive to changes in national income. They used equation 2.2 to estimate the responsiveness of tax yields on income. The results showed that tax reforms had a positive impact on the overall tax structure and on individual tax handles. The study concluded that despite the positive impact, the reforms failed to make VAT responsive to changes in income. However, VAT had been around for about eleven years only and subjecting it alone in a regression model did not make statistical sense. The current study differs from this study because it separates the effect of average monetary GDP and average total GDP on tax revenue and uses average figures instead of the annual ones because the

tax revenue figures are on fiscal year basis that starts on 1st July while the GDP figures are on calendar year that starts on 1st January.

In an attempt to highlight the trends in Kenya's tax ratios, tax effort indices and their implication for further tax reforms, Wawire (2003) performed a regression of tax revenue on income. The estimated tax equation was used to compute tax effort indices by dividing the predicted with the actual figures. After examining the tax effort indices, the study concluded that the slow down in economic growth had resulted in high levels of taxation that did not match delivery of public goods and services. The study however, never took into account the time trend characteristics of variables that were used.

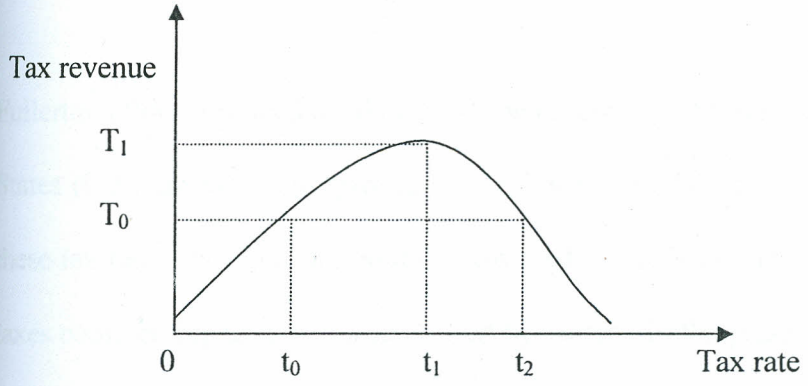
(b) Tax Rate

Tax rates have been used as explanatory variables for tax revenues in several studies. There is a long history of the use of tax rates to explain tax yields. Smith (1776) asserted that high taxes afford smaller revenue to the government than what might be drawn from more moderate taxes. This is because they encourage smuggling and diminish the consumption of taxed commodities. Dupuit (1944) agreed that by gradually increasing tax rate it would reach a level at which the yield is at maximum, beyond which the yield diminishes to zero. The trade literature, as exemplified by Caves and Jones (1973), also underscored the existence of a revenue-maximizing tariff.

Laffer, in 1973, plotted tax revenues against tax rates (Fullerton, 1981, Mansfield, 1986, Stiglitz, 1988, Jackson, 1993). The curve shows that in less than an ideal situation, there are

two rates at which given revenue can be collected. Figure 2.1 shows these two rates (t_o and t_2) that give T_o revenue.

Figure 2.1 Laffer curve



The optimal tax rate is t_1, which gives a maximum of T_1 revenue. The upward-sloping portion of the curve is called the normal range and the downward sloping segment is the prohibitive range. The latter is said to exist because high tax rates stifle economic activity, force agents to barter and encourage leisure pursuits.

In the empirical work of Grieson *et al* (1977), the study found a possibility of an inverse relationship between tax rate and tax revenue for local government in New York. Winniski (1978) linked every fiscal catastrophe, from the fall of the Roman Empire to the great depression, on the tax hike, which occurred within a few years in either direction. The study stated that the peak of the curve was the point at which the electorate desired to be taxed. This meant that if the tax rate was zero, production would be maximized and that both revenues and production would be maximized at the peak of the curve. The welfare maximizing government would operate somewhere on the normal range with the size of its

budget being determined by marginal cost-benefit analysis. For Philadelphia tax rate, Grieson (1980) found the rate to be very close to the revenue maximizing point. The study concluded that an income tax increase has an effect of raising the tax rate in excess of the socially optimal one.

Fullerton (1981) results tended to reject the notion of an inverse relationship between United States (U.S) tax rates and government revenues, but they did not invalidate the claim that these tax rates and revenues could be lowered. This is because even on the normal range, taxes could be higher than those desired by voters. In the present study, tax rates (used tax ratios as proxies) were plotted against tax revenues to find out the shape of Kenya's Laffer curve. This showed whether Kenya was operating within the normal range or prohibitive range.

(c) Tax Base

Changes in tax bases have been identified by several studies as independent variables that explain the changes in tax revenues over time. In one such study, Ghai (1965) suggested that a more promising avenue to increasing the income elasticity of the entire tax system was to operate through tax bases especially for indirect taxes. Mclure and Thirsk (1978) found that sumptuary tax on tobacco products and alcoholic drink did not have appreciable influence on decisions to consume these items. In many cases, these taxes fell heavily on low-income families and exerted their major impact on the distribution of income rather than on the pattern of consumption. They appealed for lighter sumptuary taxes or no such taxes at all.

Scovill (1975) evaluated local government taxation in Kenya, Uganda and Zambia. The study found Kenya's tax structure to be regressive, unfavourable to rural income, and revenue was unstable despite being too low. Scovill (1975: 198) suggested additional revenue sources for rural Kenya through introduction of property taxes. The study further advocated for the abolition of cesses due to their undesirable effects on resource allocation.

Manig (1983) studied capacity of governments to levy direct taxes in developing countries. The study concluded that a marked increase in direct tax shares in total tax revenue would only be achieved if the taxable capacity, that is the economic activities, were expanded. It was also found that the existing power relationships and administrative deficiencies, which themselves are marks of under development, have adverse effect on the tax system.

Mwega (1986) used a general equilibrium model to study the incidence of taxes, levies and transfers in Kenya. A model was built that replicated production, consumption and the distributions of income. Taxes and levies were then replaced by a neutral Value Added Tax and transfer income abolished. The counterfactual results were compared to the benchmark equilibrium to draw inferences about the incidence of taxes, levies and income transfers in Kenya. The system of taxes and levies was found to have a mixed but broadly progressive impact on household incomes. The system became unambiguously progressive when voluntary income transfers were taken into consideration.

In a study that empirically assessed tax performance in Kenya from 1958 to 1989, Wawire (1991) concluded that an increase in the volume of international trade increases the tax ratio

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and also tax ratio increases with GDP shares of manufacturing, mining, quarrying, building and construction. However, the study never disaggregated data according to the base of a particular tax and never took into consideration the time series properties of the variables that were used.

From these studies, it was clear that the changes in the tax base have an impact on tax revenues in Kenya. As much as these studies concentrated on the response of tax revenues to changes in their tax bases, they omitted unusual circumstances that might also determine the tax yield. In this regard, unusual circumstances were included in the present study together with the existing power relations and administrative efficiencies which are cited in the above studies as explaining changes in tax revenues. Their effects were captured by dummy variables.

(d) Structural Changes

The structural changes as reflected in the changes of sector share contribution to GDP have formed explanatory variables for tax revenue equations in several studies. Williamson (1961) for example, fitted an exponential tax ratio function to data from 33 developing countries and found a positive significant relationship between tax revenue and per capita income. Plasschart (1962) used per capita income and the value of imports to GDP ratios as determinants of tax revenue to GDP ratio. While the import ratio turned out to be significant both when used alone and when used in conjunction with per capita income, per capita income did not emerge as a significant determinant of the tax ratio.

Hinrichs (1965) found that for Less Developed Countries (LDCs) with low per capita income, openness of the economy measured by the import ratio, rather than per capita income, was the key determinant of government revenue. Lortz and Morss (1967) sought to examine the relationship between tax ratio differences and differences in per capita income and the degree of openness. They used the ratio of total value of imports to Gross National Product (GNP) as the index of openness. They found both income and openness to be significant explanatory factors, positively related to the tax ratio, and together they explained a high proportion of the variance of the tax ratio.

In their second attempt, Lortz and Morss (1970) found the explanatory variables significant at the 5 per cent level, but the degree of explained variance was reduced substantially from 64 per cent to 20 per cent. When they introduced the degree of monetization in the economy as an explanatory factor, it resulted in a significant increase in the explained variances from 20 per cent to 44 per cent, but lowered the significance of per capita income. This was attributed to the multicollinearity between per capita income and the degree of monetization.

United Nations Conference on Trade and Development (UNCTAD, 1970), attempted an expansion of the original Lortz-Morss analysis. Explanatory variables included share of agriculture in GDP, per capita income, rate of inflation and openness of the economy. All the variables had significant coefficients but the multicollinearity between agriculture share and per capita income resulted in both becoming insignificant when the model was tested on cross-sectional data. This required that one of them be dropped. It was also felt that there

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was little prior reason to include the rate of inflation in the equation. Therefore, the study settled for a model that incorporated only the agricultural share in GDP and openness index as determining factors. The two variables explained 32 per cent of the variations of the tax ratio across countries.

In another study, Bahl (1971) sought an explanation of tax income ratio in terms of the relative importance of the agricultural and mining shares of GDP. The former was selected as being closely related to the stage of development and the latter as indicative of the structure of the economy. Mining was also preferred to a simple indicator of openness, such as the share of exports in GDP. It was found out that the coefficient of the agricultural share variable was negative and that of mining share variable was positive. Although there was some evidence that countries with small taxable capacities made higher tax efforts, no strong systematic relationship was found between these two variables.

Chelliah (1971) found the marginal tax rate to be highly correlated with the tax ratio of the second period. However, the study noted that it might have been merely a reflection of the fact that a higher marginal rate leads to a higher tax ratio in the ensuing period. The study indicated a strong and positive influence of the mining sector. However, statistical testing did not show any relationship between the marginal tax rate and the level of per capita income.

Chelliah, Baas and Kelly (1975) concluded that the estimated coefficients of the explanatory variables in the alternative equations for the later period did not differ greatly from those of

corresponding equations for their earlier period as studied by Chelliah (1971). This added to the degree of confidence of their analysis. Furthermore, the ranking of countries with respect to tax effort in the two periods did not differ markedly.

Wilford and Wilford (1978b) utilized the concept of income elasticity of the tax revenue to evaluate fiscal performance over time in LDCs. The results indicated that emphasis upon import and export taxes for the revenue base had the dual disadvantage of placing excessive dependency upon sources which are not only income elastic, but are also influenced by world demand for primary commodities and domestic balance of payments constraints.

Tax ratios for a group of countries at widely differing levels of development were compared by Musgrave and Musgrave (1984). The study found that when data for all these countries were pooled, the tax ratio was positively related to per capita income. This suggested that as per capita income increases, the tax ratio also increases and this was in line with the rising share hypothesis.

In relation to Kenya, Sharply (1981) and World Bank (1975) concluded that agricultural taxes in Kenya are light. World Bank (1975), in particular, asserted that despite these taxes being light, they were also regressive. It therefore appeared that the apparent low tax revenues raised from the tax system might have been caused by light taxes that were levied in some sectors of the economy.

World Bank (1983, and 2003) and Godfrey (1986) studies focused on the growth and structural changes. It was found that Kenya's first decade after independence was marked by rapid growth of GDP and structural changes. However, from early 1973 growth and structural changes were limited. This was attributed to structural problems that jeopardized the sustainability of high rates of growth in GDP over the years, poor management of the economy, and limitations of import substitution policies coupled with lack of sustained economic reforms.

This study emphasizes specific structural change variables that were used to explain changes in tax revenues. These variables include value of exports, value of imports, monetization of the economy and GDP.

(e) Tax Evasion and Avoidance

Several studies have been carried out on tax evasion. Vaish and Panandiker (1978) found that the Indian tax system had pronounced tax evasion that reduced tax revenues. The study showed that the ratio of post tax income to total income, which is the return on tax evasion, was quite high. This tempted the individuals assessed to engage in tax evasion. The study argued that although the penalties for tax evasion were deterrent, the impact of the deterrent got diminished since the chances of detection were small. Studies such as those of Cross and Shaw (1982), Alm (1988) and Waud (1988) examined jointly tax evasion and avoidance. In these studies, individuals were seen as being free to switch between evasion and avoidance in response to changes in tax rates, deterrence audit rates

and penalties. This switching behaviour prevented increases in tax bases and hence tax revenues.

Pyle (1993) asserted that tax evasion has potentially damaging economic consequences such as loss of tax revenues, reliability of macroeconomic indicators such as GDP and unemployment, distribution of post-tax incomes, and the allocation of resources. The study found that theoretical and empirical analysis hardly offer convincing proof that a reduction in income tax rates bring about unequivocal increase in income declared to the tax authorities. The study concluded that an effective safeguard against tax evasion was the withholding of tax at source. However, this weapon cannot be applied to self-employed persons.

In relation to Kenya, Westlake (1973) analyzed the impact of the tax structure on the distribution of personal incomes. The study examined the incidence of direct personal taxation and discussed the possible rationale behind the rates. The study also examined the incidence of indirect taxation and the effect of tax evasion. The incidence of the structure of personal income taxes and indirect taxes on the distribution of income appeared to be slightly regressive. Estimated graduated personal tax evasion was less than estimated income tax evasion and both tended to strengthen the regressive nature of the tax structure.

Republic of Kenya (1982) through the Kenya Working Party on Government Expenditure, asserted that the assessment and collection of tax revenues was the major way in which the resources of the nation were directed to government use. However, the committee noted

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that the methods of detecting the non-reporting and under-reporting of income were inadequate. The Party suggested that means of identifying income recipients and confirming the incomes reported were needed, while means of tax evasion needed to be investigated. Eight year later, Hira (2000) found three forms of corruption in the tax system in Kenya that led to tax evasion and avoidance. These were intimidation and coercion at the inspection level, evasion at the point of entry through bribery, and use of areas of discretion in the law to evade tax.

From these studies, it is clear that corruption, tax evasion and avoidance determine tax revenues. Hence dummies that acted as proxies for these variables were included in the empirical model so as to capture the effects of corruption, tax evasion and avoidance on tax revenues. Such an empirical investigation has not yet been carried out in Kenya.

2.3 Overview of Literature

From the studies reviewed, the determinants of tax revenues include GDP, discretionary changes in tax base and rates, tax administration, introduction of new taxes, abolition of others, tax evasion, tax avoidance and tax exemptions.

The present study departed from the reviewed ones in that it has included unusual circumstances and population as determinants of tax revenues. Population was used as a control variable, which other studies have not used before. This was in recognition of the fact that demographic structure exhibited by Kenya consists of high population growth rate that is associated with high unemployment rate that probably makes it difficult to

implement tax policies due to low incomes and inadequate accounting. Furthermore, high population growth rate increases demand for public goods and services thereby influencing tax policies.

The present study also separated the effects of monetary GDP from that of total GDP on tax revenues. The argument was that monetization of economic activities lead to convenient ways of collecting tax revenues and easing of tax administration thereby reducing the underground economy. This is why it was envisaged in the study that the coefficient of monetary GDP was to be greater than that of total GDP.

The study used average GDP rather than annual GDP because tax data in Kenya are published as per fiscal year that starts on July 1st each calendar year and ends on 30th June of the next calendar year, while GDP figures are on calendar year basis. So it was prudent that if any meaningful results were to be obtained, average GDP was to be used. This was a major departure from the rest of the studies including the most recent one by Muriithi and Moyi (2003).

Moreover, literature in this study has been reviewed according to the determinants of tax revenues, which again was a departure from the past studies carried out in Kenya. This type of review exposed the reader to the details captured by each variable in the tax revenue function and the results that arise therefrom.

The study has taken into account the time series properties of tax revenue data. Hence the parameter estimates obtained are as close as possible to the real ones. This is in the

realization of the fact that most studies, even the most recent one on tax reforms and tax revenue mobilization in Kenya by Muriithi and Moyi (2003), did not test for stationarity of time series, neither did it carry out statistical diagnostic tests, which this study has done. The diagnostic tests that were performed in the present study include tests for cointegration, stationarity of variables, normality in the regression residuals, serial correlation, ARCH of residuals, homoscedasticity, heteroskedasticity, and specification errors. The combination of the long-run and short-run data in the models estimated overcame the problems of losing information that could have occurred if the study had addressed the non-stationarity problem through differencing (see also Adam, 1998).

2.4 Theoretical Framework

2.4.1 Introduction

The analysis in this thesis closely followed Paul Samuelson's fundamental general equilibrium analysis of public sector activities (Samuelson, 1954: 387 - 389, 1955:350 - 356, Musgrave, 1986: 324 - 328, Chipman, 1982: 152 - 178, Bolnick, 1978: 62 - 77, Varian, 1992: 414 - 429, Barnett, 1993: 94). The model that the thesis used was constructed taking into account the demand side for government financing of public goods provision. It emphasized the optimal allocation of resources between the public and private goods. The model was relevant to the study because it considered both the government revenue and its expenditure to provide the public goods. Moreover, it is a model of resource allocation that can be modified to emphasize the interaction between desired levels of public goods provision and the economic cost of levying taxes (Barnett, 1993: 94).

2.4.2 The model

Assume that there is a pure private good (Q_p) and a pure public good (Q_g). Control of all resources initially lies with the private sector, and must be transferred to the public sector for producing Q_g. Increasing marginal opportunity cost characterizes this transference activity. This marginal cost includes resources used directly to levy taxes plus loss of Q_p through dampened incentives and reduced efficiency in the private sector resulting from the tax policies (Branson, 1989: 530 - 534, Agénor and Montiel, 1996: 83, Froyen, 2002: 76, Dornbusch, Fischer and Startz 2003: 249 - 254).

Assume further that the government fully finances its activities through taxes. Also assume a set of individualistic preferences, $\bar{U}$ (Q_g, Q_p) embodying continuously diminishing marginal rates of substitution between the public and private goods (Bolnick, 1978: 64, Stiglitz, 1988: 133, Barnet, 1993). This preference function is assumed to be a characteristic of Scitovsky's social indifference curves (Samuelson, 1976: 219 - 251, Scitovsky, 1941; Layard and Walters; 1978: 35, Mishan, 1981:32 - 44) or Bergson-Samuelson social welfare function (Varian; 1997: 552, Bergson, 1938, and Samuelson, 1977: 81 - 88).

The demand function for the public good is derived by considering a model of utility-maximizing behavour coupled with a description of underlying economic constraints. The basic assumption is that a rational individual will always choose a most preferred bundle (**x**) that consists of both public and private goods from a set of affordable alternatives (**X**) that satisfy the individual's budget constraint. If Y is a fixed amount of income available to the

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individual and $\mathbf{p} = (p_g, p_p)$ is the vector of prices for a public good (p_g) and a private good (p_p), the set of affordable bundles and the budget of the individual could be given by:

$$B = \{\mathbf{x} \text{ in } X: \mathbf{PX} \leq Y\}$$

The problem of utility maximization is then expressed as:

Max $U(\mathbf{x})$

Such that $\mathbf{PX} \leq Y$ and $\mathbf{x}$ is in X

However, under the local nonsatiation assumption, a utility-maximizing bundle $\mathbf{x}^*$ must meet the budget constraint with equality (Varian, 1992: 98). This allows the restating of the utility problem in indirect form as:

$V(P, Y) = \text{Max } U(\mathbf{x})$

Such that $\mathbf{PX} = Y$

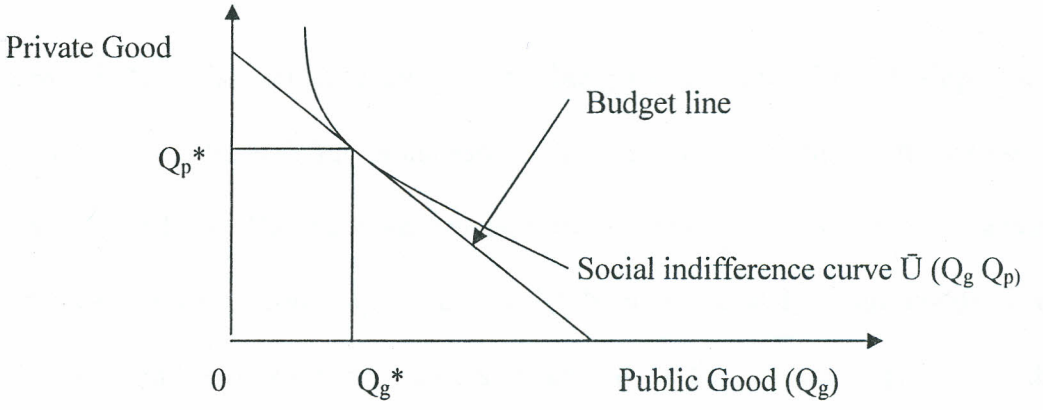
The value of $\mathbf{x}$ that solves this problem is the individual's demand bundle which expresses how much of each good the individual would buy at given levels of prices and income. The function that relates $\mathbf{P}$ and Y to the demanded bundle, conditional on other covariates is the individual's demand function.

The individual's bundle that maximizes utility is at a point where the budget line is tangent to the indifference curve (Stiglitz, 1988: 134). Therefore, a rational individual would choose to allocate the income between public and private goods in such a way that the marginal rate of substitution of the public good for private good ($MRS_{g,p}$) equals the ratio of their prices, i.e, $MRS_{g,p} = -\frac{p_g}{p_p}$ (see also Mansfield, 1975: 50 - 56, Silberberg, 1990: 316 - 319, and Pindyck and Rubinfeld, 1996: 96 - 99). However, according to Nath (1979:55 - 56), free foreign trade may prevent efficient allocation of income over time (see also Agénor and

Montiel, 1996: 44 - 55). This implies that for optimum allocation, the marginal benefit of any good must be equal to its marginal cost which should be equal to its world price in a competitive foreign market. Therefore, $MRS_{g,p} = -\frac{P_g}{P_p} = -\frac{P_{gw}}{P_{pw}}$.

Figure 2.2 illustrates this condition at the tangency of the budget line with the indifference curve for a taxpayer.

Figure 2.2: Utility-maximizing conditions



Q_g* and Q_p* are the optimal quantities that should be provided for the public and private good respectively. The position and slope of the budget line depends on income and the prices of the public good and the private good. For each level of income, there will be some optimal choice for each of the goods. For the public good (Q_g), the optimal choice at each set of prices and income will be the demand function.

The demand equation of the following general form is often estimated: $Q_g = f(p_g, y, z)$; where Q_g represents the demand for the public good for an individual, p_g is the price an individual pays for a unit of the publicly provided good, y is the income of the individual, and z is a vector of variables reflecting such things as the economic and political

composition of the economy (Barnett, 1993: 113). Y is exogenously determined, while p_g is dependent on the tax share which in turn depends on the form of the tax base. The demand curve is actually the marginal willingness to pay curve (Stiglitz, 1988: 135). At each level of output of the public good, the demand curve shows how much the individual would be willing to pay for an extra unit of the public good. The tax price for the public good at the optimal level is equal to the marginal rate of substitution which is the amount of the private good that an individual must give up for one more unit of the public good.

When income changes, the vertical intercept of the budget line is altered but its slope does not change if prices are fixed. With an increase in income, the budget line shifts outwards parallel to the original one. The individual can now purchase more of both goods and attain a higher utility-maximizing consumption choice for both public and private goods. The resulting locus of utility-maximizing bundles is known as the income expansion path (Silberberg, 1990: 317 - 318, Varian, 1992: 116, Varian, 1997: 97).

From the income expansion path, an Engel curve is derived which relates income to the quantity demanded of the public good. A straight income expansion path leads to a linear Engel curve through the origin. In this case the individual's demand curve has unit income elasticity. This implies that the individual will demand the same proportion of each commodity at each level of income (Varian, 1992: 117). However, in the case of utility-maximizing consumption choice, the income expansion path is expected to bend towards the private good implying that as the consumer gets more income, more of both goods are

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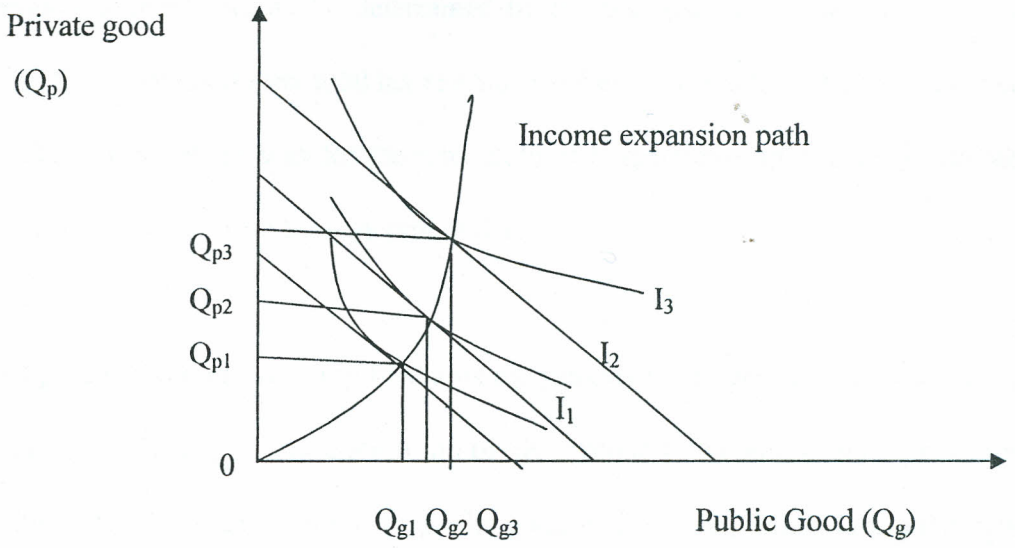
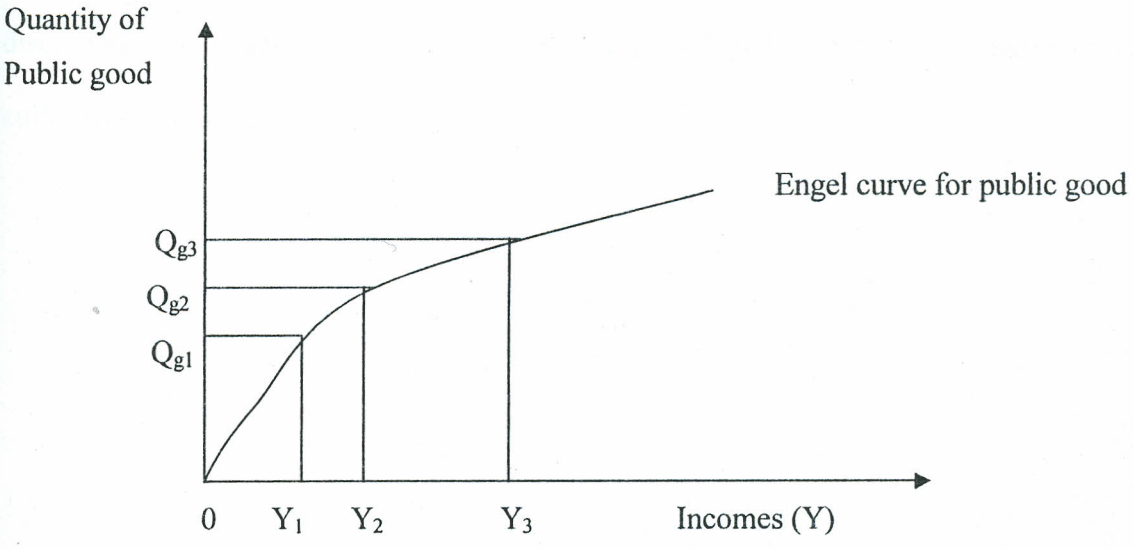
demanded but proportionately more of the private good than the public one. Figure 2.3 that follows is the income expansion path for a utility-maximizing consumer.

Figure 2.3: The income expansion path



I_1, I_2 and I_3 are indifferent curves. In the case of a bending income expansion path like the one above, the resulting Engel curve bends towards income implying that as the consumer's income increases, proportionally less of the public good is demanded. This is presented graphically in the following figure.

Figure 2.4: The Engel curve



Suppose the government wishes to tax a utility-maximizing individual in order to obtain a certain amount of revenue that is used to provide the public good the individual consumes, the revenue obtainable would be determined by the tax bases especially the individual's income. In this study therefore, total tax revenue is taken as a function of per capita income. This relationship paves the way for the estimation of Engel curves that relate the amount of tax revenues from various taxes to income (GDP).

At the empirical level, tax revenue functions are proxies for Engel curves. Since taxes are used to finance public goods, a relationship of tax revenue to income is but a proxy for the relationship between consumption of a public good and income, which is a public good's Engel curve. The factors that shift the Engel curves were identified to include monetary GDP, the degree of openness of the economy as measured for example, by the volume of international trade, population, unusual circumstances, introduction of new taxes, establishment of KRA, introduction of SAPs, trade and financial liberalization, tax evasion, tax avoidance, tax exemptions, free riding strategy by some individuals, and discretionary changes in the tax bases, tax rates, tax legislation, tax administration, and collection techniques.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

To attain the objectives of the study, both quantitative and qualitative data were collected and analyzed. Time series analysis was performed to show both short run and long run relationships between tax revenues and their determinants.

3.2 Empirical model

The multiplicative functional form of the estimated tax revenue model was specified as follows:

$T = e^{\alpha} Y^{\beta} e^{\varepsilon}$ ..... (3.1)

Where: T = tax revenue

β = estimated parameter

Y = vector of total GDP, monetary GDP, volume of trade and volume of imports

α = constant term

e = natural number

ε = disturbance term

As noted in the literature review, this specification followed standard practice in this area of research (see for example, Ole, 1975, Wilford and Wilford, 1978a and 1978b, Rao, 1979, Omuroyi 1983, Asher, 1989, Adam, 1992, Osoro, 1993 and 1995, Ariyo, 1997, Wawire, 2000, Muriithi and Moyi, 2003, and Wawire, 2003).

To estimate the parameters of the model using OLS method, the multiplicative equation was linearized by taking the logarithms of the variables in the empirical model (3.1) and introducing an error term ε and the subscript i, which denotes a particular source of tax revenue. Therefore, the general estimating equation was:

$$InT_{it} = \alpha_i + \beta_i \, InY_t + \varepsilon_{it} \quad \ldots\ldots (3.2)$$

Where, T_{it} = revenue from the i^{th} source in year t

Y_t = vector of total GDP, monetary GDP, volume of trade and volume of imports in year t

α_i = coefficients of intercept dummies for i^{th} revenue

β_i = elasticity coefficients associated with i^{th} revenue

ε_i = disturbance term for the i^{th} revenue

The foregoing approach does not pay attention to the special characteristics of the nature of the tax system and institutional and demographic factors that shape the trends in the economy. The Kenyan economy has been affected by various unusual circumstances and events that were exogenous in nature. These included the 1973 and 1979 oil price crises, SAPs, the 1976/77 coffee boom, the 1983/84 and 2000 droughts, the 1991/92 to 1992/93 liberalization efforts, and ethnic clashes in some of the most productive areas of the economy. Others were changes in tax administration, collection techniques and structure, introduction of new taxes (such as sales taxes in 1973, excise and customs duties in 1978, sales taxes on imports in 1984/85, VAT in 1990, and excise tax on petroleum products in 1994/95), abolition of some taxes (such as GPT in 1973, sales taxes in 1990), and numerous changes in tax rates and tax bases. This study captured the effects of these

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unusual circumstances in the derivation of short run and long run relationships between taxes and national income.

Considering the fact that tax revenues might change over time due to changes in the exogenous factors, the equations presented above were re-specified and some re-parameterized and dummies defined for discretionary changes and unusual circumstances. Dummies were introduced in those years where unusual observations were detected through various diagnostic tests following Johnston and Dinardo (1997), Thomas (1997:260), Kennedy (1989:180), Maddala (1977:132), and Wilford and Wilford (1978a: 93). The estimating equation (3.1) was then re-specified as:

$$T_{it} = e^{\sum_{i=1}^{K} \alpha_i D_i} Y_t^{\sigma_i} e^{\in_{it}} \quad \text{.....} \quad (3.3)$$

Where D = 0 for observations not characterized by unusual circumstances, and D = 1 for observations with unusual circumstances, while σ measured the tax revenue income elasticity. Taking logarithm of equation (3.3), the estimating equation became:

$$\ln T_{it} = \sum_{i=1}^{K} \alpha_i D_i + \sigma_i \ln Y_t + \in_{it} \quad \text{.....} \quad (3.4)$$

Where, T_{it} = revenue from the i^{th} tax in year t

Y_t = vector of total GDP, monetary GDP, volume of trade and volume of imports in year t

α_i, σ_i = parameters to be estimated

k = set of dummies representing unusual circumstances

A slope dummy was introduced in equation (3.4) by interacting Y with a dummy variable. This was because over a long period of time and under unusual circumstance, not only do intercepts change but also slopes may change (Koutsoyiannis, 1988: 282-283, Ariyo 1997: 25). Furthermore, lags in GDP were introduced in the model because new policy guidelines contained in the budget speech are not usually implemented until the relevant circulars are issued to the implementing departments. The lags captured the delayed effects of covariates on tax revenues. The following tax revenue equations were therefore estimated.

$$InT_{it} = \alpha_i + \beta_i\, InY_t + \sum_{t=1}^{T} \delta_i\, InY_{t-1} + \in_{it} \quad \text{.....} \quad (3.5)$$

$$InT_{it} = \sum_{i=1}^{K} \gamma_i D_i + \sum_{i=1}^{K} \sigma_i InY_t + \sum_{i=1}^{K} \lambda_i D_i * InY_t + \in_{it} \quad \text{.....} \quad (3.6)$$

Where, T_{it} = revenue from the i^{th} source in year t

Y_t = vector of total GDP, monetary GDP, volume of trade and volume of imports in year t

Y_{t-1} = vector of total GDP, monetary GDP, volume of trade and volume of imports in the previous year, t-1

D_i = intercept dummy variables

$D_i * InY_t$ = interaction terms

$\in_{it}$ = disturbance term for the i^{th} revenue in year t

$\alpha_i, \sigma_i, \beta_i, \lambda_i, \delta_i, \gamma_i$ = parameters to be estimated.

Dummies were included in the model only if they enhanced the predictive power of the model by improving adjusted R-squared, Durbin-Watson (DW) statistic and reduced the standard error of regression. From the equations that were estimated and found to be well specified on statistical grounds, some had more than two lags. For these equations, acceptable first formulations were reached at, and a search for acceptable simplification was performed following Johnston and Dinardo (1997) procedures.

The appropriate number of lags for each estimated equation was determined on the basis of Akaike information criterion (AIC), and the Schwarz criterion (SC). The specification that minimized the Akaike information criteria was selected. However, in choosing the number of lags, caution was taken because although longer lag lengths were appropriate because they fully captured the dynamics of the system being estimated and increased the number of parameters that were estimated, they reduced the degrees of freedom and increased data requirement.

The average values for the independent variables were the average of that year and the previous year's. The average values were used because the figures for independent variables are usually given per calendar year while those of dependent variables are given as per fiscal year that starts on July 1st of each calendar year.

3.3 Stationarity of data

Time series analysis was central to the understanding and empirical modeling of dynamic response of tax revenues to changes in their determinants. The non-random behaviour of time series data would have therefore, undermined the usefulness of the standard econometric methods had they been applied in the study without considering time series properties (Russell and Mackinon, 1993, Gujarati, 1995, Adam 1998, Johnston and Dinardo, 1997, Hill, Griffith and Judge, 2001). Regression on such data would have been spurious and inconsistent because a common time trend is shared (Yule, 1926, Granger and Newbold, 1974, Russell and Mackinnon, 1993, Hill, Griffith and Judge, 2001).

One way that was used to detect the presence of spurious correlation is by the use of the DW statistic. The standard rule that was applied is that if the adjusted R-squared is greater than the DW statistic, there was an increasingly high probability of spurious correlation that could not be solved by increasing the sample size. The second method was to use the Breusch-Godfrey asymptotic Lagrange multiplier test for serial autocorrelation.

The formal statistical tests for the presence of a unit root were used to detect non-stationarity in variables in this study. First, the Augmented Dickey Fuller (ADF) test procedures as explained by Dickey and Fuller (1979), Mackinnon, (1991), and Thomas (1997), was followed. This was in the recognition of the facts that the data generating process was not an AR (1) process under the null hypothesis and that the ADF was correctly specified in the higher order case (Engle and Granger, 1987). The ADF test regression took the form:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

Where, i = number of lags in ΔY_{t-i} with the maximum being m.

The lags showed the spread necessary for an explanatory variable to exhaust the explanatory influence on the dependent variable. The maximum number of lags, m, in the study was just enough to save the degrees of freedom and to eliminate serial correlation.

The null (H_o) and the alternative (H_I) hypotheses were:

H_o: $\delta = 0$ Non-stationary series

H_I: $\delta < 0$ Stationary series

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Second, the Phillips-Perron (PP) test procedures for a nonparametric method of controlling for higher-order serial correlation in a series were followed (Phillips and Perron, 1988). The test regression for the Phillips-Perron (PP) test took the form:

$$\Delta y_t = \alpha + \sum_{i=1}^{m} \beta_i y_{t-i} + e_t \quad \text{..... (3.8)}$$

Where, Δy_t = first difference of the dependent variable, i = number of lags in ΔY_{t-i} with the maximum being m, α and β are coefficients while e_t is the error term.

While the ADF test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side, the PP test makes a correction to the t-statistic of the coefficient from the AR (1) regression by using the truncation lag (the number of periods of serial correlation to include) to account for the serial correlation. The asymptotic distribution of the PP t-statistic is the same as the ADF t-statistic.

3.4 Cointegration analysis

The use of cointegration technique allowed the study to capture the equilibrium relationship between non-stationary series within a stationary model, following Adam (1998: 26), Johnston and Dinardo (1997:266). Furthermore, it avoided both the spurious and inconsistent regression problems, which would have otherwise occurred with the regression of non-stationary data series. It also permitted the combination of the long-run and short-run information in the same model and overcame the problems of losing information that could have occurred from attempts to address non-stationary series through differencing (Adam, 1998).

Cointegration technique made it possible to capture the information of non-stationary series without sacrificing the statistical validity of the estimated tax equations (see also Hendry, 1986 and Stock and Watson, 1988). Testing for cointegration was done through estimation of the Engle-Granger cointegrating relationships (Granger, 1986 and Engle *et al*, 1987). The test involved detecting whether the regression residuals were stationary or non-stationary. The ADF and the Philip-Perron (PP) unit root tests were performed on the regression residuals for this purpose. The ADF test for cointegration took the form:

$$\Delta\hat{e}_t = \delta\hat{e}_{t-1} + \sum_{i=1}^{m} a_i \Delta\hat{e}_{t-i} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots \quad (3.9)$$

Where, $\hat{e}_{t-1}$ = Ordinary least squares regression residuals.

The null hypothesis H_o and the alternative hypothesis H_1 were:

H_o: $\delta = 0$ Cointegration does not exist

H_1: $\delta < 0$ Cointegration exists

The PP test took the same form as ADF test for cointegration except for the introduction of the truncation lag. The PP unit root test for regression residuals was performed because Pierre (1989) argued that the presence of unusual circumstances might invalidate conventional ADF unit root test (Johnston and Dinardo, 1997). Other diagnostic tests performed included normality test using Jarque-Bera statistic, the Breusch-Godfrey asymptotic test for serial autocorrelation (LM), ARCH residuals test, homoscedasticity, white heteroskedasticity test, and the Ramsey RESET test for specification error, Chow forecast test and CUSUM test for parameter constancy.

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The years that had experienced unusual observations were determined after the graphical inspection of the regression residuals from the initial formulation of the cointegrating relation showed dramatic spikes either downward or upwards. The dummy variables were used depending on whether their inclusion improved the adjusted R-squared and Durbin-Watson statistic, and at the same time, reduced the standard error of regression.

The elasticity estimates were derived from the meaningful long run relationships that passed a battery of diagnostic tests. For Autoregressive Distributed Lag (ARDL) models, the elasticity estimates were calculated using the procedure outlined by Johnston and Dinardo, 1997, and Hill, Griffiths, and Judge, 2001) and described below.

The ARDL relation was specified as follows:

$$\mathbf{A\,(L)\,Y_t = m + B_1\,(L)\,X_t + B_2\,(L)\,X_{2t} + \varepsilon_t} \quad \ldots\ldots\ldots\ldots (3.10)$$

The implied long run relationship was:

$$\tilde{y} = \frac{m}{A(1)} + \frac{B_1(1)}{A(1)}\bar{X}_t + \frac{B_2(1)}{A(1)}\bar{X}_2 \quad \ldots\ldots\ldots\ldots (3.11)$$

Where, A (1) = 1- sum of the coefficients of lagged dependent variable (y)

$B_1(1)$ = sum of the coefficients of explanatory variable, X_1

$B_2(1)$ = sum of the coefficients of explanatory variable, X_2

The three sums were to be significantly different from zero for a cointegrating relationship to exist. Thus the existence of a cointegrating relationship was confirmed by testing whether A(1), $B_1(1)$ and $B_2(1)$ were zero. Testing that A(1) was zero, was equivalent to testing that the sum of the coefficients on the lagged dependent (y) terms was equal to one. The short run elasticity estimates were the coefficients of the non-

lagged explanatory variables, while the long run elasticity estimates were computed using the following formula:

$\frac{B_1(1)}{A(1)}$, and $\frac{B_2(1)}{A(1)}$, for X_1 and X_2 respectively.

3.5 Correlation analysis

Correlation analysis was vital because violation of one of the assumptions of the Ordinary Least Squares method that the explanatory variables should not be strongly collinear would have impaired the efficiency of the estimated parameters or made their estimation impossible.

The procedure that was explained by Koutsoyiannis (1988: 239) was used to detect the presence of multicollinearity. The procedure involved gradually inserting additional variable in the estimating equation and examining its effects on the individual coefficient, on the student t-values, and on the overall adjusted R-squared. If the variable improved adjusted R-squared without rendering the individual coefficients unacceptable on *apriori* consideration, the variable was considered useful and retained as an explanatory variable. If the new variable did not improve adjusted R-squared and did not affect, to any considerable extent, the values of the individual coefficients, it was considered superfluous and excluded from the regression. If the new variable adversely affected the sign or the value of the coefficient, it was considered detrimental to estimation results and was excluded from the regression.

3.6 Data

Data collection guidelines in appendix VIII were used to collect data for the study. Time series data were obtained from the Republic of Kenya Economic Surveys, Budget Speeches, Statistical Abstracts and National Development Plans; International Monetary Fund Financial Statistics (CD-ROMs) and The World Bank African Database ((CD-ROMs). Substantial amount of materials and records were also obtained through visits to the Ministry of Finance (MF), KRA, Kenya Institute of Public Policy Research and Analysis (KIPPRA), African Economic Research Consortium (AERC), The World Bank local office, Ministry of Planning and National Development (MPND) and library desk studies.

Both dependent and independent nominal variables were converted to real values, measured in constant (1995) Kenya shillings. Time series data for average GDP and its related variables were converted from their nominal values to their real values by dividing nominal values with the GDP deflator using 1995 as the base year. The deflator was chosen because it is the most comprehensive price index for GDP (Branson, 1989: 6). Furthermore, it measures inflation correctly since it is a weighted average of the changes in all prices of newly produced goods in the economy (Dernburg, 1985: 25). Hence it has the advantage of incorporating all the newly produced goods in the economy and allowed for changes in composition of output (Dernburg, 1985: 27).

The reason for the conversion of nominal average GDP to real average GDP was that the nominal average figures did not reflect changes in production and income caused by

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inflation that leads to prices rising when the quantities are falling. Furthermore, the real values were measures of aggregate production that eliminated the effects of inflation and showed what was happening to economic activities, apart from the movement in prices. Tax revenues were converted to their real values by dividing their nominal values with the consumer price index (CPI). This avoided biased results caused by inflation. The CPI was used because it falls on the expenditure side of the GDP equation. Furthermore, CPI is more of a cost-of-living index (Dernburg, 1985: 26), and hence it was the right one to use in converting nominal values of tax revenues to their real values. This is because tax revenues have the effect of reducing disposable personal income. The other reason for its use was that it includes the cost of imports and some items that are not actually goods and services that affect the cost-of-living.

Population was used in this study as a control factor. This was in recognition of the fact that population growth rate has serious implications on demand for public goods and services and thus on tax revenues that fund these goods and services. High population growth rate is also associated with high illiteracy rate and low education level that make it difficult to implement tax policies. Population entered the tax revenue equations as an independent variable so as to determine its influence on tax yields from various sources. Second, all the variables were divided by population to convert them into their per capita values. The two sets of results are reported in chapter four.

The year 1995 was chosen as the base year because most macroeconomic variables showed normal performance during that year. Furthermore, apart from being a more

recent year, it was a year during which few changes were experienced in the economy. The refined data were analyzed using descriptive statistics and regression methods. The study examined the accuracy of the forecasting powers of the estimated tax revenue models using the Theil's inequality coefficients (Theil, 1966, Maddala, 1977: 346, Koutsoyannis, 1988: 492). The raw and refined data are presented in appendices I and II.

CHAPTER FOUR

EMPIRICAL RESULTS

4.1 Introduction

This chapter presents the findings of the study. It highlights sample statistics, discusses econometric and related results, including the forecasting power of the tax models and trends in tax revenues.

4.2 Sample statistics

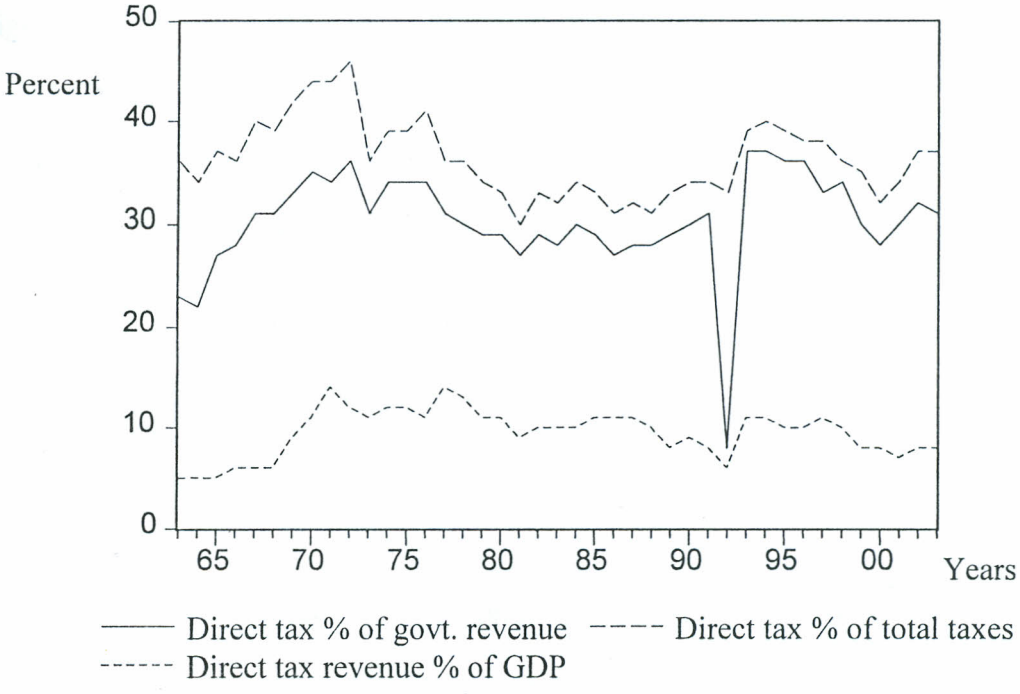
(a) Composition of direct taxes

During the period 1963/64 - 1973/74 income taxes, which include corporate tax accounted for about 95 percent of all direct taxes. This share increased to 99 percent in the period 1974/75 - 1982/83 with the abolition of graduated personal tax (GPT) that was collected last in 1973/74 fiscal year. It appears that an early attempt to broaden the direct tax base through imposition of GPT and estate duty did not improve the contribution of direct taxes in total tax revenue, which on the average remained at 36 percent. The contribution of estate duty and GPT was dismal, averaging about 1.5 and 1 percent of total direct taxes for GPT and estate duty respectively. In relation to total tax and total government revenues, the shares of these type direct taxes were negligible.

From 1983/84 fiscal year all the direct tax revenues come from PAYE and corporation taxes. The shares of these taxes in total tax and total government revenues have remained

fairly stable over the years at average rates of 36 and 30 percent respectively for the period under study (table A5 in appendix III). Income tax revenue by 1963/64 was about 5 percent of GDP, 36 percent of total tax revenue and 23 percent of total government revenues. These figures had slightly changed to 8 percent of GDP, 37 percent of total tax revenue and 37 percent of total government revenues by 2003/04 fiscal year. Figure 4.1that follow presents trends in direct tax revenues as percentages of GDP, total tax and total government revenue using figures from table A5.

Figure 4.1: Trends in direct tax revenue as percentage of GDP, total tax revenue and total government revenue, 1963 - 2003



The figure shows that direct tax revenue remained fairly stable over the years at 10 percent of GDP, 30 percent of government revenue and 38 percent of total tax revenue. However, some years experienced downswings in these shares. These years are 1972/73

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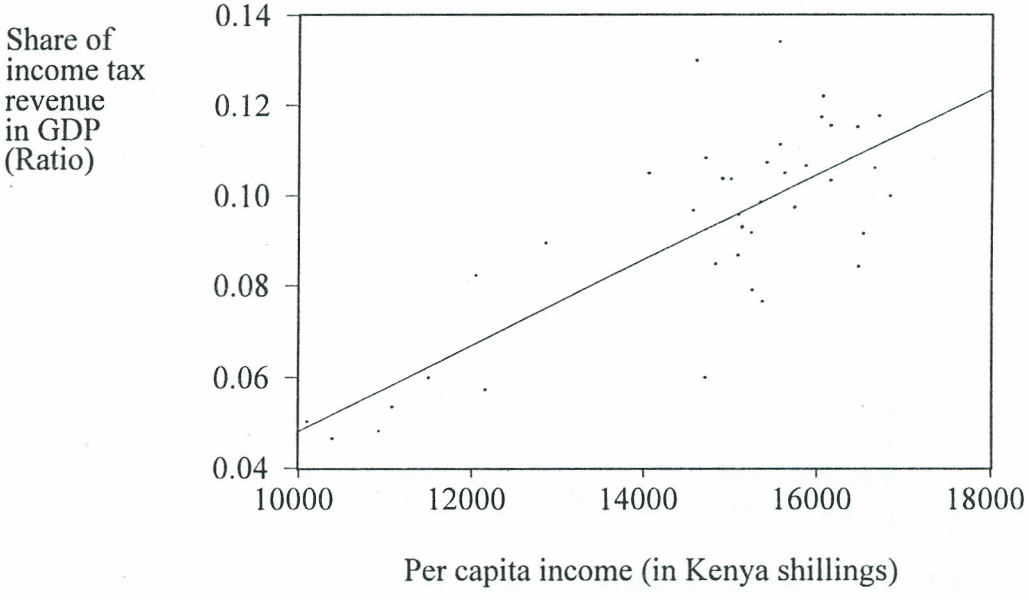
due to oil price shocks, 1992/93 due to ethnic violence in the wake of multiparty elections, 2000 due to drought and subsequent power rationing, and 2001/2002 due to multiparty election fever. The direct tax revenue as a percent of GDP shows a slight decrease from 1993/94 when it was 11 percent to 8 percent in 2003/04. This reflects the government's efforts to reduce personal and corporate income taxes and increase that of indirect taxes.

The relationship between the share of income taxes in GDP and per capita income is established in figure 4.2.

Figure 4.2: Per capita income plotted against the share of income tax revenue in GDP



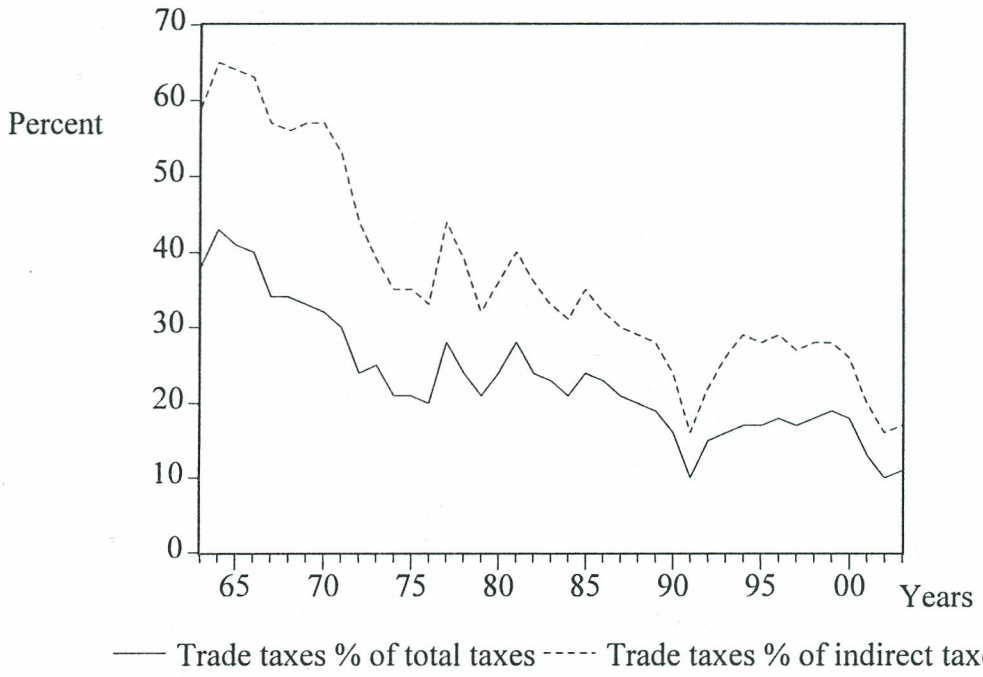
The figure shows that the share of income taxes in GDP generally appears to rise with the rising per capita income. This is because the level of per capita income could be taken to

reflect the level of surplus over subsistence out of which taxes could be paid (see also Chelliah, 1971).

(b) Composition of international trade taxes

The composition of trade taxes (table A6 in appendix III) shows the relative importance of each tax in total indirect tax revenue, total tax revenue, government revenue and GDP. Figure 4.3 below shows trends in total trade taxes as a percentage of indirect and total tax revenues.

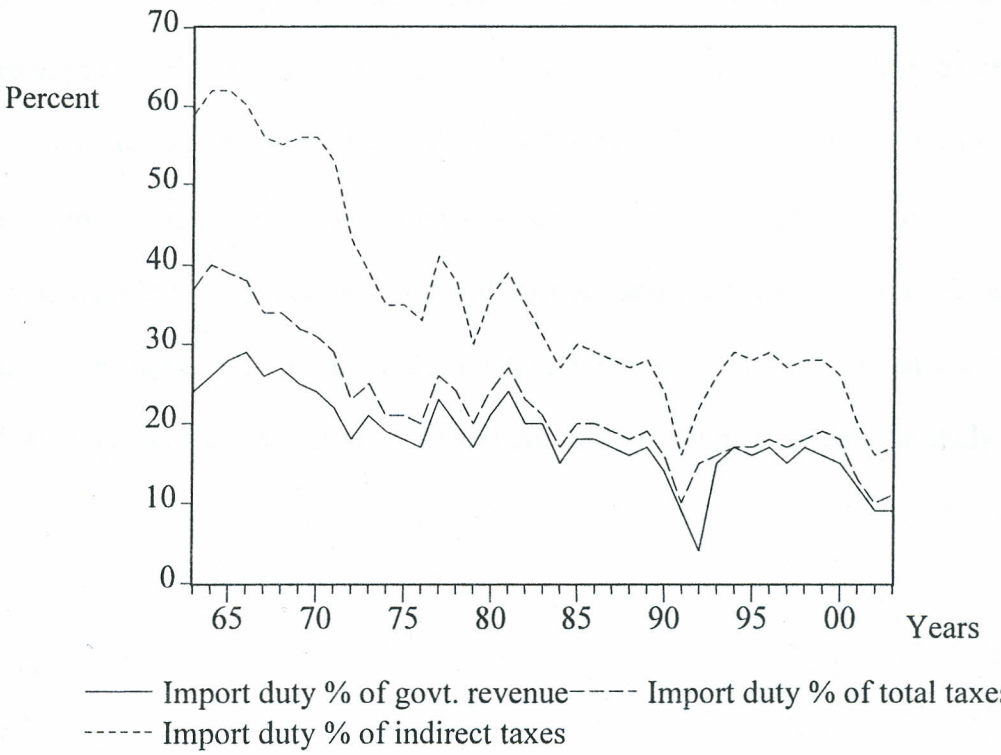
Figure 4.3: Trends in total trade tax revenues as percent of indirect tax revenue and total tax revenue, 1963 - 2003



As shown in the above figure, trade tax revenue share as percent of indirect tax and total tax revenues shows a downward trend between 1963 and 2003. This implies that Kenya has been shifting its tax policy from taxes on international trade to domestic taxes. In

fact the present taxation measures regarding trade only serve a protectionism role and not a revenue raising role. This reduced reliance on trade taxes is a good idea because trade taxes are vulnerable to international business cycles that the country cannot control. If relied upon, these types of taxes would lead to serious budget deficits. However, despite this argument, import duties still form a substantial part of total tax and total central government revenues. Figure 4.4 below shows trends in shares of import duties in total tax, indirect tax, and government revenue.

Figure 4.4: Trends in import duty as a percentage of total tax, indirect tax and total government revenue, 1963 - 2003



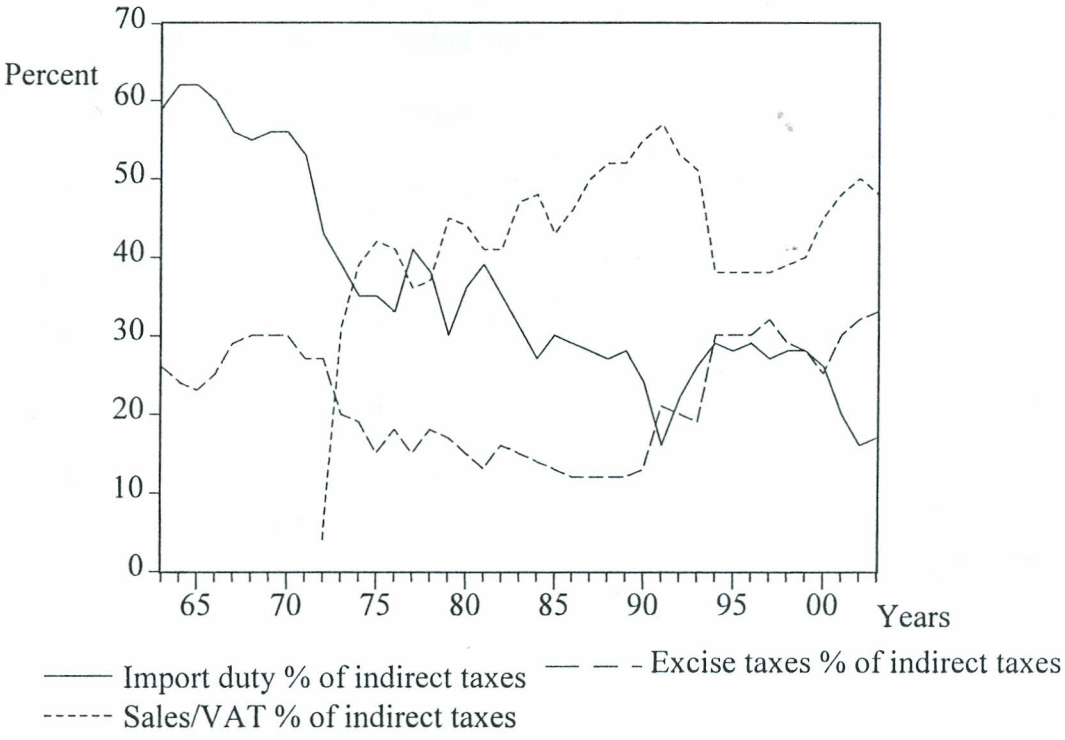
The figure depicts downward trends in the shares of import duties in total tax, in indirect tax, and in government revenues. It is also noted that import duties forms a significant share of indirect taxes.

The contribution of export taxes to the central government revenue has been negligible. This is because of Kenya's desire to promote exports. On the other hand, Kenya being a small open economy, faces fixed terms of trade and as a result of this, any export duty levied may be shifted backward onto those involved in production for export. Hence export taxes directly reduce the incomes of resources employed in the sector (see also Thirsk, 1997a).

(c) Composition of indirect taxes

Indirect tax instruments have been employed to raise government revenue for the provision of public goods and services, apart from being a prohibitive tool for consumption of harmful products. Indirect taxes in Kenya include excise duties, entertainment tax, petrol and diesel tax, sales tax, VAT on imports and on domestic manufactures, land premia, royalties, licenses and fees. The percentage contribution of various individual indirect taxes in total indirect and total tax revenues are reported in table A7 in appendix III. In figure 4.5 that follows, revenue from the main types of indirect taxes as a percent of total indirect tax revenue are plotted over the study period.

Figure 4.5: Revenue from the main types of indirect taxes as percentage of total indirect tax revenue, 1963 - 2003



From the graph, import duties, sales taxes/VAT and excise duties formed the bulk of indirect tax revenues. Their contributions were 59 and 26 percent respectively in 1963/64 and by 1973/74 the contribution of import duties had declined to 39 percent, while that of excise duties had declined to 20 percent after rising to a peak of 30 percent in the fiscal years 1968/70 and 1970/71. The introduction of sales tax in 1973 saw the share of excise duties in both total indirect taxes and total tax revenue decline over time from 19 and 11 percent respectively, to 12 and 8 percent respectively, by the fiscal year 1989/90. The reduced role of excise taxes in the revenue system explains its diminishing importance overtime. Although in 1973/74 excise taxes were as important as the sales tax, by 1981, excise taxes contributed less to total revenue than the sales tax. This was because during

this period inflation undermined the real value of the per unit basis on which the excise taxes are collected.

However, this trend was reversed during the fiscal year 1990/91 when a steady rise in the share of excise duties in total taxes was experienced. By the fiscal year 2003/04, the share had considerably risen to 33 percent and 17 percent of indirect tax revenue and total tax revenue respectively. The rise was occasioned by the introduction of excise taxes on petroleum products in 1994/95. Revenue from excise taxes maintained a positive growth between 2001 and 2003 despite the lifting of duty on locally produced sugar (Republic of Kenya, 2004: 86). The most important sources of excise revenue are excise taxes collected on alcoholic beverages, cigarettes, petroleum, second hand clothes and second hand vehicles.

Revenue from licenses and fees under Traffic Act contributed up to 3 percent of total indirect tax revenue in the fiscal year 1963/64. This share had increased to 5 percent of total indirect tax revenues by the fiscal year 1972/73 when it started decreasing drastically over the years with the introduction of the sales tax. In fact this share has been stable at 1 percent despite the introduction of transport licensing board fees in 2000/01 fiscal year.

The contribution of revenues from business trading licenses and duties formed a negligible percent of total indirect tax revenue over the study period. Their share in total indirect tax revenue remained below 1 percent for several years within the period of

study. This means that business trading licenses and duties cannot be relied on to finance provision of public goods and services. The situation is made worse by the declining economic growth that has resulted in increased poverty level. People are unable to start enterprises as a consequence of this.

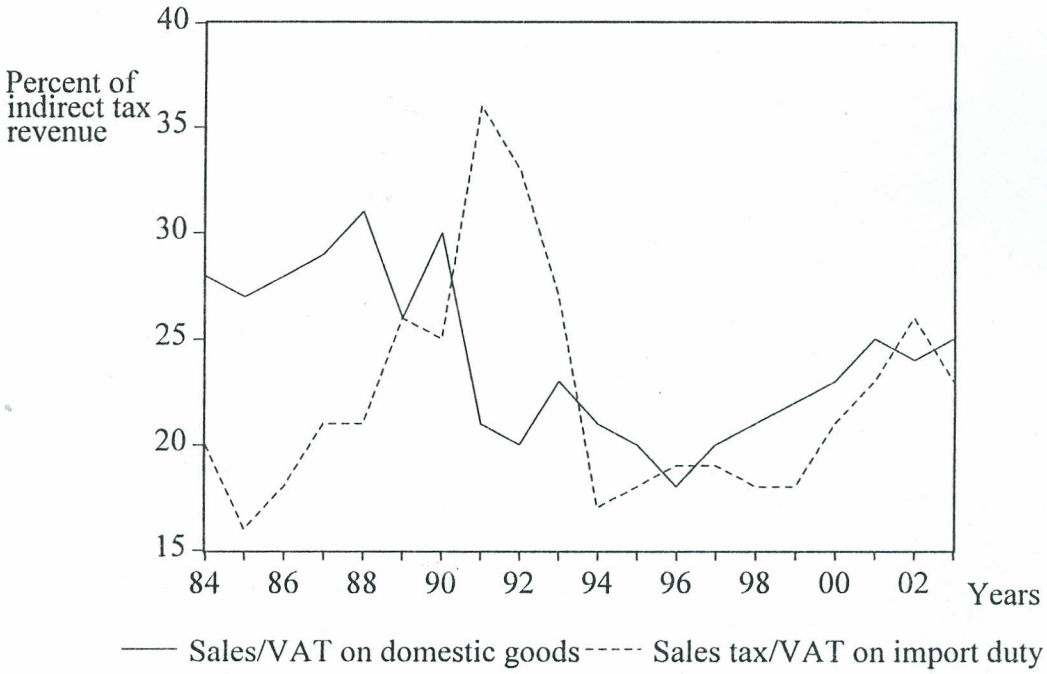
The contribution of other taxes, licenses and duties combined to indirect tax revenue remained below 8 percent per annum except for the fiscal year 1972/73 when this share was 13 percent owing to inflation pressures occasioned by the rising oil prices. Other taxes that have played some role in raising tax revenue but have since been abolished or combined with other taxes while reporting include entertainment tax, petrol and diesel tax, royalties and land premia. Among these category of taxes, petrol and diesel tax and stamp duties contributed a high percent of indirect tax revenue of an average of 2 and 4 percent of indirect taxes per annum respectively. The contribution of royalties, entertainment tax and land premia in total indirect tax revenue were on the average less than 1 percent per annum, hence negligible.

The introduction of sales tax in 1972/73 fiscal year led to a decline in relative importance of most of the indirect taxes including import duties, excise duties, licenses, and fees under Traffic Act and business licenses. Sales tax quickly became a major source of total tax revenue contributing about 13 percent and 20 percent of indirect tax and total tax revenues respectively for the fiscal year 1973/74. It consequently assumed an upward trend over the years rising to a record 57 percent and 37 percent of total indirect tax and total tax revenue respectively, in the fiscal year 1991/92.

However, these shares were not sustained and fell steadily to 38 percent and 23 percent in the fiscal years 1994/95 and 1997/98 respectively, before settling at 48 percent and 30 percent in the fiscal year 2003/04 for total indirect tax and total tax revenue respectively. Currently, VAT is the major source of indirect tax revenues in Kenya contributing about 48 percent followed by excise duties at 33 percent and import duties at 17 percent.

From the time of its introduction in 1972/73 up to 1983/84, sales tax was levied as a single tax. However, before its replacement in 1990 with the wider based Value Added Tax (VAT), it had two parts, a tax on domestic manufactures and a separate tax on imports. The relative importance of these types of sales tax /VAT in indirect tax revenues are presented in table A8 in appendix III and their trends are shown in figure 4.6 that follows.

Figure 4.6: Trends in sales taxes/VAT on domestic manufactures and on volume of imports as a percent of indirect tax revenue, 1984 - 2003



For the period 1984/85 to 1989/90, sales tax revenue on domestic manufactures constituted a larger percentage of indirect tax revenue than sales tax revenue on imports. However, with the abolition of sales tax and introduction of VAT in 1990/91, the percentage contribution of sales taxes/VAT on imports in indirect tax revenue increased from 25 percent in 19990/91 to 36 percent and 33 percent in 1991/92 and 1992/93 respectively. The contributions of VAT on imports by passed the contribution made by the VAT on domestic manufactures for the period 1991/92 to 1993/94. However, during the subsequent years, the contributions of both types of VAT showed a mixed performance occasionally by-passing one another.

(d) Composition of total tax revenues

The composition of total tax revenue (table A9 in appendix III) shows the structure of tax revenue in Kenya. The trends in percentage shares of direct tax, indirect tax and trade taxes in total tax revenue are shown in figure 4.7 that follows.

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Figure 4.7: Trends in direct tax revenue, indirect tax revenue and trade tax revenues as a percent of total tax revenue, 1963 - 2003

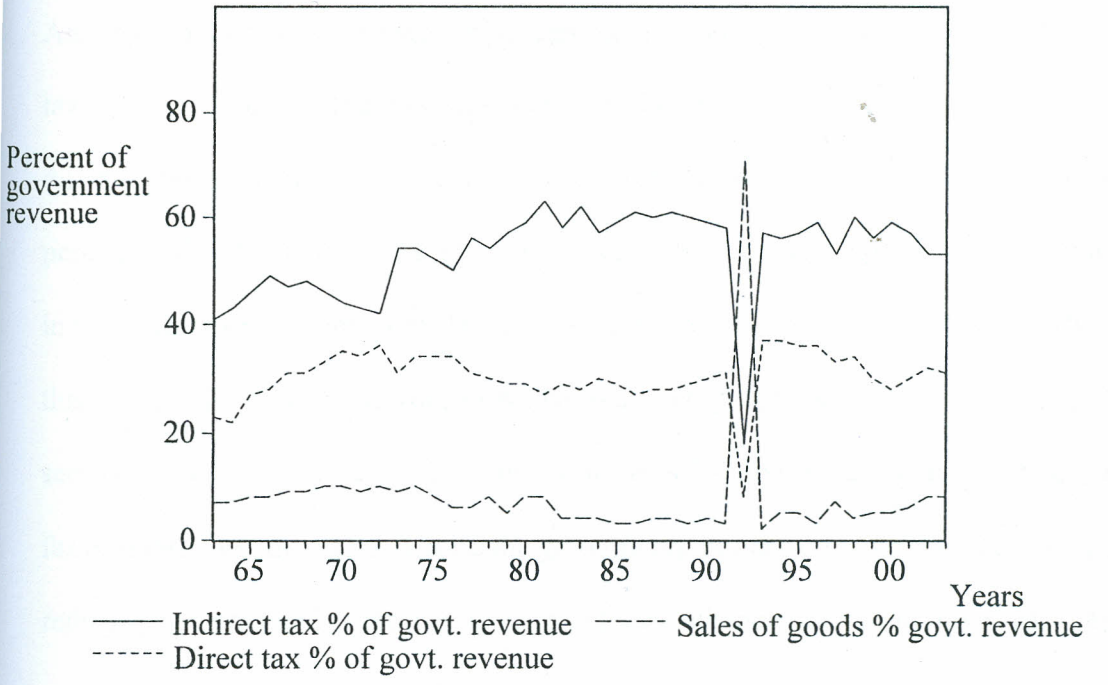
The share of direct tax in total tax revenue was 36 percent in the fiscal year 1963/64, and by the year 1972/73 this share had gradually increased to 46 percent. With the introduction of sales tax, this share gradually declined over the years to 31 percent in 1989 except for 1976/77 when it was 41 percent due to the coffee boom. From 1990 onwards, this share fluctuated between 32 percent and 40 percent. The share of direct taxes in total tax revenue has remained relatively stable despite the government's policy to minimize the number of low income earners directly involved in income taxes as a way of achieving fairness and efficiency in the tax system (Republic of Kenya, 1997, Nyamunga and Ochieng, 2001).

The share of indirect taxes in total tax revenue has remained higher than that of direct taxes over the years. This share was 64 percent in the fiscal year 1963/64 and remained above 60 percent throughout the study period except for the fiscal years 1969/70, 1971/72 and 1972/73 when it was below 60 percent. Moreover, the four fiscal years registered increased share of direct taxes in total tax revenues of between 46 and 42 percent. This was due to increased collections from the graduated personal tax whose share in total tax revenue had increased to between 4 percent and 8 percent from a mere 2 percent in 1967/68 fiscal year. In the fiscal years 1983/84 and 2000/01, indirect taxes contributed approximately 68 percent of total tax revenue, which was the highest share during the study period. Therefore, indirect taxes are very important in the Kenya's tax system.

(e) The composition of government revenues

The composition of government revenues is shown in the table A10 in appendix III. However, figure 4.8 below shows trends in tax percentages of direct, indirect, sales of goods and services, property income, and fees, fines and penalties in total government revenue.

Figure 4.8: Trends in direct tax revenue, indirect tax revenue and sales of goods as percent of government revenue, 1963 - 2003



The contribution of indirect taxes to total government revenue remained fairly stable over the years except for the fiscal year 1992/93. This share was below 50 percent from 1963/64 to 1973/73 when it assumed a fairly steady upward trend. From 1972/73, it fluctuated in the range of 50 and 63 percent of total government revenue except for 1992/93 fiscal year when it dropped drastically to 18 percent. This was occasioned by privatization and inflationary pressures which led to revenues from the sales of goods and services to drastically shoot up to 71 percent of government revenues. It appears that the tax reforms that have taken place since 1987 had little impact on the contribution of indirect taxes in total government revenue (See also Muriithi and Moyi, 2003). This

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share neither increased nor declined in the advent of liberalization and donors freeze of aid to Kenya.

Another important component of government revenues that was investigated is direct taxes. This includes revenues from personal income and corporate taxes. The share of direct taxes in total government revenue has fluctuated between 22 percent and 37 percent within the period of study. However, 1992/93 fiscal year witnessed a drastic fall in this share to 8 percent from the previous year 1991/92 of 31 percent. As earlier stated, this was attributed to privatization which increased proceeds from the sales of goods and services. The importance of these types of taxes in total government revenue remained fairly stable over the years despite the government pursuing tax policies that are aimed at reducing personal and corporate taxes in order to enhance saving and investment efforts.

Sales of goods and services and property income have contributed almost equally to the total government revenue over the years. Their shares have remained fairly stable at an average of 8 percent for the sales of goods and services and at 6 percent property income for the period 1963/64 to 1979/80. From this period, the share of sales of goods and services in total government revenue declined over time until 1992/93, when it drastically increased to 71 percent from 3 percent the previous year due to privatization. The share of property income on the other hand remained relatively stable at 5 percent on average. However, this share declined to approximately 1 percent from 1992/93 to the year 2003/04, except for the fiscal year 1997/98 when it was 6 percent.

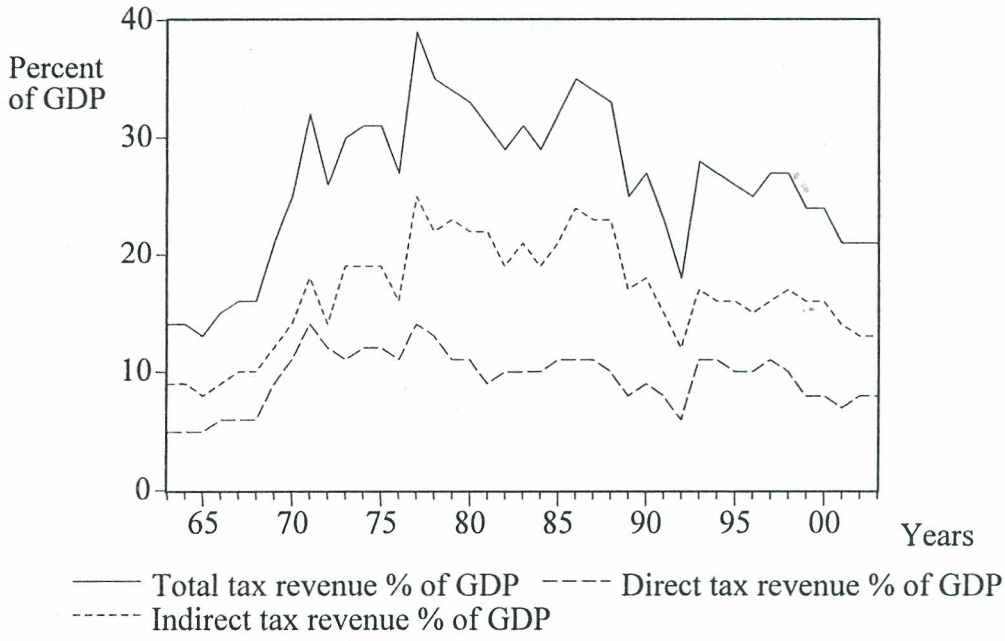
Compulsory fees, fines and penalties formed a high percentage of government revenue only in the early years of the study period as can be witnessed from figure 4.9. However, this declined with time up to 1970 when the trend stabilized at below 5 percent for the remaining years except for 1999/00 when it was 8 percent probably due to enforcement of transport licensing fees.

From the foregoing, it is clear that Kenya relies heavily on taxes as sources of central government revenue. Other non-tax revenues play a minimal role in raising funds for economic growth and development. Tax policies should therefore be designed to bring about efficiency, stabilization and equity within the economy without compromising incentives to work, save and invest.

(f) Trends in tax revenues as percent of GDP

Trends in tax ratios show the relative magnitudes of various categories of taxes and government revenues as GDP changes. The ratios are reported in the table A11 in appendix III. The trends reported in figure 4.9 that follows are inter alia, for total tax, direct tax, indirect tax and government revenues.

Figure 4.9: Trends in revenues from direct taxes, indirect taxes and total taxes as percent of GDP, 1963 - 2003



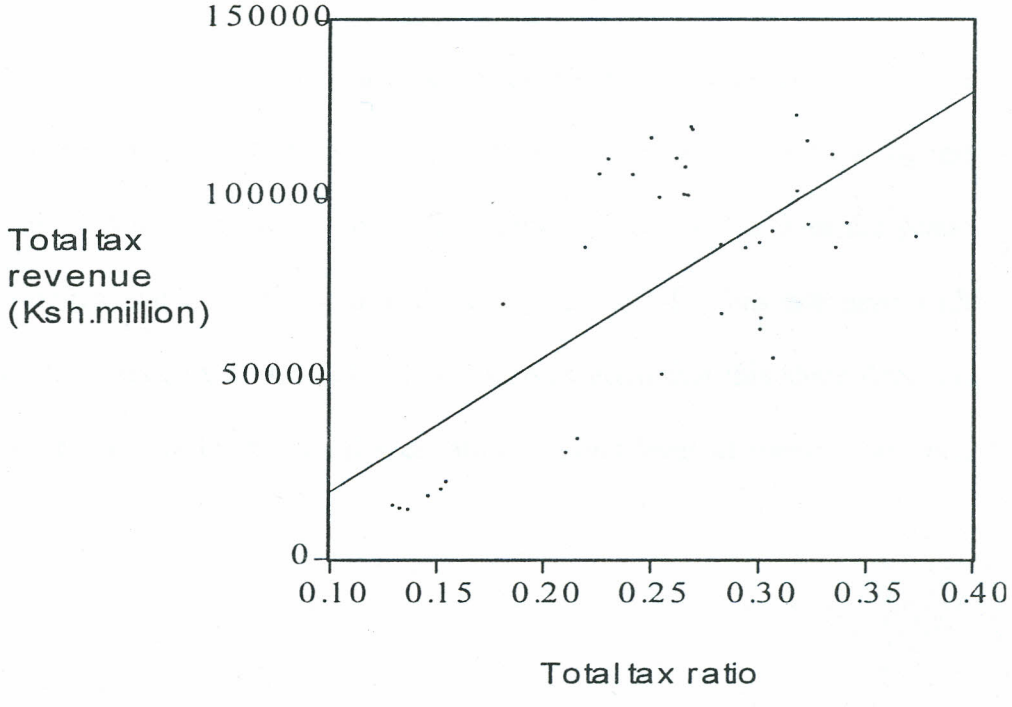
Generally at independence in 1963, the tax ratios were relatively low. They rose over time up to 1972/73 fiscal year when they started fluctuating but were quite high until the year 1988/89 when they again declined gradually to their lowest levels in the year 1992/93. The ratios rose in 1993/94 but remained low up to 2003/04 compared to those of the period between 1972/73 and 1988/89.

Total tax revenue as a percent of GDP shows fluctuations over the years between 14 percent, attained in 1963/64, and 39 percent attained in 1977/78 fiscal year. The total tax revenue as a percentage of GDP fluctuated between 14 percent and 16 percent for the period immediately after independence until 1968/69 fiscal year. The fluctuations continued although at 25 percent and above between 1969/70 and 2003/04, with exception of 23 percent attained in the fiscal year 1992/93. The fiscal year 1992/93

recorded the lowest tax ratios because of low economic growth rate occasioned by the 1992 multiparty election fever, ethnic clashes and the erosion of purchasing power due to inflationary pressure. Between 1971/72 and 1988/89 fiscal years, the total tax ratio remained high averaging above 30 percent of GDP. This was not a very healthy situation because it meant that most of the resources available for private use and for investment were being channeled to the public sector, which has never been a good investor. This might have resulted in crowding out of private sector investment leading to a decline in economic growth in the subsequent years.

The following figure 4.10 shows the scatter diagram with the line of good fit for total tax ratios (see table A11 in appendix III) plotted against real total tax revenue figures with 1995 as the base year (see table A4 in appendix II).

Figure 4.10: Total tax ratio plotted against total tax revenue (The Laffer curve)



From the scatter diagram, it appears that a tax ratio of more than 0.31leads to less tax revenue being collected. The points concentrate around tax ratios of between 0.21 and 0.35 and the results seem to support the notion of an inverse relationship between tax revenue and tax ratio (proxy of tax rate). The total tax revenue of between 21 percent and 35 percent of GDP is relatively high and has remained so despite the tax reform measures that have been put in place by the government to reform the tax system. These measures were articulated in the *Tax Management Administration Guidelines* and in the *Sessional Paper No. 1 of 1986* (Republic of Kenya, 1986). The high tax ratio seems to have stifled economic growth instead of creating an enabling environment, encouraging redistribution of income and savings through fiscal discipline. Taxation in Kenya therefore has become target oriented and it appears to have lost its major purpose of service delivery and encouragement of economic growth and development through efficient allocation of productive resources, equity and stabilization.

Direct tax revenue formed only 5 percent of GDP by 1963/64 and by 2003/03 it had slightly risen to 8 percent. The fiscal years 1971/72 and 1977/78 recorded the highest direct tax ratio of 14 percent. However, direct tax ratio remained stable over the years. This evidence implies that the ratio of direct tax revenue to GDP has not risen with income. This result is shared with Chelliah (1971) who asserted that this share does not begin to rise with per capita income until a certain minimum level of income has been attained.

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Indirect tax revenue formed approximately 9 percent of GDP in 1963/64. This share remained constant until 1967/68 when it rose to 10 percent. By 1977/78, it had risen to 25 percent before declining steadily over the years to 13 percent in the fiscal year 2003/04. This implies that less and less resources are being transferred to the public sector from the private sector. However, it may also imply that real GDP has been declining steadily over time while the tax rates have remained constant.

Indirect taxes seem to concentrate more on predictability of revenue, administrative ease, and certainty of collection, than on such principles as fairness, economic neutrality, and ease of compliance. The major sources of indirect tax revenue are VAT, excise taxes, and import duties, respectively. The share of excise taxes in GDP by-passed that of import duties in the year 1995, which suggests that the introduction of excise tax on petroleum products and the establishment of KRA led to increase in revenue.

4.3 Econometric and related results

4.3.1 Findings of diagnostic tests

(a) Stationarity of data

The unit root test was performed in order to detect whether there existed stationary or non-stationary series closely following Dickey and Fuller (1979), Mackinnon (1991) and Thomas (1997). The ADF test results for the variables are presented in table A12 in appendix IV. Regressions are presented with constant (C) and constant and trend (C and T). The tests showed that the time series for all the variables were non-stationary at levels using 1 percent critical value. The first difference for all the variables did not exhibit unit

roots, which means that the data were stationary at first difference. Furthermore, the conventional test, assuming an intercept and four lags did not reject the unit root hypothesis at the first difference.

(b) Cointegration of variables

The results of the unit root tests for cointegration of variables are reported in table A13 in appendix V. These results confirmed that the regression residuals for all the tax models that were estimated were stationary, implying the existence of cointegrating relationships.

(c) Distribution and other properties of variables

Before accepting the results of the dynamic specification, it was important to ensure that the equations estimated tracked the data well. Several other diagnostic tests were performed and the results are reported in tables A14 to A18 in appendix V. This ensured that the tax models captured the salient features of the data and was consistent with the economic theory. The means and standard deviations for the variables used in the estimated tax equations are given in table A18 in appendix V. The standard deviations were small meaning that the values of the variables were not so dispersed.

The histogram-normality test (Jarque-Bera test) is a test of the distribution of the error term and it uses the first four moments of the distribution namely mean, standard deviation, skewness and kurtosis. The results of the Jarque-Bera test are reported in table A14 in appendix V. The Jarque-Bera test results had probability values greater than 0.05, hence the normality assumptions of the regression residuals for all the estimated

equations were not rejected. The regression residuals therefore followed a normal distribution, which means that the OLS estimates obtained were efficient and consistent.

Two types of autocorrelation tests were performed. These were the DW statistic test for first order autocorrelation and the Lagrange Multiplier (LM) test for higher order autocorrelation. This was in recognition of the fact that OLS models assume serial independence in the residuals (Maddala, 1977: 257, Greene, 1990: 382 - 383). The results of these two tests for auto correlation are presented in the table A15 in appendix V.

The DW statistics were close to two (2) and in some cases greater than two, implying no evidence of autocorrelation. However, the standard DW statistic was not a sufficient test for autocorrelation since all regressors were not strictly exogenous and the error process was not considered to be of the first order. The DW statistic was therefore a test of only the first order auto correlation and had relatively low power (see Adam, 1998, Thomas, 1997: 428). Furthermore, the presence of lagged dependent variable in the tax models might have tended to bias the DW test statistic towards two (2).

To offset the shortcomings of the use of DW test statistic, the LM test was performed. The LM test is a general test for high order autocorrelation and is relatively more powerful than the DW test, especially for this study, where higher order lagged dependent variables were included as regressors and the error process was AR (M). The LM test was performed by regressing regression residuals on their own lagged values up to the sixth lag. The appropriate lag lengths were determined by the AIC and the Schwarz

criterion presented in table A13 in the appendix V. From the results in the table A15 in the appendix V, the hypotheses of zero autocorrelation in the residuals were not rejected. This was because the probabilities were greater than 0.05. The LM test did not therefore reveal serial correlation problems for the tax models.

In recognition of the fact that there might be autocorrelation disturbances in the series leading to homoscedasticity (Johnson and Dinardo, 1997 and Engle, 1982a), the ARCH test was performed with one up to six lags. Furthermore, although the problem of heteroscedasticity is mostly encountered in cross-section data (see for example Johnson and Dinardo, 1997 and Engle, 1982b), in this study, the white heteroscedasticity test was performed on the residuals as a precaution. The results of the ARCH and White tests results are reported in the table A16 in the appendix V

The results of the ARCH test showed probabilities of individual coefficients lying between 0.13 and 0.99, with probability of F-statistics lying between 0.11 and 0.96. These high probabilities meant that the assumption of homoscedastic residuals for the estimated tax equations could not be rejected in favour of the ARCH residuals. Furthermore, the results of white test showed very high probabilities that were greater than 0.05, which rejected the presence of heteroscedasticity.

Considering Ramsey (1969) and Ramsey and Schmidt (1976) argument that various specification errors such as omitted variables, incorrect functional form, correlation between independent variables and the error term, give rise to non zero error term vector

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(Johnson, and Dinardo, 1997: 121), the performance of the Ramsey RESET test was inevitable. The test was performed to determine whether there were specification errors. The Ramsey RESET test results are in table A17 in appendix V. The results showed high probability values that were greater than 0.05, meaning that there was no significant evidence of miss-specification.

According to Johnson and Dinardo (1997:13), an estimated equation should have relevance for data outside the sample used in the estimation. In recognition of this fact, the Chow Forecast test was performed to determine the parameter constancy following Chow (1960). Observations from 1964/65 to 1994/95 were used for estimation and those from 199596 to 2002/03 for testing. To avoid the F-statistic overstating the true significance level, disturbances were checked for the absence of heteroscedasticity first before the Chow test was performed. The results for Chow forecast tests are presented in the table A17 in the appendix V. The results showed high probability values that were greater than 0.05, implying that the estimated parameters were constant.

Considering the fact that the study used time series data where time gives a unique ordering of the data (Johnson and Dinardo, 1997: 118), recursive estimations were performed for each tax equation in order to detect specification errors through estimated parameter inconstancy. The CUSUM test, CUSUM residual squares test, one-step-forecast test, N-step forecast test and recursive coefficient tests were performed. In all cases, there were no residuals lying outside the two standard error bands, suggesting that the parameters are constant.

The t-statistic was used to test the hypothesis that a coefficient was equal to zero. Two methods were used in this study to interpret the t-statistic. The first method was to observe its estimated value. If the computed t-statistic for a coefficient was greater than 2 or smaller than -2, the null hypothesis was rejected. If, on the other hand, the computed t-statistic was smaller than 2 or greater than -2 the null hypothesis was accepted (Koutsoyiannis, 1988: 90). The second method was the probability (p-value) of observing the t-statistic given that the coefficient was equal to zero. At 5 percent significance level, a p-value lower than 0.05 was taken as evidence to reject the null hypothesis, while at the 1 percent significance level, a p-value lower than 0.01 led to the rejection of the null hypothesis.

The standard errors (ratio of coefficients to their t-statistics) measured the statistical reliability of the coefficient estimates. The larger the standard errors, the more statistical noise in the estimates were encountered. Standard errors of the estimated coefficients were small hence there were little statistical noises in the estimates, and the coefficients were statistically reliable (Kothari, 2004: 164). The standard errors of regression (which are the standard deviations of the regression residuals) were also small, meaning that the estimated tax equations tracked the data well.

Degrees of freedom, which are the number of variables that can vary freely, were used to perform tests of the reliability of estimates obtained. The number of degrees of freedom associated with sum of squares was given by the number of observations used to compute the sum of squares minus the number of parameters that had to be replaced by their

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sample estimates or restrictions placed on the variables used to form the sum of squares. The degrees of freedom associated with the sum of squares in all the estimated tax equations were large, hence the estimated results are reliable.

The F-statistic was used to test the hypothesis that all of the slope coefficients (excluding the constant) in the estimated tax equations were zero. The p-values for the F-statistics were zero (see tables 4.1 to 4.7), which led to the rejection of the null hypothesis that all slope coefficients were equal to zero. This meant that the corresponding Adjusted R-squared statistics were different from zero. Therefore, the effect of all the independent variables on the tax revenue for each tax equation was jointly different from zero.

4.3.2 Determinants of tax revenues

In the light of the reported results of various diagnostic tests, the tax revenue equations were deemed well specified on statistical grounds and were therefore used to analyze the determinants of tax revenues. The OLS regression results for tax revenue equations are reported in tables 4.1 to 4.7 that follow.

Table 4.1: Determinants of total taxes (t-statistics are in parenthesis)

Independent variables	Dependent variables			
	log total tax revenue	log per capita total tax revenue	log total tax revenue	log per capita total tax revenue
Constant	0.15 (0.1)	1.21 (0.4)	0.57 (0.3)	2.02 (1.2)
Oil crisis, coup attempt unfavourable weather, poor infrastructure, donor funds suspension, ethnic clashes, multiparty elections (D = 1for years: 1973, 1979, 1982, 1983, 1984, 1990, 1991, 1992, 993, 1998, 2002, = 0 otherwise)	-0.38** (-3.7)	-0.36** (-3.3)	-0.38** (-4.1)	-0.39** (-3.8)
East Africa community market, sales taxes, coffee & tea booms, SAPs, excise & customs duties, excise on petroleum products, KRA (D = 1 for years 1972, 1973, 1976, 1977, 1978, 1986, 1987, 1988, 1995, = 0 otherwise)	0.26** (3.6)	0.30** (4.0)	0.28** (4.1)	0.32** (4.6)
log total GDP	1.11 (1.7)	0.91 (1.3)		
log population	-0.18 (-0.5)		-0.12 (-0.6)	
First lag of log total GDP	-0.70 (-1.4)	-0.7 (-1.2)		
First lag of log total tax revenue	0.44** (3.2)	0.56** (3.9)	0.37** (2.9)	0.53** (4.5)
Sixth lag of log total tax revenue	0.15* (2.1)	0.06 (0.9)	0.11 (1.4)	0.10 (1.2)
log monetary GDP			1.37** (2.7)	1.32* (2.4)
First lag of log monetary GDP			-0.92* (-2.0)	-1.20* (-2.5)
Adjusted R-squared Standard error of regression Durbin-Watson statistic Degrees of freedom F-statistic p-value	0.93 0.09 1.8 33 58 0.00	0.78 0.10 1.7 33 19 0.00	0.94 0.08 2.0 33 69 0.00	0.82 0.09 2.0 33 23 0.00

(i) The asterisks (*) and (**) denote that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively.

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

Table 4.2: Determinants of direct taxes (t-statistics are in parenthesis)

Independent variables	Dependent variables			
	log direct tax revenue	log per capita direct taxes	log direct tax revenue	log per capita direct taxes
Constant	-2.5 (-0.5)	0.85 (0.3)	0.08 (0.1)	0.82 (0.8)
Oil crisis, unfavourable weather, donor funds suspension (D = 1for years 1973, 1979, 1984, 1993, 2002, = 0 otherwise)	-0.66** (-8.7)	-0.63** (-9.1)	-0.31** (-3.1)	-0.32** (-3.3)
Coup attempt, insecurity, influx of refugees, Persian Gulf war, , ethnic clashes, multiparty elections, (D = 1for years, 1982, 1983, 1991, 1992, 1997, 2002, = 0 otherwise)	-0.28** (-4.1)	-0.27** (-4.0)		
log total GDP	0.96* (2.0)	0.84 (1.8)		
log population	-0.23 (-0.4)		-0.04 (-0.2)	
First lag of log total GDP	-1.01 (-1.6)	-1.00 (-1.6)		
Second lag of log total GDP	0.78 (1.4)	0.69 (1.2)		
Third lag of log total GDP	0.73 (1.4)	0.44 (1.1)		
Fifth lag of log total GDP	-0.92** (-3.4)	0.91** (3.3)		
Seventh lag of log total GDP	-1.04** (-4.0)	-0.96** (-4.5)		
Fifth lag of log direct tax revenue	-0.32* (-2.5)	-0.22** (-3.0)		
Import substitution strategy, East Africa community market, coffee & tea booms, SAPs (D = 1 for years 1972, 1976, 1977, 1978, 1986, 1987 = 0 otherwise)			0.28** (4.6)	0.27** (4.5)
Favourable weather, KRA, (D= 1 for years 1980, 1994, 1995, 2001, = 0 otherwise)			0.49** (4.7)	0.48** (4.6)
log monetary GDP			1.32* (2.4)	1.33* (2.4)
First lag of log monetary GDP			-1.11* (-2.4)	-1.24** (-2.8)
First lag of log direct tax revenue			0.74** (7.5)	0.77** (7.9)
Adjusted R-squared	0.91	0.89	0.97	0.93
Standard error of regression	0.06	0.06	0.09	0.09
Durbin-Watson statistic	1.8	1.6	1.9	1.9
Degrees of freedom	31	31	37	37
F-statistic	30	28	177	74
p-value	0.00	0.00	0.00	0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is significant at 5 percent and 1 percent level respectively.

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

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Table 4.3: Determinants of indirect taxes (t-statistics are in parenthesis)

Independent variables	Dependent variables			
	log indirect tax revenue	log per capita indirect taxes	log indirect tax revenue	log per capita indirect taxes
Constant	-5.2 (-1.7)	-5.1* (-1.9)	-4.2* (2.0)	-2.35 (-1.6)
Import substitution industrialization, East Africa community market, coffee boom, commencements of excise tax &VAT, (D = 1 for years 1972, 1976, 1977, 1978, 1990, = 0 otherwise)	0.33** (4.7)	0.33** (4.9)	0.35** (4.2)	0.38** (4.7)
Oil crisis, suspension of donor funds, foreign exchange & financial liberalization, multiparty party elections (D = 1 for years 1973, 1979, 1990, 1991, 1992, 1993, = 0 otherwise)	-0.31** (-4.9)	-0.31** (-5.0)	-0.29* (-2.6)	-0.30* (-2.6)
log total GDP	2.11** (3.6)	2.02** (3.5)		
log population	-0.46 (-1.4)		-0.52 (-1.7)	
First lag of log total GDP	-1.31* (-2.6)	-1.22** (-2.8)		
First lag of log indirect tax revenue	0.68** (5.8)	0.69** (6.0)		0.59** (4.4)
log monetary GDP			1.63** (2.7)	1.5* (2.5)
First lag of log monetary GDP			-0.71 (-1.4)	-0.91* (-2.0)
Adjusted R-squared	0.98	0.95	0.97	0.92
Standard error of regression	0.09	0.09	0.10	0.11
Durbin-Watson statistic	1.6	1.6	1.9	2.0
Degrees of freedom	37	37	37	37
F-statistic	266	121	193	83
p-value	0.00	0.00	0.00	0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively. .

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

Table 4.4: Determinants of income taxes (t-statistics are in parenthesis)

Independent variables	Dependent variables			
	log income tax revenue	log per capita income taxes	log income tax revenue	log per capita income taxes
Constant	-0.1 (-0.04)	0.21 (0.08)	1.3 (1.4)	1.62* (1.9)
Oil crisis, unfavourable weather, donor funds suspension, ethnic clashes, multiparty elections (D = 1for years 1973, 1979, 1983, 1984, 1993, 2002, = 0 otherwise)	-0.57** (-5.1)	-0.61** (-5.5)	-0.42** (-6.1)	-0.44** (-6.2)
log total GDP	1.93** (3.2)	2.3** (4.0)		
log population	-0.04 (-0.1)		0.17 (0.9)	
First lag of log total GDP	-1.46* (-2.5)	-1.69** (-2.9)		
Fifth lag of log total GDP	1.86** (3.1)	2.25** (3.8)		
Sixth lag of log total GDP	-1.49* (-2.4)	-2.16* (-4.3)		
log monetary GDP			1.96** (5.3)	2.07** (5.4)
First lag of log monetary GDP			-1.82** (-3.3)	-1.98** (-3.5)
Second lag of log monetary GDP			0.84 (1.7)	0.87 (1.7)
Third lag of log monetary GDP			-1.16** (-3.2)	-1.1** (-2.9)
Fifth lag of log monetary GDP			1.19** (3.4)	1.33** (3.8)
Sixth lag of log monetary GDP			-0.62* (-2.0)	-0.88** (-3.3)
First lag of log income tax revenue			0.36** (4.3)	0.36** (4.0)
East Africa community market, coffee & tea booms, budget rationalization, KRA (D = 1 for years 1972, 1977, 1978, 1985, 1986, 1995, = 0 for others)			0.25* (7.0)	0.25* (6.6)
Coup attempt, drought, *El Nino* (D= 1 for 1982, 1983, 1997, 1998, = 0 otherwise)			-0.17** (-3.9)	-0.15** (-3.4)
Adjusted R-squared	0.83	0.66	0.96	0.92
Standard error of regression	0.11	0.11	0.05	0.05
Durbin-Watson statistic	1.7	1.8	2.3	2.2
Degrees of freedom	32	32	32	32
F-statistic	25	12	64	33
p-value	0.00	0.00	0.00	0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively.

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

Table 4.5: Determinants of sales tax /VAT revenues (t-statistics are in parenthesis)

Independent variables	Dependent variables							
	log sales taxes/ VAT	log per capita sales tax /VAT	log sales taxes/ VAT	log per capita sales tax /VAT	log sales tax/ VAT	log per capita sales tax /VAT	log sales tax/ VAT	log per capita sales /VAT
Constant	-10.8 (-1.5)	-19.6** (-3.1)	-4.6* (-2.2)	-2.75 (-1.0)	-19** (-4.5)	-1.88 (-1.7)	-15** (-4.0)	-0.56 (-0.4)
Oil crisis, (D = 1 for years 1973 and 1979, = 0 otherwise)	-2.6** (-16.0)	-2.4** (-16.0)	-2.36** (-27.7)	-2.34** (-20.0)	-0.27** (-5.0)	-0.15* (-2.4)	-22** (-4.0)	-39** (-7.4)
Abolition of GPT, *El Nino* rains, ethnic strife, election fever, drought, (D= 1 for 1973, 1993, 1997, 2000, = 0 otherwise)	-0.22** (-2.9)	-0.17* (-2.3)	-0.2** (-6.0)	-0.25** (-6.4)				
Sales tax, favourable weather, elements of SAPs, VAT (D = 1 for 1973, 1980, 1986, 1987, 1988, 1990, 1994, = 0 otherwise)	0.30** (4.5)	0.29** (4.0)	0.21** (6.8)	0.21** (5.1)	0.26** (5.5)	0.14* (2.6)		
log total GDP	1.94** (2.7)	2.78** (3.1)						
log population	-1.2 (-1.8)		-0.5* (-2.1)		0.07 (0.63)		0.4** (2.8)	
log monetary GDP			1.29** (5.9)	1.03** (3.7)				
Log volume of imports					1.5** (6.7)	0.68** (4.3)		
Third lag of log imports					0.45* (2.6)	-0.17 (-1.3)		
First lag of log sales tax/VAT					0.59** (6.1)	0.6** (4.3)		
log volume of trade							1.5** (3.8)	0.38 (1.6)
Second lag of log volume of trade							1.00* (2.0)	0.60 (1.0)
Third lag of log volume of trade							-1.7** (-3.0)	-1.10 (-1.4)
Fourth lag of log volume of trade							1.1** (3.2)	0.90* (2.3)
Oil crisis*log volume of trade							1.7** (3.7)	3.9** (7.1)
Adjusted R-squared	0.96	0.94	0.99	0.98	0.86	0.85	0.92	0.90
Std. error of regression	0.13	0.14	0.06	0.08	0.07	0.09	0.18	0.17
Durbin-Watson	1.8	1.5	2.4	1.8	2.2	2.0	2.2	1.0
Degrees freedom	30	30	30	30	30	30	30	30
F-statistic	133	99	618	300	20	21	55	44
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively.

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

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Table 4.6: Determinants of excise duty (t-statistics are in parenthesis)

Independent variables	Dependent variables					
	log excise duty	log per capita duty	log excise duty	log per capita duty	log excise duty	log per capita duty
Constant	4.1 (0.8)	2.9 (0.7)	0.9 (1.1)	1.09 (1.4)	1.9* (2.0)	2.0* (2.2)
Coup attempt (1982) unfavourable weather, aid suspension, ethnic clashes, multiparty elections (D = 1for years 1982, 1983, 1984, 1993, 2000, 2002, = 0 otherwise)	-0.25* (-2.1)	-0.25* (-2.1)	-0.22* (-2.6)	-0.2* (-2.4)	-0.28* (-1.9)	-0.29* (-2.0
Oil crisis, (D = 1 for years 1973 and 1979, = 0 otherwise)	-0.36** (-3.2)	-35** (-3.2)	-0.44** (-3.0)	-0.44** (-3.0)	-0.34* (-2.3)	-0.34* (-2.4)
Commencement of customs & excise taxes, excise tax on petroleum products, AGOA, budget rationalization (D = 1 for years 1978,1985 & 1994/95, 2001,= 0 otherwise)	0.21 (1.6)	0.24* (2.0)	0.20 (1.6)	0.27* (2.0)	0.19 (1.6)	0.26* (2.0)
log total GDP	-0.88* (-2.2)	-0.91* (-2.2)				
log population	0.63 (1.0)		0.03 (0.13)		0.34 (1.7)	
Fifth lag of log total GDP	3.1** (4.1)	3.19** (4.2)				
Sixth lag of log total GDP	-2.45** (-3.8)	-2.32** (-3.9)				
First lag of log excise duty	0.83** (8.9)	0.85** (9.0)	0.76** (7.8)	0.73** (8.3)	0.73** (5.8)	0.76** (7.2)
Sixth lag of log excise duty	-0.2 (-1.3)	-0.25 (-1.7)				
First lag of log volume of trade			-0.44 (-1.7)	-0.32 (-1.5)		
Second lag of log volume of trade			0.55* (2.0)	0.39* (1.9)		
log volume of imports					0.59* (2.0)	0.54* (2.0)
First lag log volume of imports					-0.81* (-2.6)	-0.80* (-2.6)
Fourth lag of log volume of imports					0.18 (1.4)	0.2 (1.8)
Adjusted R-squared Standard error of regression Durbin-Watson Degrees of freedom F-statistics p-value	0.92 0.11 2.8 32 40 0.00	0.79 0.11 2.8 32 14 0.00	0.93 0.13 1.80 36 74 0.00	0.76 0.13 1.8 36 21 0.00	0.90 0.14 2.0 34 40 0.00	0.67 0.13 2.0 35 11 0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively.

(ii) Standard error is a ratio of the estimated coefficient to its t-statistic.

Table 4.7: Determinants of trade taxes and import duty (t-statistics are in parenthesis)

Independent variables	Dependent variables			
	log import duty	log per capita import duty	log trade taxes	log per capita trade taxes
Constant	1.1 (1.8)	0.83 (1.3)	1.4* (2.2)	1.08 (1.6)
Foreign exchange market liberalization, suspension of donor funds (D =1 for years 1991, 1992, 1993, = 0 otherwise)	-0.66** (-4.1)	-0.70** (-4.3)	-0.70** (-4.0)	-0.74** (-4.1)
log volume of imports	0.42** (3.4)	0.3* (2.5)		
log population	0.02 (0.1)		0.04 (0.3)	
First lag of log imports duty	0.37** (2.8)	0.49** (3.8)		
log volume of trade			0.27* (2.6)	0.18 (1.8)
First lag of trade tax revenue			0.5** (4.1)	0.6** (5.1)
Adjusted R-squared	0.88	0.77	0.86	0.76
Standard error of regression	0.15	0.16	0.17	0.18
Durbin -Watson statistic	2.2	2.2	2.3	2.2
Degrees of freedom	38	39	38	39
F-statistic	64	40	55	37
p-value	0.00	0.00	0.00	0.00

(i) The asterisk (*) and (**) denotes that the relevant parameter estimate is statistically significant at 5 percent level and 1 percent level respectively.

(ii) Standard error is a ratio of an estimated coefficient to its t-statistic.

Following is a discussion of regression results presented above. Log total GDP has positive and statistically significant effects on log direct taxes, log indirect taxes, log income taxes, and log sales taxes/VAT. Moreover, these tax structures are elastic except for the direct taxes. However, the effects of log total GDP and its lagged values on log total tax revenue are statistically insignificant at 5 per cent level. The long run total tax elasticity is 0.98 meaning that total tax revenue is not very sensitive with respect to

growth in total GDP (see also, Ole, 1975, Njoroge, 1993, Adari, 1997, Wawire, 1991, 2000, and 2003, and Muriithi and Moyi 2003).

The coefficients on log monetary GDP in the equations for log total taxes, log direct taxes, log indirect taxes, log income taxes, and log sales taxes/VAT revenues, have positive signs and are statistically significant. These coefficients are greater than those on total GDP meaning that monetary economic activities are easy to trace for the purpose of taxation than the non-monetary ones. They also point to the existence of an underground economy that may consist of parallel markets that comprise rent seeking activities, smuggled goods and currency, and the informal sector (see also, Osoro, 1995, Mwanza, 1997).

The lagged values for log monetary GDP have negative and statistically significant effects on log total tax revenue, log indirect tax revenue, log direct tax revenue and on log income tax revenue (except for the positive effects of its second and fifth lagged values on log income tax revenue). This means that the previous levels of monetary GDP determine the amount of current tax revenue that can be collected. Furthermore, the coefficients on the lagged values of log tax revenue are statistically significant, meaning that the current tax yields are influenced by the previous yields.

The log of volume of trade and its lagged values have positive and statistically significant effects on log trade tax revenue. This means that trade tax revenue increase with the volume of trade and that its previous level determines the current amount that can be

collected. The log of volume of trade, its lagged values and the lagged value of log sales taxes/VAT revenue, have statistically significant effects on log sales taxes/VAT revenue. Therefore, the volume of trade, its previous volume and previous level of sales taxes/VAT revenue determine the amount of tax revenue that is collected from sales taxes/VAT.

The coefficients on the first lagged values of log volume of trade and on log per capita volume of trade in the excise duty and in its per capita terms equations, are negative and statistically insignificant. However, the coefficients on its second and the first lagged values of log excise duty, are positive. Therefore, the previous levels of volume trade and excise duty revenue influence current revenue from excise duty, since the positive coefficient is statistically significant. But these coefficients are less than one which reinforces the regressive nature of the structure of excise duty levied on the volume of trade.

The impact of log volume of imports on log import duty revenue is positive and statistically significant. Hence the volume of imports determines revenue from import duty. The coefficient on the lagged log import duty revenue in the import duty equation is positive and statistically significant. Therefore, the previous level of import duty revenue do influence current revenue collected from levying import duty.

The coefficients on log volume of imports and on its per capita terms in the excise duty equations are positive and statistically significant. Revenues from excise duty are

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therefore influenced by the volume of imports, although this tax revenue response is inelastic. On the other hand, the lagged values of log volume of imports (in real and per capita terms) have negative and statistically significant effects on revenue from excise duty. This means that previous levels of volume of imports influence tax yields from excise duty.

The elasticities of sales taxes/VAT with respect to log volume of imports and log per capita volume of imports are positive and statistically significant, meaning that an increase in the volume of imports increases revenue collected from sales taxes/VAT levied on the imports.

The coefficients on log population in the equations for log total taxes, log direct taxes, and log indirect taxes are less than one, negative and statistically insignificant. This means that an increase in population leads to a decrease in tax yields. This can be attributed to the increase in dependency ratio (World Bank, 2003), free rider strategy adopted by some potential taxpayers (Barnett, 1993, Borooah, 1993: 143), tax evasion, (Pyle, 1993), tax avoidance, corruption, and the copying effect where people copy those who do not pay. However, the coefficients on log population in the equations for log income taxes, log sales taxes/VAT, log trade taxes, and log excise duty, are positive but statistically insignificant. The only positive and significant coefficient on log population is in the equation for log sales taxes/VAT on log volume of trade. The positive coefficient indicates that an increase in population will increase tax revenues. This can be attributed to high demand for taxable goods and services associated with population increases and

also to the effort by KRA to target individual taxpayers in order to enhance tax compliance.

The dummies included in the estimating equations captured the effects of unusual circumstances on various tax revenues. The unusual circumstances that were experienced in the economy that positively influenced the tax yields from various sources include successful rural development policies (1971, 1972), import substitution industrialization strategy supported by access to East African Community markets (1972, 1973), introduction of sales tax (1973), coffee and tea booms (1976, 1977, 1986), commencement of Customs and Excise Tax Act in 1978, introduction of sales tax on imports (1984/85), budget rationalization programme (1985), introduction of excise tax on petroleum products in 1994/95, and establishment of KRA in 1995.

Other unusual circumstances that positively influenced tax revenues are favourable weather (1980, 1994, 2001), introduction of some elements of SAPs such as cost sharing, TMG, trade and price liberalization, liberalization of the financial sector (1986, 1987, 1988, 1990, 1991, 1992, 1994, 2001), adoption of managed floating exchange rate (1994) and African Growth and Opportunity Act (AGOA- 2001) (see also Republic of Kenya, 1975, 1986, 1996, 1997a, 2002a, 2002b, World Bank, 1983, and 2003).

The unusual circumstances that are found to have had adverse effects on tax revenue yields include abolition of GPT (1973), oil price shocks (1973, 1979), coup *d'etat* attempt (1982), droughts and subsequent power rationing and the devastating effects of *El Nino*

(1984, 1997, 1998, 2000), suspension of donor funds including the IMF's Enhanced Structural Adjustment Facility and World Bank's Structural Adjustment Credit (1991, 1992, 1997, 1998), and the Persian Gulf war (1990/91). Others that had negative effects on tax yields include foreign exchange market liberalization (1993), regional conflicts and influx of refugees (1991/92), ethnic violence in some of the high agricultural productive areas of the country (1991/92 and 1997), political uncertainty in the wake of multiparty elections (1992, 1997, and 2002), declining tourism activities and travel adversaries by trade partners (1991, 1992, 1997), poor infrastructure linked to *El Nino* (1998) (see also Republic of Kenya, 1975, 1994a, 1999a, 2002a, 2002b and 2003, and World Bank, 1983, and 2003).

4.3.3 The forecasting power of the tax models

The forecasting performance of the tax models are evaluated, first, on the basis of the differences between predictions and actual values (Koutsoyiannis, 1988:490). The smaller the difference between predictions and the actual values of the tax revenues, the better is the forecasting performance of the tax model. Inspection of the scatter diagrams after plotting points determined by the predictions and actual values showed that the forecasts from the tax models were statistically plausible.

The second method used to evaluate the forecasting power of the tax models is the computation of Theil's inequality coefficient for each model. The coefficient lies between zero and infinity (Theil, 1966, Maddala, 1977:346, Koutsoyiannis, 1988:492). The smaller the value of the inequality coefficient, the better is the forecasting performance of

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the tax models. The Theil's inequality coefficients for each estimated tax model are reported in table A13 in appendix V. The results show that the tax revenue models attained satisfactory forecasts for their respective tax revenues since the Theil's inequality coefficients were less than one, and close to zero (Koutsoyannis, 1988: 493)

4.3.4 Tax effort indices

The composition of tax revenues highlighted in section 4.2 showed some indication of the relative levels of taxation within the study period. However, any inference on tax effort based merely on tax shares fails to take into account the fact that taxable capacity changes over time, and the tax structures need to adjust to these changes. To capture this phenomenon, tax effort indices were estimated for each tax model from which inference was made as to the adequacy of the response of that tax structure to changes in taxable capacity.

The estimated tax elasticities reported in tables 4.1 to 4.7 in the preceding section were used to predict tax revenue for each year. Dividing the actual tax figures by the predicted taxes gave an index for the tax effort. The results are presented in the tables A19 and A20 in the appendix VI. A summary of these results are presented in table 4.8.

Table 4.8 Sample statistics for tax effort indices

Type of tax revenue	Tax base	Mean	Maximum	Minimum
Total tax revenue	Total GDP	0.99	1.01	0.98
	Monetary GDP	1.00	1.01	0.99
Direct tax revenue	Total GDP	1.00	1.01	0.99
	Monetary GDP	1.00	1.02	0.98
Income tax revenue	Total GDP	0.99	1.02	0.98
	Monetary GDP	1.00	1.01	0.99
Indirect tax revenue	Total GDP	0.99	1.02	0.98
	Monetary GDP	0.99	1.03	0.98
Sales tax/VAT revenue	Total GDP	1.00	1.02	0.98
	Monetary GDP	1.00	1.01	0.98
	Volume of imports	1.00	1.01	0.99
	Volume of trade	1.00	1.03	0.97
Excise duty	Total GDP	1.00	1.02	0.98
	Volume of imports	1.00	1.03	0.97
	Volume of trade	0.99	1.04	0.97
Import duty	Volume of imports	0.99	1.04	0.97
Trade taxes	Volume of trade	0.99	1.04	0.97

The lowest tax effort index is 0.97, which indicates an under-utilization of tax base by 3 percent. The implication is that these tax structures adjust by less than proportionate changes in their respective tax bases. This could be probably attributed to the existence of an underground economy, tax evasion, tax avoidance, generous tax exemption, tax reduction and corruption, free riding strategy adapted by some potential taxpayers, weak tax administration and non-detection of potential taxpayers.

The maximum tax effort index is 1.04 which indicates an over-taxation of the tax base by 4 percent. This means that these tax revenue structures adjust more than proportionately to the changes in their respective taxable capacities. Taxable capacities for total tax with respect to monetary GDP, direct tax with respect to total GDP, income tax with respect to

monetary GDP and sale taxes/VAT with respect to the volume of imports are well utilized since their tax effort indices are one. Therefore, these tax revenue structures adjust satisfactorily to the changes in their respective taxable capacity factors.

Generally, trade taxes depict greater fluctuations in the utilization of their taxable capacities as compared to other types of taxes. This is evidenced by the fact that trade taxes have the lowest tax effort index of 0.97 as well as the highest tax effort index of 1.04. This finding suggests that imports, and generally international trade transactions, are sometimes over taxed and this appears to encourage the thriving of an underground economy. It may also mean that international trade is prone to corruption and generous tax exemptions that fuel the operations in the black market.

4.3.5 Predicted tax revenues

The long run elasticity coefficients are more appropriate in determining tax revenues than the short run ones. This is because high tax elasticity in the short run means that the tax structure yields substantial revenues but overtime taxpayers may shift away from using those products that are taxed. Therefore, the long run tax elasticities were used in this study to predict real tax revenues for the next decade. The justification for this exercise was that the nature of the tax system and institutional and demographic factors needed to be taken into account while predicting tax revenues from various tax sources. Since this study took into account these factors while estimating the tax elasticities, it is now possible to predict tax revenues more accurately than before.

The long run tax elasticities that were used to predict tax revenues from various sources were calculated from the regression results reported in tables 4.1 to 4.7 in section 4.3.2, following standard procedures described in chapter three. The following table 4.9 presents the long run tax elasticities used to predict tax revenues for the next decade.

Table 4.9: Tax elasticities with respect to selected tax bases

Elasticity with respect to:	Type of tax							
	Total taxes	Direct taxes	Indirect taxes	Income taxes	Sales taxes/ VAT	Excise duty	Import duty	Trade taxes
Total GDP	0.98	1.02	2.50	0.83	1.93	-0.62		
Volume of trade					2.80	0.46		0.54
Volume of imports					4.57	-0.15	0.67	

The predicted tax revenues, total GDP, volume of imports and volume of trade are reported in tables A21 to A32 in appendix VII. They show the amount of tax revenues that can be collected if the tax bases grow at various rates starting from one to eight percent over the next decade. However, this section is dedicated to the derivation, presentation and description of the trends in various predicted tax revenues. Figure 4.11 that follows shows trends in predicted total tax revenues for GDP growth rates of 2 percent, 4 percent, 6 percent and 8 percent for the period, 2003/04 - 2015/16.

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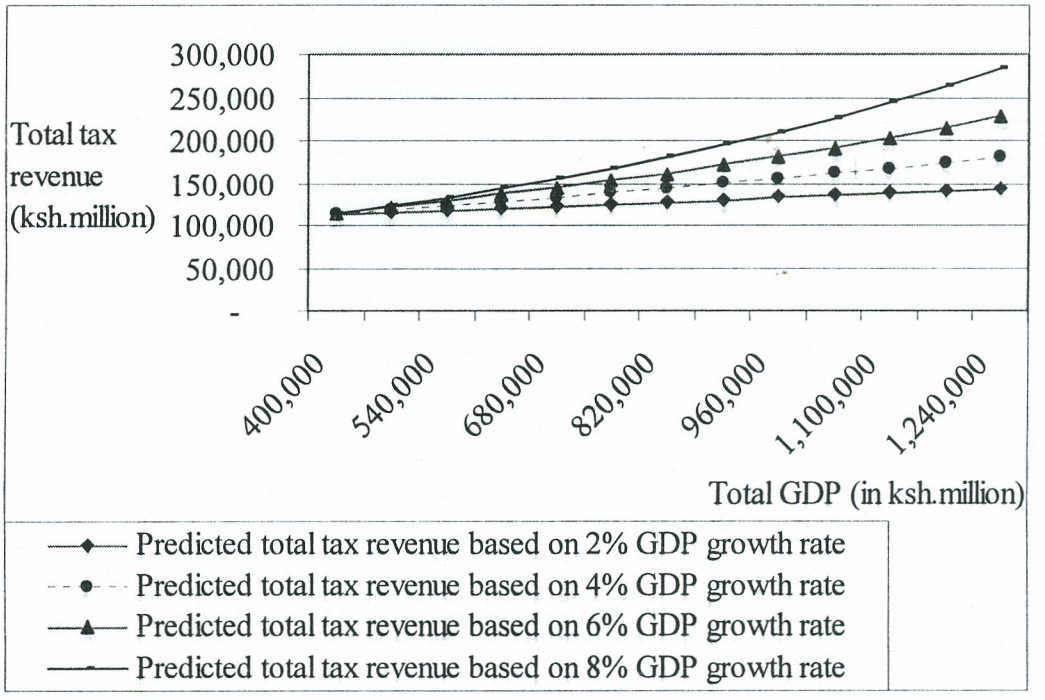
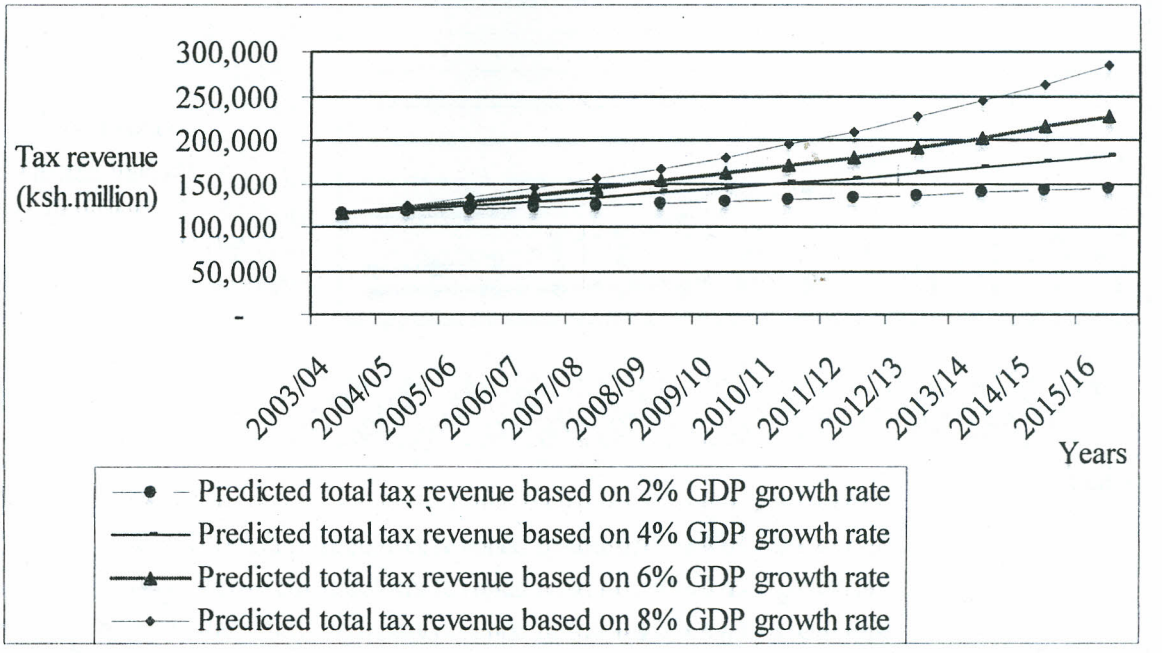
Figure 4.11: Predicted total tax revenues at GDP growth rates of 2 percent, 4 percent, 6 percent and 8 percent for the period, 2003/04 - 2015/16



The curves show the amount of tax revenues that can be collected at each level of GDP. The lower curve suggests that tax revenue will not grow proportionately to growth in GDP. This will be the case if GDP grows at less than 4 percent in the next decade. At GDP growth rate of 6 percent and above, the curves bend towards the tax revenue axis. This implies that as GDP increases, proportionally more of the tax revenue will be collected. To complement the information derived from the curves in figure 4.11 above, the following figure 4.12 shows trends in total tax revenues with respect to GDP growth rates of 2 percent, 4 percent, 6 percent and 8 percent.

Figure 4.12: Trends in predicted total tax revenues at GDP growth rates of 2 percent, 4 percent, 6 percent and 8 percent for the period, 2003/04 - 2015/16



The figure shows that if GDP growth rate is 6 percent and above as envisaged in the *Economic Recovery Strategy for Wealth and Employment Creation* (Republic of Kenya, 2000), total tax revenues at constant 1995 prices will have more than doubled by 2015/16. Otherwise, any growth rate in GDP that is less than 6 percent will not lead to a substantial increase in total tax revenues in the near future.

The following figure 4.13 shows trends in the predicted tax revenues from direct taxes and indirect taxes for selected growth rate in GDP of 2 percent, 4 percent, and 6 percent.

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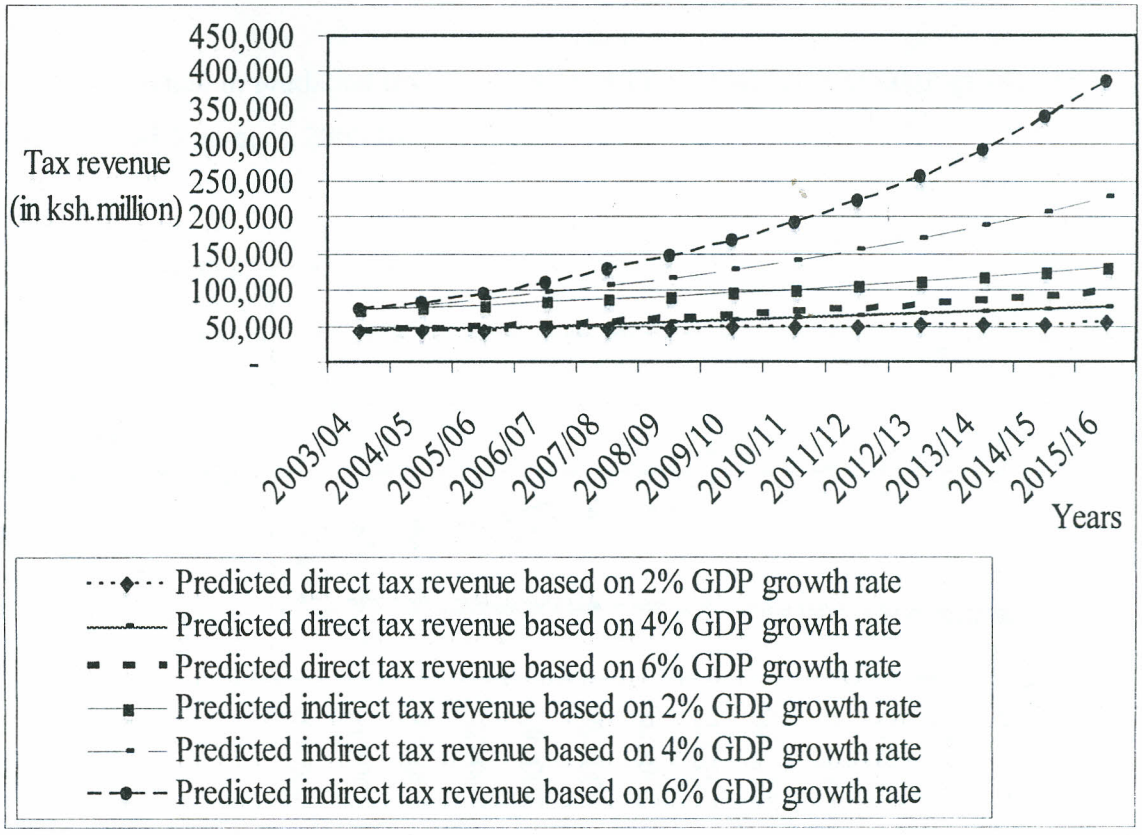
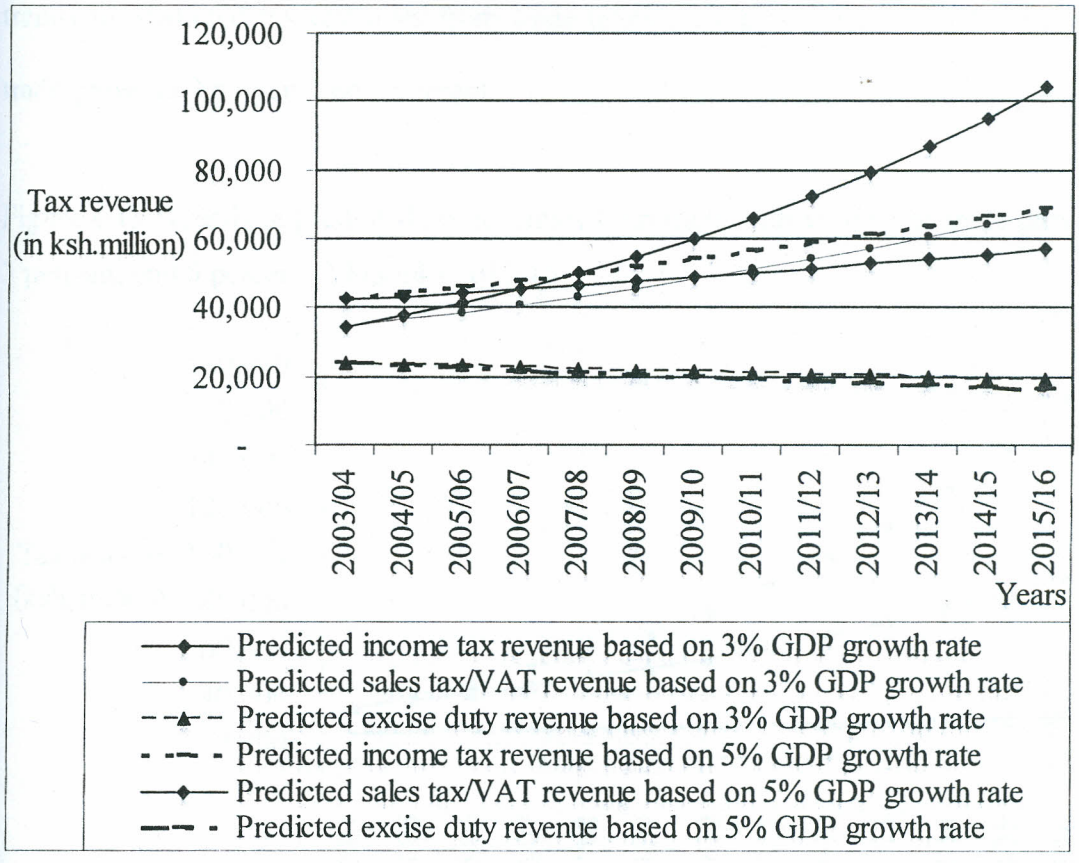
Figure 4.13: Trends in predicted tax revenues from direct and indirect taxes at GDP growth rates of 2 percent, 4 percent and 6 percent, 2003/04 - 2015/16



The figure shows that indirect taxes will continue to be the main source of tax revenue given the steep slope exhibited by its trend line compared to that of direct taxes. This is because the indirect tax structure is elastic compared to the direct tax structure which was found to be unitary in this study. This finding means that direct tax structure should be made more elastic than it is presently. This is in recognition of the urgency of additional tax revenues and the inevitable political tension that can be created by continuing tax rate increases especially in the current multiparty era.

The following figure 4.14 depicts trends in predicted tax revenues from individual taxes at GDP growth rate of 3 percent and 5 percent.

Figure 4.14: Trends in predicted tax revenues from individual taxes at GDP growth rates of 3 percent and 5 percent, 2003/04 - 2015/16



The trends in figure suggests that VAT will continue to be the main source of tax revenues at all levels of GDP growth rates as compared to income taxes and excises duties. In fact at GDP growth of 5 percent and more, revenue from VAT might more than double the current amount by the fiscal year 2015/16. Thus revenue from VAT shows more robust outcome than revenues from income and excises duties as economic growth takes place. Income taxes will follow VAT closely in contributing revenue to the

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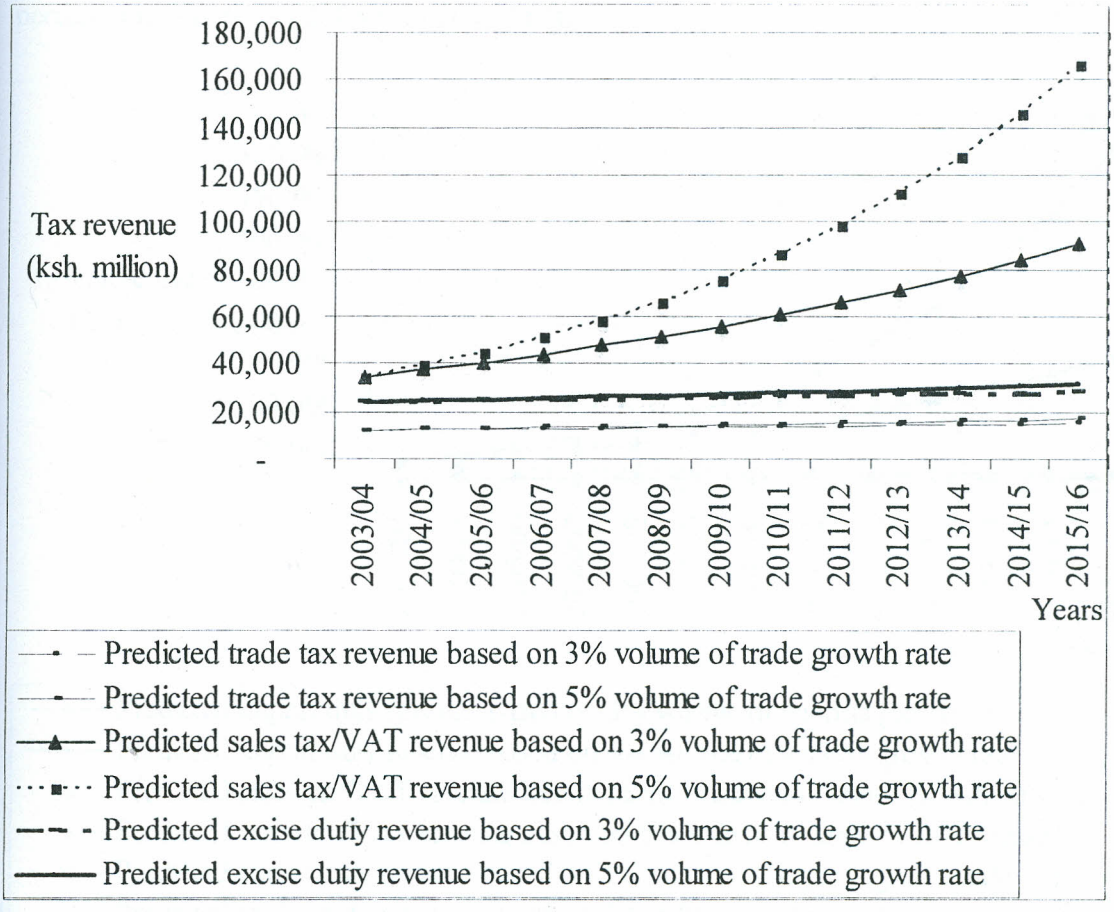
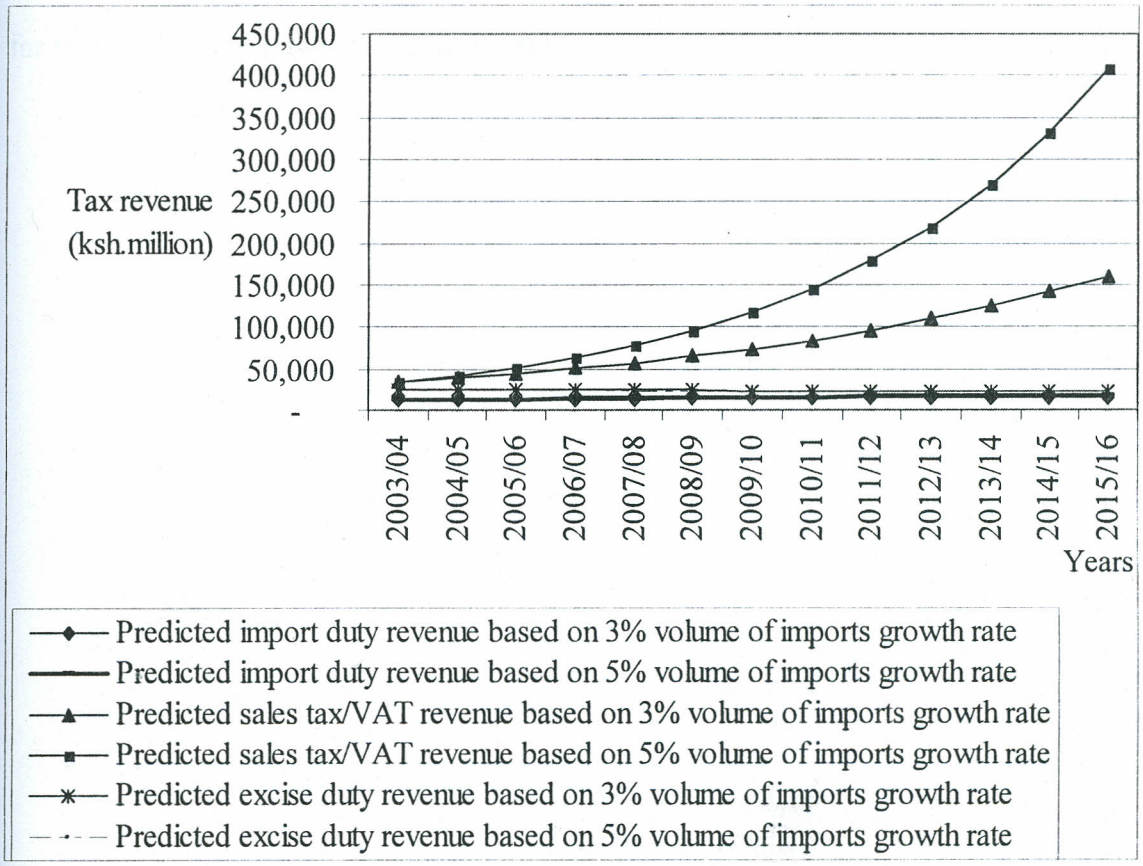
exchequer. However, revenues from income taxes will be steady and stable gradually rising over the years. This is reflected in the unitary income tax structure. Trade taxes will contribute almost a constant amount to the treasury, while excise duties will perform dismally over the years probably, due its regressive nature as found this present study. Excise duties will continue with its downward trend. The following figure 4.15 presents trends in predicted tax revenues from trade taxes for the next decade if the volume of trade grows at 3 percent and 5 percent.

Figure 4.15: Trends in predicted tax revenues from trade with volume of trade growing at 3 percent, and 5 percent, 2003/04 - 2015/16



From the figure, VAT on the volume of trade will continue to contribute more to tax revenue than excise duty on volume of trade as volume of trade grows over time. Moreover, revenue from excise duty show a gradual downward trend as the volume of trade grows. There is therefore an urgent need to reverse this trend and curb the dismal performance of excise duty to make revenue from this tax more responsive to growth rate in the volume of trade. Trade taxes depict a relatively stable tax structure with respect to growth in the volume of trade. The following figure 4.16 depicts trends in predicted tax revenues with growth rate in volume of imports at 3 percent and 5 percent.

Figure 4.16: Trends in predicted tax revenue with volume of imports growth rate of 3 percent and 5 percent, 2003/04 - 2015/2016



The figure shows that VAT on volume of imports will continue to contribute to tax revenues more than import duties and excise duties as the volume of imports grows over time. Moreover, import duties and excise duties depict dismal performance due their inelastic structures with respect to volume of imports in the long run. There is therefore a need to make these two tax structures elastic so that they can contribute substantial amount of revenues to the government.

In conclusion, for the economy to generate enough resources for the provision of public goods and services, various tax bases should grow at an annual average rate of five percent and above. However, if drastic measures are put in place to make various tax structures more elastic, lower growth rates in the tax bases could yield enough resources for the provision of public goods and services.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary

The study was designed to examine the composition of tax revenues, identify the determinants of tax revenues by estimating tax revenue equations, assess the response of tax structure to changes in the taxable capacity, predict revenues from various taxes for the next decade and draw policy implications. This was in realization of the fact that earlier studies carried out in this area omitted key determinants of tax revenues, such as the nature of the tax system and institutional, demographic and structural features of the economy. Due to this omission, the estimated income elasticities of tax revenues are often unreliable for planning purposes.

The determinants of tax revenues are now properly understood, documented, and captured in relevant tax revenue models estimated in this study. It is therefore possible to estimate accurately tax revenues within a specified period of time. Furthermore, pro-growth tax policies can now be designed and tax changes that are equity enhancing implemented.

The thesis used Paul Samuelson's (1955) fundamental general equilibrium analysis of the public sector to derive its main results. In my framework, the demand function for the public good was derived from a constrained model of utility-maximization. In the same vein, tax revenues were taken as functions of household incomes, which paved way for estimation of Engel curves for public goods. Time series data that were used in the study were obtained

from published documents. Both dependent and independent nominal variables were converted to real values, measured in constant (1995) Kenya shillings. The refined data were analyzed using descriptive statistics and regression methods.

5.2 Conclusions

The share of total tax revenue in GDP has remained high despite the efforts put in place by the government to reform the tax system and make it development friendly. The high tax ratio seems to have stifled economic growth. This is because most of the resources available for private investment seem to have been channeled to public use thereby crowding out private investment. In the essence, taxation appears to be target oriented and not one that can bring about economic growth and development through efficient allocation of productive resources, equity and economic stabilization.

The econometric results exhibit an overall tax system that is insensitive to growth in its tax bases. These results are supported by the findings of Ole (1975), Njoroge (1993), Adari (1997), Wawire (1991, 2000, and 2003). Consequently, planners should expect the growth rate in tax revenues to be less than proportionate to growth in the GDP. The creation of an elastic tax structure is therefore required. This will provide revenue as the growth process gets underway without the need for continuous discretionary policies such as high tax rates, ad hoc legislative enactment and tax collection techniques.

The government is faced with the problem of how to increase the tax revenue at minimal costs. From the results of this study, it appears that the problem is solved via indirect

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taxation. However, this solution conflicts with the government's commitments to social justice because indirect taxes can be regressive (see also Bhatia, 1998). The government must therefore develop mechanisms for dealing with this issue.

The tax elasticities with respect to GDP are less than those with respect to monetary GDP pointing to the existence of an underground economy. Borrowing from Osoro's (1995) study, this underground economy in Kenya may consists of the parallel market that comprises rent seeking activities, the black market that comprises smuggled commodities and currencies, and the informal sector.

The econometric results depict a growth elastic indirect tax structure both in the short run and in the long run. The structure could therefore be relied upon to generate public revenues to support the development process. This explains why the share of indirect taxes in total taxes has been increasing over the years. Furthermore, most of the revenue from indirect taxes comes from VAT followed by excise duties and import duties in that order.

The growth elasticity of direct tax revenue structure is unitary. This is in contrast with the results of Nyamuga and Ochieng (2001) and Muriithi and Moyi (2003). Furthermore, the share of direct tax revenue in total tax revenue has been declining over time probably because of the government's policy to exempt low income earners in an effort to achieve fairness and efficiency in the tax system. However, at this point in time, when import duties and generally trade taxes are being reduced within the COMESA and the East

African regions, tax reform measures should focus increasingly on the bases for direct taxes to make the structure more elastic.

Income tax structure is growth inelastic, despite the argument that it should be among the most elastic ones and hence a major source of government revenue (Wilford and Wilford, 1978a, Republic of Kenya, 2004: 84). This finding was not expected since much of the efforts that have been directed at tax reforms by KRA focuses upon personal and corporate tax revenues. For example, mandatory acquisition of Personal Identification Number (PIN) and compulsory filing of tax returns by all civil servants, are some of these reforms. The finding confirms the success of the government's efforts in reducing the number of low-income earners directly involved in income tax (Republic of Kenya, 1997a). Furthermore, the finding suggests that income taxes in the long run have an effect of throttling the effort that produces the same through disincentive to save, to invest and to work, and violates the principle of convenience. Moreover, income tax revenue declines with the increase in population and this is attributed to the high dependency ratio (World Bank, 2003), free rider strategy adopted by some potential taxpayers (Barnett, 1993:100, Borooah, 1993:143), tax evasion (Pyle, 1993), tax avoidance, corruption and the copying effect where some people copy those who do not pay taxes.

Import duties structure was found to be inelastic both in the short run and in the long run. However, the long run elasticity coefficients are greater than the short run ones, implying that more revenue could be raised in the long run. Furthermore, import duties shares in GDP and in total taxes have been declining over time. This can probably be attributed to

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the reduction in the fees paid when declaring goods imported under Tax Remission for Export Office (TREO) and the removal of import duties on computers, computer accessories, and a variety of other new materials (Republic of Kenya, 2004:85).

The contribution of export taxes to total tax revenue is negligible. This is attributed to the government's desire to promote exports and the fact that the economy, being small and open, faces fixed terms of trade. In this situation, any duty levied on exports is shifted back onto those involved in production thereby reducing incomes of resources employed in that sector (see also Thirsk, 1997a, Bulutoglu and Thirsk, 1997, Bahl, 1997).

Trade tax structure is inelastic with respect to volume of trade. It appears that foreign trade taxes have gradually lost importance over the years due to the government's efforts to shift its tax policy from international trade to domestic trade. This is a healthy situation because with emerging trading blocs, trade taxes will eventually be eliminated. Hence it is important to strengthen domestic taxation mechanisms to raise more revenue that will make up for the lost revenue from trade taxes.

Sales taxes/VAT structure is elastic with respect to GDP and the volume of trade. This means that changes in GDP and volume of international trade leads to a more than proportionate change in revenues from these sources. The study also finds that elasticities of sales taxes/VAT on volume of trade are greater than those with respect to the volume of imports. This means that imports are easier and convenient to levy sales taxes/VAT on than domestic manufactures.

Excise duties are growth inelastic and regressive with respect to GDP, volume of trade and volume of imports. This means that consumers shift away from consuming excisable products over time.

The coefficients for the population variable in various regressions are negative and less than one except for income taxes, sales taxes/VAT on trade, trade taxes and excise duties. This means that an increase in population leads to a decrease in tax revenues collected from various taxes, a finding that is expected since increases in population put pressure on demand for public goods, hence on taxes that fund their provision. Furthermore, high population is associated with illiteracy that leads to poor income reporting and inadequate record keeping which hinders tax revenue collection especially from domestic taxes.

The positive coefficients for the population variable for trade taxes point to the fact that high population growth creates demand for taxable goods and services in the economy. This finding might probably imply that high population growth leads to high demand for imported goods and services as opposed to locally produced ones. While for income taxes, it might mean that high population growth rate leads to high employment levels, thus more taxable incomes in the economy.

Tax revenues respond with lags to changes in their respective tax bases. This means that the previous levels of tax bases (such as GDP, volume of trade, and volume of imports) have significant influence on the present levels of tax revenues. This further means that new policy guidelines contained in the budget speeches are not usually implemented

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immediately. Hence the long time lag in the response of the taxes influences tax revenue collected from various sources at a point in time.

Non-quantitative factors that influence tax yields from various sources include the nature of the tax system, and institutional, demographic, and structural features of the economy. Among the notable ones that seem to have had positive influences on tax revenues are successful rural development policies, import substitution industrialization supported by access to East African Community markets, introduction of sales tax in 1973, coffee and tea booms, commencement of Customs and Excise Tax Act in 1978, introduction of sales tax on imports in the fiscal year 1984/85, budget rationalization programme, introduction of excise tax on petroleum products in 1994, establishment of KRA in 1995, favourable weather, introduction of some elements of SAPs such as cost sharing, TMG, trade and price liberalization.

The following unusual circumstances and events had negative effects on tax revenues; oil price shocks, coup *d'etat* attempt of 1982, droughts and subsequent power rationing, suspension of donor aid, foreign exchange market liberalization, Persian Gulf war 1990/91, regional conflicts and influx of refugees, ethnic violence, political uncertainty in the wake of multiparty elections, travel adversaries by trade partners, high interest rates in the wake of financial market liberalization, and dilapidated infrastructure caused especially by *El Nino* rains.

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The overall tax effort index indicates that there is under taxation, meaning that the maximum tax revenue given the taxable capacity is never obtained. This could be attributed to the existence of the underground economy, corruption, tax evasion, tax avoidance, generous granting of tax exemption, inefficiency in tax revenue collection and administration, narrow tax bases and generally low rate of tax compliance (see Republic of Kenya, 2002a and 2004).

The predicted tax revenues from various sources indicate inelastic growth with respect to growth in their bases except for indirect taxes and value added taxes. Thus, unless drastic tax reform measures are undertaken to change the current nature of the tax system taking into account the institutional, demographic and structural features of the economy, the government should expect to get the predicted revenues in the next decade or so depending on the growth rate in the tax bases.

5.3 Policy Implications

The tax structure should be overhauled notwithstanding the reforms that have taken place so far. The study reveals several reasons for this. First, the growth of the economy involves massive structural changes and if the tax system is left unchanged, these changes may produce many unintended distortions in allocation of resources. Hence the tax system should be made to adapt to the current and expected future changes in the institutional, demographic and structural features of the economy. Second, in order to meet the increasing demand for social welfare programmes, more revenue should be raised which is only possible when the tax system is well structured, supported by an

efficient tax administration. Third, narrow and distortionary tax bases should be replaced with broader bases that would raise revenues at lower rates and treat sources and uses of income in a less discriminatory manner (see also Francisco and Thirsk, 1997).

A marked increase in total tax revenue can only be achieved if taxable capacity is substantially expanded through increased economic activities. These increased activities should occur first and foremost in the sectors that attract indirect taxation especially VAT.

Expansion of volume of trade especially to non-COMESA countries would be a pre-requisite to increasing revenues from trade taxes especially from VAT on imported commodities. However, there must be coordination of tariffs and domestic indirect taxes so that the former play only a protective role and the later a revenue raising role.

The government should rely on indirect taxes because they are elastic and generate revenue with limited administrative costs, are less inconveniencing because they are hidden in the commodity prices being transacted, present less chances for tax evasion, are powerful tools for guiding resources allocation through changing supply and demand forces, are more flexible such that rates and coverage can be selective and can be modified to suit the objective of the government, apart from taking into account the externalities and allowing individuals the choice of whether or not to consume the taxed commodities. However, as Thirsk (1997a: 26) argued, the imposition of these taxes on productive inputs should be avoided because they distort production decisions,

discourage exports, create an unknown pattern of tax incidence and lead to undesirable tax cascading effects. In this regard therefore, VAT should be the only tax that should be imposed on inputs because it is refundable and avoids the above listed negative effects.

To increase revenue from personal and corporate income taxes, the government should expand their bases by approving fewer tax exemptions, use presumptive taxation for the hard-to-tax groups, greatly rely on withholding taxes in order to reduce tax evasion and avoidance, include public enterprises in the tax base and impose minimum taxes on private sector enterprises.

Due to the potential negative effects of the implementation time lags on tax revenues collected, new policy guidelines contained in the budget speeches and other tax policy documents should be implemented, as a matter of urgency, almost immediately.

Tax bases should be broadened and tax rates and special treatment reduced to ensure compliance by taxpayers, increase productivity and address the issue of the underground economy. In fact, reduction in tax rates and special treatment may greatly increase the effectiveness of the tax reforms (see also Dethier, 1998, Sewell and Thirsk, 1997).

Tax brackets should be continuously reviewed to benefit the low-income earners and keep tax rates low to avoid distorting the market and reduce smuggling through the underground economy. Furthermore, top personal tax rate should be aligned with corporate tax rate to reduce the incentive to shift income among categories of personal

income and corporate income (see also Thirsk, 1997b). It may also pay to reduce or eliminate taxes on commodities that are consumed by the poor and increase VAT rates on products consumed by the high income earners.

One way of bringing about an elastic tax system would be to provide information bases and taxpayer education through pamphlets dissemination, seminars, conferences and *barazas* which might encourage more people to pay taxes. Taxpayers should be encouraged to maintain proper audited accounts, observe honesty while filing tax returns, lobby through organized groups for reduction of tax rates on basic commodities and for provision of services and taxpayer education, and comply with tax administration procedures and rules.

Population growth rate must be controlled since it impacts negatively on tax revenues. Hence reduction in the birth rate is very vital and tax relief for married couples should not encourage large families.

A couple of issues that can be influenced by public policy still need to be investigated as regards the Kenya's tax system. Therefore, the following areas are recommended for further research. An investigation into the revenue sources of local authorities, an analysis of the government expenditure and its link to tax revenues, and an inquiry into the fiscal deficits and their causes.

KENYATTA UNIVERSITY LIBRARY,

BIBLIOGRAPHY

Adam, C. (1998). *Macroeconomic Management: New Methods and Policy Issues, Time Series Econometrics for Developing Countries,* Centre for the Study of African Economies. Oxford: University of Oxford.

Adam, C. S. (1992). *Recent Development in Econometric Methods: An application to the Demand for money in Kenya,* AERC special paper No.15 September, Nairobi African Economic Research Consortium.

Adari, M. M. (1997). Value Added Tax in Kenya. M.A. Research Paper, University of Nairobi.

Agénor, P.R and, P. J, Montiel, (1996). *Development Macroeconomics.* Princeton, New Jersey: Princeton University press

Alm, J. (1988). "Compliance Costs and the Tax Avoidance-Tax Evasion Decision" *Public Finance Quarterly,* 16, 31- 66.

Andersen, S. P. (1973). "Built-in Flexibility of Sensitivity of the Personal Income Tax in Denmark". *Swedish Journal of Economics*, 75, 23 - 38

Ariyo, A. (1997). *Productivity of the Nigerian Tax System: 1970 - 1990,* Research paper No. 67. Nairobi: African Economic Research Consortium.

Asher, M. G. (1989). *Fiscal Systems and Practices in ASEAN: Trends, Impact and Evaluation,* Singapore: Institute of South-East Asian Studies

Bahl, R. (1997). "The Jamaican Tax Reform: its Design and Performance" in Thirsk, (ed.) *Tax Reform in Developing Countries*, Washington D. C.: The World Bank.

Bahl, R. W. (1971). "A Regression Approach to Tax Effort and Tax Ratio Analysis". *IMF Staff Papers,* 18, 570 - 607.

Barnett, R. R. (1993) "Preference Revelation and Public Goods" In Jackson M. P (Ed.) *Current Issues in Public Sector Economics,* London: Macmillan Press. Pp. 94 - 131

Bergson, A. (1938). "A Reformulation of certain Aspects of welfare Economics" *Quarterly Journal of Economics,* 52, 310 - 334.

Bhatia, H.L. (1998). *Public Finance.* 9th edition. New Delhi, Vikas Publishing House.

Bolnick, B.R. (1978). "Tax efforts in Developing Countries: What do Regression Measures Really Measure?" In Toye, J.F.J. (Ed.), *Taxation and Economic Development, England*: Frank Cass and Company Ltd. pp. 62 - 77.

Borooah, V.K. (1993). "Public Choice: An Introductory Survey" in Jackson M. P (Ed.) *Current Issues in Public Sector Economics*. London: Macmillan Press Ltd. Pp. 132 - 155

Branson, H.W. (1989). *Macroeconomic Theory and Policy*. 3rd edition. New York: Harper & Row Publishers.

Bulutoglu, K and W. Thirsk. (1997). "Turkey's Struggle for a Better Tax System" in Thirsk (ed.) Tax *Reform in Developing Countries*. Washington D. C. The World Bank. Pp 361 - 409.

Caves, R. E. and Jones, R.W. (1973). *World Trade and Payments*. Boston: Little-Brown & Company.

Chelliah, R. (1971)."Trends in Taxation in Developing Countries" *IMF Staff Paper,* 18, 254 - 327.

Chelliah, R. J Baas, H.J and Kelly, M. (1975). "Tax Ratios Tax Efforts in Developing Countries: 1969-1971" *International Monetary Fund Staff Papers,* 22, 187 - 205.

Chipam, J.S. (1982). "Samuelson and Welfare Economics" In Feiwel G.R. (Ed.) *Samuelson and Neoclassical Economics.* Boston: Kluwer. Nijhoff Publishing. Pp. 152-184.

Chipeta, C. (1998). *Tax Reform and Tax yield in Malawi,* AERC Research Paper No. 81. Nairobi: AERC

Choudhry, N. N. (1975). "A Study of the Elasticity of the West Malaysian Income Tax System, 1961-1970", IMF *Staff Paper*, 22, 494 - 501.

Choudhry, N. N. (1979). "Measuring the Elasticity of Tax Revenue: A Divisia Index Approach" *IMF Staff Papers,* 26, 87 - 96

Chow, G. C. (1960). "Tests of Equality between Sets of Coefficients in Two Linear Regressions" *Econometrica,* 52, 211 - 222.

Cross, R. and Shaw, G.K. (1982). "The Economics of Tax Aversion" *Public Finance,* 37, 36 - 47.

Dernburg, T (1985) *Macroeconomics: The measurement, Analysis, and Control of Aggregate Economic Activity.* McGraw-Hill International Book Company.

Dethier, J. (1998). "*Overview*" In Bokros, L and J. Dethier. (Ed.) *Public Finance Reform during the Transition: The Experience of Hungary*, Washington D. C. The World Bank, Pp. 1- 22.

Dickey, D.A. and W. A. Fuller. (1979). "Distribution of the Estimators for Autoregressive Time Series with a unit Root", *Journal of the American Statistical Association*, 74, 427 - 431.

Dornbusch, R., S. Fischer and R. Startz. (2003). *Macroeconomics,* Eighth edition, New Delhi: Tata McGraw-Hill Company Limited

Dupuit, J. (1944). "On the Measurement of Utility of Public Works" translation, in K.J. Arrow and Scitovosky, T. (Eds.) *Readings in Welfare Economics,* Published for the American Economic Association. Home Wood, Illinois: D. Richard Irwin Inc.

Ehrlich, C (1974) "Economic and Social Developments before Independence". In Ogot, B.A (Ed.). *Zamani*: *A Survey of East African History,* New Edition Nairobi: EAPH, Longman Kenya. Pp 333 - 345.

Engle, R and C. W. J. Granger. (1987). "Cointegration and Error Correction: Representative Estimation and Testing" *Econometrica*, 55, 251 - 276.

Engle, R. F. (1982a). "A General Approach to Lagrange Multiplier Model Diagnostics" *Journal of Econometrics,* 20, 83 - 104.

Engle, R. F. (1982b). "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation". *Econometrica* 50, 988 - 1007.

Example of Direct Taxation" *Economica,* 27, 61 - 81

Francisco, G and W. Thirsk. (1997). "Mexico's Protracted Tax Reform" In Thirsk, (Ed) *Tax Reform in Developing Countries*. Washington D.C. The World Bank. Pp 287 - 327.

Froyen, T.R. (2003). *Macroeconomics Theories and Policies*. Seventh edition. New Delhi: Pearson Education Pte Ltd.

Fullerton, D. (1981). "On the possibility of an Inverse Relationship between Tax Rates and Government Revenues". *Journal of Public Economics,* 19, 3 - 20.

Gelb, A. (1993). "Socialist Transformations: Some Lessons and Implications for Assistance". In SIDA *Redefining the Role of the State and the Market in the Developing Process*, Skara: Vastergot lands Tryckeri. Chapter 2. Pp. 15 - 52.

KENYATTA UNIVERSITY LIBRARY

Ghai, D. (1965). Income Elasticity of the Ugandan Tax Structure. A Dissertation presented to the faculty of the Graduate School of Yale University for a Ph.D. Degree.

Godfrey, M. (1986). *Kenya into 1990: Prospects for Growth.* The Economist Intelligence Unit Special Report No. 1952. London: The Economist publications Ltd.

Granger, C. W. J and P. Newbold. (1974). "Spurious Regressions in Econometrics: *Journal of Econometrics,* 2, 111 - 120.

Granger, C. W. J. (1986). "Developments in the Study of Cointegrated Economic Variables" *Oxford Bulletin of Economics and Statistics,* 48, 213 - 228.

Greene, W. H. (1990) *Econometric Analysis.* New York: Macmillan Publishing Company

Grieson, R.E, H.William, M. Albert, and D.M. Richard. (1977) "The Effect of Business Taxation on Location of Industry" *Journal of Urban Economics,* 3, 170 - 185.

Grieson, R.E. (1980). "Theoretical Analysis and Empirical Measurements of the Effects of the Philadelphia Income" *Journal of Urban Economics,* 18, 123 - 137.

Gujarati, D. N. (1995). *Basic Econometrics.* Third edition. International Edition Economic Series. New York. McGrew-Hill Inc.

Hendry, D.F. (1986). "Econometrics Modeling with Cointegrated Variables: An Overview" *Oxford Bulletin of Economics and Statistics,* 48, 201 - 212

Hill, R.C and W. E, Griffiths, G. G Jugde. (2001). *Undergraduate Econometrics.* Second Edition. New York: John Wiley and Sons, Inc.

Hinrichs, H. H. (1965). "The changing level of the Government Revenue Share". General *Theory of Tax Structure during Economic Development.* Massachusetts: Cambridge. Pp.1 - 31.

KENYATTA UNIVERSITY LIBRARY

Hira, N (2000) "Forms of Corruption in the Kenyan Tax System" In Mullei, A (Ed.) *The Link Between Corruption and Poverty: Lessons from Kenya Case Studies*. Nairobi: African Centre for Economic Growth. Pp. 89 - 99

IMF. (2004). *International Financial Statistics CD-ROM*, Washington D.C: IMF, online

Jackson, P. M. (1993). *Current Issues in Public Sector Economics.* London: Macmillan.

Johnston, J and J. Dinardo. (1997). *Econometric Methods*, Fourth Edition., New York: The McGraw-Hill Companies, Inc.

Kaldor, N. (1964). "Will Underdeveloped Countries Learn How to Tax?". *Essays on Economic Policy,* Vol.1, London: Gerald Duckworth & Company Limited, pp. 253 - 268.

Kennedy, P. (1989). *A Guide to Econometrics*. 2nd Edition. Massachusetts: MIT Press.

Khan, M. Z. (1973). "Responsiveness of Tax Yields to Increase in National Income" *Pakistan Development Review*, 11, 22 - 39

King, J. R. (1979) *Stabilization Policy in an African Setting: Kenya 1963-1973,* Nairobi: Heinemann Educational Books Ltd.

Kothari, C. R. (2004). *Research Methodology, 2nd* edition. New Delhi: New Age International (P) Ltd.

Koutsoyiannis, A. (1988). *Theory of Econometrics,* 2nd edition, London and Basingstoke: Macmillan Publishers.

Kusi, N. K. (1998). *Tax Reform and Revenue Productivity in Ghana,* AERC Research Paper Number Seventy-four. Nairobi: AERC

Layard, P.R.G. and Walters, A.A. (1978). *Microeconomic Theory.* New York: McGraw - Hill Book Company.

Leuthold, J. and T. N'Guessan. (1986). "Tax Buoyancy and Elasticity in Developing Economy" *Bureau of Economic and Business Research, Faculty Working Paper No. 1272,* Urban Champain: University of Illinois

Lortz, J.R and Morss, E.R. (1967). "Measuring Tax Effort in Developing Countries" *IMF Staff Papers,* 14, 478 - 495.

Lortz, J.R and Morss, E.R. (1970). "A Theory of Tax Level Determinants for Developing Countries" *Economic Development and Cultural Change,* 18, 328 - 341.

Mackinnon, J. G. (1991). "Critical Values for Cointegration Tests". In Engle, R. F and C. W. Granger. (Eds) *Long-Run Equilibrium Relationships,* Oxford: Oxford University press. Pp. 267 - 276

Maddala, G. S. (1977). *Econometrics,* International Edition, Singapore: McGraw-Hill.

Manig, W. (1983). "Government Capacity to Levy Taxes in Peripheral Countries: The Example of Direct taxation" *Economica,* 27, 61 - 81.

Mansfield, C. Y. (1972). "Elasticity and Buoyancy of Tax System; A Method Applied to Paraguay" IMF *Staff Papers,* 29, 425 - 440.

Mansfield, E. (1986). *Principles of Macroeconomics.* 5th edition. New York: W.W. Norton & Company.

Maxon, M.R. (1990). "The Establishment of the Colonial Economy". In W.R. Ochieng and R.M. Maxon (Ed.), A*n Economic History of Kenya.* Nairobi: East Africa educational Publishers Ltd. Pp. 63 - 74.

Mclure, J. and Thirsk, T.W. (1978). "The Inequality of Taxation Iniquity: A Plea for Reduced Sumptuary Taxes in Developing Countries" *Economic Development and Cultural Change,* 26, 487 - 503.

Milambo, M. (2001). Elasticity and Buoyancy of the Zambia Tax System, Unpublished M.A. Paper, University of Nairobi.

Mishan, E.J. (1981) "Economic Efficiency and Social Welfare", *Selected Essays on Fundamental Aspects of the Economic Theory of Social Welfare.* London: George Allen & Unwin. Chapter 4, Pp. 33 - 44.

Muriithi M K and E. D. Moyi. (2003). *Tax Reforms and Revenue Mobilization in Kenya,* AERC Research Paper 131, Nairobi: AERC

Musgrave, A.R. (1986) "Samuelson on Public Goods 1983". In Musgrave A.R, (Ed.) *Public Finance in a Democratic Society.* Vol. II, Fiscal Doctrine, Growth and Institutions, Sussex: The Hamster Press Group, Pp. 319 - 334.

Musgrave, R.A. and Musgrave, P.B. (1984). *Public Finance in Theory and Practice,* 4th edition. Singapore: McGraw-Hill Book Company.

Mwanza, J.M, (1997). The Impact of Tax Reforms on Buoyancy and Elasticity of the Kenyan Tax System, 1972/73 - 1995/96, M.A research paper, University of Nairobi, unpublished.

Mwega, F.M. (1986). "The Incidence of Taxes and Transfers in Kenya: A General Equilibrium Analysis" *East African Economic Review,* 2, 6 - 13.

Nath, S. K. (1979). *A Perspective of Welfare Economics,* London: The Macmillan Press.

Njoroge, J. W. (1993). Revenue Productivity of Tax Reforms in Kenya: 1972/73 - 1991/92. Unpublished M.A. Research paper: University of Nairobi.

Nyamunga, J.B and M. Ochieng (2001). *Income Tax in Kenya: Assessment of Policy and Legislative Regimes.* Nairobi: Kenya Revenue Authority.

KENYATTA UNIVERSITY LIBRARY

Ogot, B. A. (1974). "Kenya under the British, 1895 to 1963" In Ogot, B. A. (Ed.) *Zamani: A Survey of East African History*. New Edition. Nairobi: East African Publishing House/Longman Kenya. Pp 249 - 294.

Ole, A.M. (1975). Income Elasticity of Tax Structure in Kenya: 1962/63-1972/73 Unpublished. M.A Research Paper, University of Nairobi

Omoruyi, S. E. (1983). "Growth and Flexibility of Federal Government Tax Revenue: (1960 -1979" *Economic and Financial Review,* 21, 11 - 19.

Osoro, N.E. (1993). *Revenue Productivity Implications of Tax Reform in Tanzania.* Research Paper No. 20, Nairobi; African Economic Research Consortium.

Osoro, N.E. (1995). *Tax Reforms in Tanzania: Motivations, Directions and Implications.* Research paper No. 38. Nairobi: African Economic Research Consortium.

Philips, P. C. B and P. Perron (1988). "Testing for a Unit root in Time Series Regression" *Biometrika*, 75, 335 - 346.

Pierre, P. (1989). "The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis" *Econometrica,* 57, 1361 - 1401.

Pindyck, S. R and D. L. Rubinfield (1996) *Microeconomics*. Englewood Cliffs, Prentice-

Plasschart, S. (1962). *Taxable Capacity in Developing Countries*. International Bank of Reconstruction and Development Report No. EC-103.

Prest, A. R. (1962). "The Sensitivity of Yield of Personal Income Tax in United Kingdom" *Economic Journal,* 52, 576 - 596.

Pyle, D. J. (1993). "The Economics of Taxpayer Compliance" In Jackson, P. M. (ed) *Current Issues in Public Sector Economics.* London: Macmillan. Pp. 58 - 93.

Ramsey, J. B and P. Schmidt. (1976). "Some Further Results on the Use of OLS and BLUS Residuals in Specification Error Tests" *Journal of the American Statistical Association,* 71, 389 - 390.

Ramsey, J. B. (1969). "Tests for Specification Error in Classical Linear Least Squares Analysis" *Journal of the Royal Statistical Society,* Series B, 31, 350 - 371.

Rao, V. G. (1979). *The Responsiveness of the Indian Tax System. 1969/ 1970 - 1973/1974.* Bangalore: Allied.

Republic of Kenya, (1965). *Sessional Paper No. 10 of 1965 on African Socialism and its Application to Planning in Kenya.* Nairobi: Government printer.

Republic of Kenya, (1975). *Sessional Paper No. 4 of 1975 on Economic Prospects and Policies.* Nairobi: Government printer.

Republic of Kenya, (1977). *Budget Speech.* Nairobi: Government Printer.

Republic of Kenya, (1982). *Report and Recommendations of the Working Party on Government Expenditure.* Nairobi: Government printer.

Republic of Kenya, (1986). *Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth,* Nairobi: Government printer.

Republic of Kenya, (1994a). *National Development Plan 1994 - 1996.* Nairobi: Government printer.

Republic of Kenya, (1994b). *Sessional Paper No. 1 of 1994 on Recovery and Sustainable Development to the Year 2010.* Nairobi: Government printer.

Republic of Kenya, (1997a). *National Development Plan 1997 - 2001.* Nairobi: Government printer.

Republic of Kenya, (1997b). *Sessional Paper No. 2 of 1997 on Industrial Transformation to the Year 2020.* Nairobi: Government printer.

Republic of Kenya, (1999a). *Economic Survey.* Nairobi: Government printer.

Republic of Kenya, (1999b). *National Poverty Eradication Plan, 1999 - 2015.* Nairobi: Government printer.

Republic of Kenya, (2000). *Economic Recovery Strategy for Wealth and Employment Creation*, Nairobi: Government printer

Republic of Kenya, (2002a). *Medium -Term Expenditure Framework: Fiscal Strategy Paper 2002/03 - 2004 /2005.* Nairobi: Government Printer

Republic of Kenya, (2002b). *National Development Plan 2002- 2008.* Nairobi: Government printer.

Republic of Kenya, (2004). *Economic Survey,* Nairobi: Government printer.

Republic of Kenya, (2005). *Economic Survey,* Nairobi: Government printer.

Republic of Kenya, *Economic Surveys (various issues),* Nairobi: Government printer.

Republic of Kenya. *Statistical Abstracts,* Various issues. Nairobi: Government printer.

Russell, D and J. G. Mackinnon, (1993). *Estimation and Inference in Econometrics,* Oxford University Press.

Sahota, G.S. (1961). *Indian Tax Structure and Economic Development,* London: Asia Publishing House.

Samuelson, P.A (1955). "Diagrammatic Exposition of the theory of Public Expenditure" *Review of Economics and Statistics,* 37, 350 - 356.

Samuelson, P.A (1977). "Reaffirming the Existence of Reasonable Bergson-Samuelson Social Welfare Functions" *Economica,* 44, 81 - 88.

Samuelson, P.A. (1954). "The Pure Theory of Public Expenditure" *Review of Economics and Statistics,* 36, 387 - 389.

Samuelson, P.A. (1976). *Foundation of Economic Analysis,* College Edition, New York: Anthem.

Scitovsky, T. (1941) "A note on welfare propositions in Economics" *Review of Economic Studies,* 9, 77 - 88.

Scovill, M.E. (1975). Local Taxation in Uganda, Kenya and Zambia, Unpublished Ph.D Degree Thesis, University of Illinois at urban - Champaign.

Sewell, D. and W. Thirsk, (1997) "Tax Reform in Morocco: Gradually getting it Right". In Thirsk (Ed) *Tax Reform in Developing Countries,* Washington D.C: The World Bank. Pp 329 -360

Sharply, J. (1981)."Resource Transfer between the Agricultural and Non-agricultural Sectors: 1964–1977, in Killick, T. (Ed.), *Papers on the Kenyan Economy, Performance and Policies,* Nairobi: Heinemann Educational Books. Pp. 311 - 319.

Silberberg, E. (1991). *The Structure of Economics: A Mathematical Analysis,* New York: McGraw-Hill

Simiyu, N. T. T. (1999). *Taxation in Kenya,* Nairobi: Projesco Business Trainers.

Singer, N. M. (1968). "The Use of Dummy Variable in Establishing the Income Elasticity of State Income Tax Revenue" *National Tax Journal,* 21, 200 - 204.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations,* Reprinted 1993, The World's Classics, A Selected Edition (Ed.), Kathryn Sutherland, Oxford: Oxford University press.

KENYATTA UNIVERSITY LIBRARY

Stiglitz, J. E. (1988). *Economics of the Public Sector*, Second Edition, New York: W.W. Norton & Company

Stock, J. H and M. W. Watson. (1988). "Variable Trends in Economic Time Series" *Journal of Economic Perspectives,* 2, 147 - 174.

Talbott, I.D. (1990) "African Agriculture" In Ochieng W.R. and R.M. Maxon (Eds), *An Economic History of Kenya.* Nairobi: East African Educational publishers Ltd. Pp. 75 - 91.

Theil, H. (1966). *Applied Economic Forecasting*. Amsterdam: North-Holland.

Thirsk, W. (1997a). "Overview: The Substance and Process of Tax Reform in Eight Developing Countries" in Thirsk (Ed.), *Tax Reform in Developing Countries,* Washington D. C: The World Bank.

Thirsk, W. (1997b). "Bolivia's Tax Revolution" in Thirsk (Ed.) *Tax Reform in Developing Countries*, Washington D. C: The World Bank.

Thomas, R. L. (1997). *Modern Econometrics: An Introduction.* London: FT Prentice Hall

Toye, J.F.J. (1978). (Ed.), *Taxation and Economic Development,* London, England: Frank Cass & Co. Ltd.

UNCTAD. (1970). Objectives for Mobilization of Domestic Resources. Mimeographed. TD/B/C3/73, Add 1 Feb. 23.

Vaish, O. P. and S. Panandiker. (1978). *Direct Taxes: Proposals for Reform,* Centre for Fiscal Studies, New Delhi: Vikas Publishing House PVT Ltd.

Varian H. R. (1992). *Microeconomic Analysis*. Third Edition. New York: W.W. Norton & Company Inc.

Varian, H. R (1997). *Intermediate Microeconomics: A Modern Approach,* 4th Edition, New Delhi: Affiliated East-West press.

Waud, R. (1988) "Tax Evasion, Optimal Tax Rates and Indexation". *Public Finance*, 43, 310 - 325.

Wawire, N. H. W. (2000). "Revenue Productivity Implications of Kenya's Tax System" in Kwaa Prah, K. and A. G. M. Ahmed (Ed.). *Africa in Transformation. Political and Economic Issues.* Vol. 1 Chapter 6. Addis Ababa: OSSREA, Pp. 99 - 106.

Wawire, N. H. W. (1991). An Empirical Assessment of Tax Performance in Kenya: 1958 - 1989, M.A. Research Paper, Kenyatta University.

Wawire, N. H. W. (2003). "Trends in Kenya's Tax Ratios and Tax Effort Indices, and Their Implication for Future Tax Reforms" in Illieva E. V. (Ed.) *Egerton Journal,* 4, 256 - 279

Westlake, M..J. (1973). "Tax Evasion, Tax Incidence and Distribution of Income in Kenya" *Eastern Africa Economic Review,* 5, 1 - 25.

Wilford, S.D and W.T. Wilford, (1978b). "On Revenue Performance and Revenue-Income Stability in the Third World", *Economic Development and Cultural Change,* 26, 505 - 523.

Wilford, S.D. and W.T. Wilford. (1978a). "Estimates of Revenue Elasticity and Buoyancy in Central America: 1955- 1974" in Toye, J.F.J (Ed.), *Taxation and Economic Development.* London: Frank Cass & Co. Ltd. Pp. 83 - 100.

Williamson, G. (1961). "Public Expenditure and Revenue: An International Comparison". *The Manchester School of Economics and Social Studies,* 29, 43 - 56.

KENYATTA UNIVERSITY LIBRARY

Winniski, J. (1978). *The Way the World Works: How Economies Fail to Succeed,* New York: Basic Books.

World Bank (2004). *Africa Database CD-ROM:* Washington D.C: World Bank, Online

World Bank, (1975). *Kenya: Into the Second Decade,* Baltimore: John Hopkins.

World Bank, (1983). *Kenya: Growth and Structural Change,* A World Bank Country Study. Vol. 1, Washington D.C: World Bank.

World Bank, (2003). *Kenya: A Policy Agenda to Restore Growth*, Report No. 25840 - KE. Washington D.C: The World Bank.

Yule, G. V. (1926). "Why Do We Sometimes Get Nonsense Correlations between Time Series? A Study in Sampling and the Nature of Time Series" *Journal of the Royal Statistical Society*, 89, 1- 64.

Zeleza T. (1990). "The Colonial Labour System in Kenya" in W.R. Ochieng and R.M. Maxon (Eds), *An Economic History of Kenya,* Nairobi: East African Educational Publishes Ltd. Pp. 171 - 199.

APPENDICES

Appendix I: Raw data

Table A 1: Raw data for independent variables

Fiscal Year	GDP (Ksh. million)	Monetary GDP (Ksh.million)	Imports (Ksh. million)	Trade (Ksh. million)	Population (millions)	GDP deflator (1995)	Consumer Price index (1995)
1964	6627.0	4849.2	1532	2603	9.37	6.90	0.056
1965	6609.8	5000.0	1781	2822	9.67	7.03	0.058
1966	7700.6	5670.0	2248	3494	9.98	7.15	0.061
1967	8133.8	5990.2	2132	3324	10.30	7.32	0.062
1968	8786.2	6607.2	2295	3554	10.64	7.45	0.063
1969	9514.8	7220.8	2339	3709	10.99	7.45	0.062
1970	10437.4	8046.8	2841	4390	11.37	7.43	0.052
1971	11515.4	8977.2	3682	5249	11.77	8.57	0.056
1972	13171.8	10282.0	3679	5588	12.19	7.78	0.039
1973	14802.4	11708.6	4303	6882	12.63	7.88	0.046
1974	17926.0	14407.4	8676	15820	13.09	8.68	0.051
1975	21140.2	19959.8	8260	15398	13.58	10.07	0.060
1976	25560.2	24165.8	9232	18666	14.09	11.26	0.065
1977	32813.0	31136.2	11752	24756	14.62	13.39	0.079
1978	35768.2	33757.2	15860	27722	15.18	15.66	0.090
1979	39592.4	37118.2	14732	26734	15.76	16.14	0.098
1980	44707.4	42074.0	21054	36120	16.37	17.05	0.111
1981	51944.6	48929.2	20914	36388	17.00	18.68	0.132
1982	59964.8	56673.2	20188	37740	17.66	20.70	0.150
1983	68346.6	64358.8	20284	40211	18.34	23.12	0.165
1984	73221.4	77524.0	24639	48049	19.04	25.86	0.183
1985	83539.4	88478.0	26540	52064	19.76	28.48	0.202
1986	97023.0	102299.2	30129	60463	20.50	30.82	0.210
1987	107017.0	112964.6	34682	62674	21.26	33.53	0.222
1988	122598.2	129436.2	41086	74170	22.03	35.34	0.244
1989	140603.8	148524.0	52247	91801	22.80	38.36	0.268
1990	167556.0	159122.0	61390	112576	23.59	41.58	0.368
1991	190806.0	181638.0	63326	123838	24.37	50.73	0.420
1992	219720.0	209882.0	69041	138328	25.15	59.58	0.578
1993	270182.0	259732.0	118783	253701	25.92	66.49	0.879
1994	322238.0	311022.0	115080	200723	26.67	89.91	0.937
1995	393766.6	381723.8	155169	252508	27.39	100.00	1.000
1996	449621.4	436626.2	168486	286686	28.09	108.51	1.110
1997	536382.8	522503.0	190674	311119	28.76	126.13	1.198
1998	594019.0	579776.2	197789	318970	29.39	132.7	1.220
1999	642675.0	623801.0	206401	328960	29.99	147.09	1.310
2000	686159.3	669825.0	247804	382331	30.55	156.09	1.454
2001	772893.0	755552.9	290108	437698	31.06	175.79	1.591
2002	849987.8	831119.1	257710	426993	31.54	178.08	1.622
2003	968423.8	948321.5	281844	464997	32.2	-	1.753

Source: Republic of Kenya *Statistical Abstracts*, Various Issues. Nairobi: Government Printer, World Bank, and International Financial Statistic *CD-ROMs*

Table A 2: Raw data for dependent variables (in Kshs million)

Fiscal Year	Total taxes	Direct taxes	Indirect taxes	Income taxes	Import taxes	Trade taxes	Sales tax/ VAT	Excise taxes
1964/65	734.7	267.58	467.12	264.62	273.88	277.28	na	120.38
1965/66	784.9	269.46	515.46	269.22	317.84	336.00	na	124.86
1966/67	873.5	322.96	550.50	317.74	343.92	356.90	na	125.98
1967/68	1048.4	381.64	666.76	375.72	401.54	421.44	na	169.48
1968/69	1188.7	474.92	713.74	459.36	399.04	407.32	na	209.96
1969/70	1296.9	508.64	788.34	472.22	436.60	443.62	na	235.86
1970/71	1515.6	639.82	875.78	584.08	487.00	495.00	na	263.04
1971/72	1850.0	816.36	1033.68	755.66	574.42	584.14	na	305.36
1972/73	2147.4	947.28	1200.10	900.76	630.08	638.82	na	324.10
1973/74	2329.1	1077.74	1251.32	1004.04	539.86	553.50	54.06	336.76
1974/75	3210.5	1164.64	2045.84	1124.78	795.44	795.44	639.80	416.94
1975/76	3969.2	1543.04	2426.12	1531.34	842.24	842.24	937.26	453.46
1976/77	4598.7	1804.80	2793.86	1796.72	983.62	983.62	1185.48	412.60
1977/78	5317.8	2160.58	3157.22	2149.30	1057.18	1057.18	1308.44	564.40
1978/79	7995.5	2860.26	5135.28	2846.70	2083.94	2249.40	1855.26	769.44
1979/80	8394.4	3034.72	5359.68	3021.44	2025.48	2081.56	1995.38	980.46
1980/81	10277.8	3448.00	6829.76	3437.00	2049.64	2190.14	3098.14	1189.06
1981/82	12171.9	3965.26	8206.72	3951.68	2919.4	2982.02	3587.76	1204.80
1982/83	13523.2	4022.48	9500.68	3993.48	3674.24	3780.14	3895.90	1279.28
1983/84	14113.7	4635.50	9478.16	4624.50	3305.84	3442.34	3917.50	1479.06
1984/85	15936.6	5034.94	10901.68	5022.94	3424.38	3625.36	5075.42	1588.56
1985/86	17460.9	6019.36	11441.62	6019.36	3043.58	3584.32	5471.00	1575.60
1986/87	21272.5	7102.38	14170.14	7102.38	4236.80	5029.60	6065.86	1780.84
1987/88	24814.4	7714.72	17099.72	7714.72	4934.20	5611.74	7950.40	2125.40
1988/89	28203.8	8940.50	19263.28	8940.50	5388.40	5812.40	9558.00	2372.00
1989/90	32889.3	10240.50	22648.84	10240.50	6005.56	6536.56	11765.68	2748.92
1990/91	36612.7	11983.06	24629.68	11983.06	6959.36	6973.94	12806.90	2987.16
1991/92	42057.8	14261.68	27796.12	14261.68	6693.60	6695.00	15321.42	3703.28
1992/93	49516.0	17027.90	32488.14	17027.90	5118.78	5120.26	18555.40	6809.20
1993/94	61414.3	19970.50	41443.76	19970.50	9183.00	9187.44	22142.72	8367.10
1994/95	94071.3	36767.30	57304.02	36767.30	14792.78	14795.38	28994.34	11125.34
1995/96	108110.7	43505.84	64604.88	43505.84	18598.28	18598.28	24533.86	19332.26
1996/97	122745.5	48082.32	74663.14	48082.32	21175.68	21175.68	28403.72	22611.84
1997/98	127029.5	48375.02	78654.50	48375.02	22594.06	22594.06	29850.08	23687.22
1998/99	145612.2	55577.90	90034.32	55577.90	24567.06	24567.06	34468.12	28381.62
1999/00	155524.2	55234.90	100289.30	55234.90	28605.16	28605.16	40944.19	28493.06
2000/01	154480.0	53316.9	101163.00	53316.99	28803.74	28803.74	50220.86	28317.99
2001/02	162464.4	55861.95	106602.49	55861.95	21583.67	21583.67	50871.68	32076.93
2002/03	179261.7	66744.28	112517.44	66744.28	18436.23	18436.23	56135.00	35684.12
2003/04	200980.2	74143.00	126837.16	74143.00	21684.0	21684.0	60405.00	41939.00

na - means lack of figures because the sales tax had not yet been introduced

Sources: Republic of Kenya *Statistical Abstracts*, various issues. Nairobi: Government printer, World Bank and International Financial Statistic *CD-ROMs*

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Appendix II: Refined data

Table A 3: Refined data for independent variables

Fiscal Year	Population (million)	Average GDP (Ksh. million)	Average monetary GDP (Ksh. million)	Average imports (Ksh. million)	Average trade (Ksh. million)
1964/65	9.37	95033.1	70701.01	29032.02	47568.66
1965/66	9.67	100861.7	75212.23	33779.68	52966.93
1966/67	9.98	109409.1	80567.02	35619.78	55445.79
1967/68	10.30	114526.5	85260.29	35407.83	55012.80
1968/69	10.64	122825.5	92805.37	37077.19	58117.64
1969/70	10.99	134095.9	102612.49	46180.21	72122.83
1970/71	11.37	137422.6	106526.47	60192.31	89077.61
1971/72	11.77	151836.0	118455.42	80041.67	118507.10
1972/73	12.19	178575.5	140372.84	93938.41	146445.37
1973/74	12.63	197184.2	157285.08	131830.56	229902.39
1974/75	13.09	208226.6	182097.20	153892.16	283414.71
1975/76	13.58	218466.2	206413.43	139848.72	271901.28
1976/77	14.09	236028.0	223574.79	145395.13	300268.16
1977/78	14.62	236730.4	224048.23	162490.86	310694.66
1978/79	15.18	236855.5	222769.84	163274.38	290409.07
1979/80	15.76	253759.8	238372.39	170001.10	299100.66
1980/81	16.37	270144.6	254350.97	174057.53	300536.04
1981/82	17.00	283880.5	267858.59	146513.03	263633.33
1982/83	17.66	292650.9	276076.04	128760.00	247651.52
1983/84	18.34	289381.1	289075.98	128786.34	253132.94
1984/85	19.04	288235.9	305225.29	133012.74	260152.71
1985/86	19.76	304065.9	321295.93	137428.78	272830.81
1986/87	20.50	316986.6	334415.39	149848.33	285117.18
1987/88	21.26	333039.2	351582.91	162305.24	293145.36
1988/89	22.03	356724.0	376722.16	181668.37	323258.23
1989/90	22.80	384755.1	384936.68	180886.07	324227.04
1990/91	23.59	389546.6	370368.64	158798.42	300382.71
1991/92	24.37	372451.1	355158.85	135112.14	267087.09
1992/93	25.15	387565.6	371451.19	127291.17	263973.19
1993/94	25.92	382375.2	368279.56	128975.87	251421.68
1994/95	26.67	376083.6	363824.86	138993.25	233363.39
1995/96	27.39	404063.0	392053.59	153479.09	255391.84
1996/97	28.09	419810.6	408320.44	155474.73	258987.17
1997/98	28.76	436451.2	425582.49	160641.19	260574.74
1998/99	29.39	442283.5	430501.12	159840.07	256282.66
1999/00	29.99	438259.2	426611.10	163993.59	257032.84
2000/01	30.55	467375.3	456588.5	169048.4	257708.7
2001/02	31.06	461858.8	4551559.9	168871.12	266550.9
2002/03	31.50	477306.72	466711.1	158884.1	263250.9
2003/04	32.20	na	na	na	na

na - means lack of figures due to lack of GDP deflator for 2003

Source: Own Calculations

Table A 4: Refined data for dependent variables (in Ksh. million)

Fiscal Year	Total taxes	Direct taxes	Indirect taxes	Income taxes	Import taxes	Trade taxes	Sale tax/ VAT	Excise taxes
1964/65	13119.6	4778.2	8341.4	4725.3	4890.7	4951.4	na	2149.6
1965/66	13533.1	4645.8	8887.2	4641.7	5480.0	5793.1	na	2152.7
1966/67	14319.0	5294.4	9024.5	5208.8	5638.0	5850.8	na	2065.2
1967/68	16909.6	6155.4	10754.1	6060.0	6476.4	6797.4	na	2733.5
1968/69	18867.6	7538.4	11329.2	7291.4	6333.9	6465.3	na	3332.7
1969/70	20919.0	8203.8	12715.1	7616.4	7041.9	7155.1	na	3804.2
1970/71	29146.1	12304.2	16841.9	11232.0	9365.3	9519.2	na	5058.4
1971/72	33036.4	14577.8	18458.5	13493.9	10257.5	10431.0	na	5452.8
1972/73	55061.0	24289.2	30771.7	23096.4	16155.8	16380.0	na	8310.2
1973/74	50631.7	23429.1	27202.6	21826.9	11736.0	12032.6	1175.2	7320.8
1974/75	62950.5	22836.0	40114.5	22054.5	15596.8	15596.8	12545.0	8175.3
1975/76	66152.6	25717.3	40435.3	25522.3	14037.3	14037.3	15621.0	7557.7
1976/77	70748.6	27766.1	42982.4	27641.8	15132.6	15132.6	18238.1	6347.6
1977/78	67313.9	27349.1	39964.8	27206.3	13382.0	13382.0	16562.5	7144.3
1978/79	88839.3	31780.6	57058.6	31630.0	23154.8	24993.3	20614.0	8549.3
1979/80	85657.1	30966.5	54690.6	30831.0	20668.1	21240.46	20361.0	10004.6
1980/81	92592.4	31063.0	61529.3	30963.9	18465.2	19730.9	27911.17	10712.2
1981/82	92211.9	30039.8	62172.1	29936.9	22116.6	22591.0	27180.0	9127.2
1982/83	90154.4	26816.5	63337.8	26623.2	24494.9	25200.9	25972.6	8528.5
1983/84	85537.3	28093.9	57443.3	28027.2	20035.3	20862.6	23742.4	8964.0
1984/85	87085.3	27513.3	59572.0	27447.7	18712.4	19810.7	27734.5	8680.6
1985/86	86440.4	29798.8	56641.6	29798.8	15067.2	17744.12	27084.1	7800.0
1986/87	101297.7	33820.8	67476.8	33820.8	20175.2	23950.4	28885.0	8480.2
1987/88	111776.7	34750.9	77025.7	34750.9	22226.1	25278.11	35812.6	9573.87
1988/89	115589.2	36641.3	78947.8	36641.3	22083.6	23821.3	39172.1	9721.3
1989/90	122721.4	38210.8	84510.5	38210.8	22408.8	24390.1	43901.7	10257.1
1990/91	99491.1	32562.6	66928.4	32562.6	18911.3	18950.9	34801.3	8117.2
1991/92	100137.6	33956.3	66181.2	33956.3	15937.1	15940.4	36479.5	8817.3
1992/93	85667.8	29460.0	56207.8	29460.0	8856.0	8858.5	32102.7	11780.6
1993/94	69868.3	22719.5	47148.7	22719.5	10447.0	10452.1	25190.8	9518.8
1994/95	100396.2	39239.3	61156.9	39239.3	15787.3	15790.1	30943.76	11873.3
1995/96	108110.7	43505.8	64604.8	43505.8	18598.2	18598.2	24533.8	19332.2
1996/97	110581.4	43317.4	67264.0	43317.4	19077.1	19077.1	25588.9	20371.0
1997/98	106034.6	40379.8	65654.8	40379.8	18859.8	18859.8	24916.5	19772.3
1998/99	119354.2	45555.6	73798.6	45555.6	20136.9	20136.9	28252.5	23263.6
1999/00	118720.7	42164.0	76556.7	42164.0	21712.9	21712.9	29927.2	21933.7
2000/01	106244.8	36669.1	69575.6	36669.1	19673.4	19673.4	28159.6	19596.3
2001/02	116270.2	38906.9	77363.3	38906.9	19512.3	19512.3	34627.0	19261.4
2002/03	110518.9	41149.4	69369.6	41149.4	11366.4	11366.4	34608.5	22000.1
2003/04	114649.3	42294.9	72354.4	42294.9	12369.7	12369.7	34458.1	23924.1

na - means lack of data because sale tax had not been introduced

Source: Own Calculations

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Appendix III: Composition of government revenue

Table A 5: Composition of direct taxes

Fiscal year	% of GDP	% of total taxes	% of govt. revenue
1963/64	05	36	23
1964/65	05	34	22
1965/66	06	36	26
1966/67	06	36	27
1967/68	06	39	30
1968/69	06	36	29
1969/70	08	39	30
1970/71	10	41	32
1971/72	14	42	32
1972/73	12	43	34
1973/74	11	35	30
1974/75	12	39	34
1975/76	12	39	34
1976/77	11	41	34
1977/78	14	36	31
1978/79	13	36	30
1979/80	12	33	29
1980/81	11	32	28
1981/82	09	30	27
1982/83	10	33	28
1983/84	10	32	29
1984/85	10	34	30
1985/86	11	33	29
1986/87	11	31	27
1987/88	11	32	28
1988/89	10	31	28
1989/90	08	33	29
1990/91	09	34	30
1991/92	08	34	31
1993/94	11	39	37
1994/95	11	40	39
1995/96	10	39	36
1996/97	09	38	36
1997/98	10	38	33
1998/99	10	36	34
1999/00	08	34	29
2000/01	08	33	27
2001/02	07	34	30
2002/03	08	37	32
2003/04	08	37	37

Source: Own calculations

Table A 6: Composition of international trade taxes

Fiscal year	Trade taxes		Import duties		
	% of indirect tax	% of total taxes	% of total taxes	% indirect taxes	% of govt. revenue
1963/64	59	38	37	59	24
1964/65	65	43	40	62	26
1965/66	64	41	39	62	28
1966/67	63	40	38	60	29
1967/68	57	34	34	56	26
1968/69	56	34	34	55	27
1969/70	57	33	32	56	25
1970/71	57	32	31	56	24
1971/72	53	30	29	53	22
1972/73	44	24	23	43	18
1973/74	39	25	25	39	21
1974/75	35	21	21	35	19
1975/76	35	21	21	35	18
1976/77	33	20	20	33	17
1977/78	44	28	26	41	23
1978/79	39	24	24	38	20
1979/80	32	21	20	30	17
1980/81	36	24	24	36	21
1981/82	40	28	27	39	24
1982/83	36	24	23	35	20
1983/84	33	23	21	31	20
1984/85	31	21	17	27	15
1985/86	35	24	20	30	18
1986/87	32	23	20	29	18
1987/88	30	21	19	28	17
1988/89	29	20	18	27	16
1989/90	28	19	19	28	17
1990/91	24	16	16	24	14
1991/92	16	10	10	16	09
1992/93	22	15	15	22	04
1993/94	26	16	16	26	15
1994/95	29	17	17	29	17
1995/96	28	17	17	28	16
1996/97	29	18	18	29	17
1997/98	27	17	17	27	15
1998/99	28	18	18	28	17
1999/00	28	19	19	28	16
2000/01	26	18	18	26	15
2001/02	20	13	13	20	12
2002/03	16	10	10	16	09
2003/04	17	11	11	17	09

Source: Own calculations

Table A 7: Composition of domestic indirect taxes

Fiscal year	Licenses under traffic Act % of indirect taxes	Import taxes % of indirect tax	Excise duties % of indirect taxes	Business licenses % of indirect taxes	Sales taxes /VAT % of indirect tax	Other taxes licenses &duties % of indirect taxes
1963/64	03	59	26	0.3	na	03
1964/65	03	62	24	0.04	na	03
1965/66	04	62	23	0.02	na	03
1966/67	04	60	25	0.02	na	02
1967/68	04	56	29	0.6	na	2
1968/69	04	55	30	0.7	na	02
1969/70	03	56	30	0.6	na	03
1970/71	03	56	30	0.7	na	02
1971/72	04	53	27	0.5	na	08
1972/73	05	43	27	0.6	04	13
1973/74	03	39	20	0.7	31	03
1974/75	03	35	19	0.6	39	02
1975/76	02	35	15	0.6	42	02
1976/77	02	33	18	0.4	41	04
1977/78	01	41	15	0.5	36	03
1978/79	01	38	18	0.6	37	04
1979/80	02	30	17	0.4	45	03
1980/81	02	36	15	0.5	44	03
1981/82	01	39	13	0.5	41	04
1982/83	02	35	16	0.7	41	04
1983/84	01	31	15	0.6	47	04
1984/85	01	27	14	1.4	48	05
1985/86	02	30	13	0.7	43	07
1986/87	01	29	12	0.5	46	06
1987/88	01	28	12	0.6	50	06
1988/89	01	27	12	0.8	52	05
1989/90	01	28	12	0.7	52	05
1990/91	01	24	13	0.7	55	06
1991/92	01	16	21	0.8	57	04
1992/93	0.8	22	20	0.5	53	03
1993/94	0.7	26	19	0.4	51	03
1994/95	0.7	29	30	0.6	38	02
1995/96	0.6	28	30	0.6	38	02
1996/97	0.9	29	30	0.3	38	02
1997/98	0.9	27	32	0.2	38	02
1998/99	0.8	28	29	0.1	39	03
1999/00	02	28	28	0.08	40	01
2000/01	01	26	25	0.07	45	03
2001/02	01	20	30	0.09	48	04
2002/03	0.9	16	32	0.09	50	05
2003/04	01	17	33	0.18	48	06

a -means no statistics were available because sales tax had not yet been introduced
ource: Own calculations

Table A 8: Contribution of sales taxes /VAT on domestic manufactures and on imports to indirect tax revenue

Fiscal year	Sale tax /VAT on domestic manufactures % indirect tax	Sales tax/VAT on imports % of indirect taxes	Fiscal year	Sale tax/VAT on domestic manufactures% of indirect tax	Sales tax/VAT on imports % of indirect taxes
1984/85	28	20	1994/95	21	17
1985/86	27	16	1995/96	20	18
1986/87	28	18	1996/97	18	19
1987/88	29	21	1997/98	20	19
1988/89	31	21	1998/99	21	18
1989/90	26	26	1999/00	22	18
1990/91	30	25	2000/01	23	21
1991/92	21	36	2001/02	25	23
1992/93	20	33	2002/03	24	26
1993/94	23	27	2003/04	25	23

Source: Own calculations

Table A 9: The composition of total tax revenue

Fiscal Year	Direct taxes % of total taxes	Indirect taxes% of total taxes	Trade taxes% of total taxes	Fiscal Year	Direct taxes% of total taxes	Indirect taxes% of total taxes	Trade taxes% of total taxes
1963/64	36	64	38	1984/85	34	66	21
1964/65	34	66	43	1985/86	33	67	24
1965/66	37	63	41	1986/87	31	69	23
1966/67	36	64	40	1987/88	32	68	21
1967/68	40	60	34	1988/89	31	69	20
1968/69	39	61	34	1989/90	33	67	19
1969/70	42	58	33	1990/91	34	66	16
1970/71	44	56	32	1991/92	34	66	10
1971/72	44	56	30	1992/93	33	67	15
1972/73	46	54	24	1993/94	39	61	16
1973/74	36	64	25	1994/95	40	60	17
1974/75	39	61	21	1995/96	39	61	17
1975/76	39	61	21	1996/97	38	62	18
1976/77	41	60	20	1997/98	38	62	17
1977/78	36	64	28	1998/99	36	64	18
1978/79	36	64	24	1999/00	35	65	19
1979/80	34	66	21	2000/01	32	68	18
1980/81	33	67	24	2001/02	34	66	13
1981/82	30	70	28	2002/03	37	63	10
1982/83	33	67	24	2003/04	37	63	11
1983/84	32	68	23				

Source: Own calculations

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Table A 10: The composition of government revenue

Fiscal Year	Direct tax % of total govt. revenue	Indirect tax % of govt. revenue	Sales of goods & services % of govt. revenue	Property income % of govt. revenue	Compulsory fees, fines & penalties % of govt. revenue
1963/64	23	41	07	04	25
1964/65	22	43	07	05	23
1965/66	27	46	08	05	14
1966/67	28	49	08	05	10
1967/68	31	47	09	07	06
1968/69	31	48	09	08	04
1969/70	33	46	10	07	04
1970/71	35	44	10	09	02
1971/72	34	43	09	10	04
1972/73	36	42	10	08	04
1973/74	31	54	09	05	02
1974/75	34	54	10	04	02
1975/76	34	52	08	05	03
1976/77	34	50	06	05	03
1977/78	31	56	06	06	02
1978/79	30	54	08	06	02
1979/80	29	57	05	04	02
1980/81	29	59	08	06	02
1981/82	27	63	08	05	01
1982/83	29	58	04	07	02
1983/84	28	62	04	06	01
1984/85	30	57	04	06	03
1985/86	29	59	03	05	04
1986/87	27	61	03	05	04
1987/88	28	60	04	05	03
1988/89	28	61	04	05	02
1989/90	29	60	03	05	03
1990/91	30	59	04	06	01
1991/92	31	58	03	07	01
1992/93	8	18	71	02	01
1993/94	37	57	02	01	03
1994/95	37	56	05	01	01
1995/96	36	57	05	01	01
1996/97	36	59	03	01	01
1997/98	33	53	07	06	01
1998/99	34	60	04	01	01
1999/00	30	56	05	01	08
2000/01	28	59	05	02	06
2001/02	30	57	6	02	02
2002/03	32	53	08	01	03
2003/04	31	53	08	01	03

Source: Own calculations

Table A 11: Tax revenues as percent of GDP, 1963 - 2003

Fiscal year	Total taxes as % GDP	Direct taxes as % GDP	Indirect taxes as % of GDP	Government revenue as % of GDP
1963/64	14	05	09	21
1964/65	14	05	09	22
1965/66	13	05	08	18
1966/67	15	06	09	20
1967/68	16	06	10	21
1968/69	16	06	10	21
1969/70	21	09	12	26
1970/71	25	11	14	31
1971/72	32	14	18	43
1972/73	26	12	14	34
1973/74	30	11	19	36
1974/75	31	12	19	36
1975/76	31	12	19	36
1976/77	27	11	16	32
1977/78	39	14	25	44
1978/79	35	13	22	42
1979/80	34	11	23	41
1980/81	33	11	22	38
1981/82	31	09	22	35
1982/83	29	10	19	33
1983/84	31	10	21	33
1984/85	29	10	19	34
1985/86	32	11	21	36
1986/87	35	11	24	40
1987/88	34	11	23	38
1988/89	33	10	23	38
1989/90	25	08	17	28
1990/91	27	09	18	30
1991/92	23	08	15	26
1992/93	18	06	12	23
1993/94	28	11	17	30
1994/95	27	11	16	29
1995/96	26	10	16	29
1996/97	25	10	15	26
1997/98	27	11	16	31
1998/99	27	10	17	29
1999/00	24	08	16	29
2000/01	24	08	16	29
2001/02	21	07	14	25
2002/03	21	08	13	25
2003/04	21	08	13	25

Source: Own calculations

Appendix IV: Stationarity analysis of data

Table A 12: ADF unit root tests for variables (C = Constant and C & T= Constant & trend)

Dependent variable	Form			Test statistic	Critical values			Decision
					1%	5%	10%	
Log total tax revenue	ADF	C	Level	-3.18	-3.63	-2.95	-2.61	Reject at 5%
		C&T	Level	-1.57	-4.24	-3.54	-3.20	Accept
			1st difference	-3.77	-4.25	-3.55	-3.21	Reject at 5%
Log total direct tax	ADF	C	Level	-3.25	-3.63	-2.95	-2.61	Reject at 5%
		C&T	Level	-2.11	-4.24	-3.54	-3.20	Accept
			1st difference	-4.11	-4.25	-3.55	-3.21	Reject at 5%
Log indirect revenue	ADF	C	Level	-2.99	-3.63	-2.95	-2.61	Reject at 5%
		C&T	Level	-1.25	-4.24	-3.54	-3.20	Accept
			1st difference	-3.65	-4.25	-3.55	-3.21	Reject at 5%
Log income revenue	ADF	C	Level	-3.11	-3.63	-2.95	-2.61	Reject
		C&T	Level	-1.96	-4.24	-3.54	-3.20	Accept
			1st difference	-4.21	-4.25	-3.55	-3.21	Reject at 5%
Log imports duty	ADF	C	Level	-2.32	3.63	-2.95	-2.61	Accept
			1st difference	-4.10	-3.64	-2.95	-2.61	Reject
		C&T	Level	-2.09	-4.24	-3.54	-3.20	Accept
			1st difference	-4.24	-4.25	-3.55	-3.21	Reject at 5%
Log trade taxes	ADF	C	Level	-2.25	-3.63	-2.95	-2.61	Accept
			1st difference	-3.93	-3.64	-2.95	-2.61	Reject
		C&T	Level	-1.97	-4.24	-3.54	-3.20	Accept
			1st difference	-4.10	-4.25	-3.54	-3.21	Reject at 5%
Log sales taxes/VAT revenue	ADF	C	Level	-2.74	-3.71	-2.98	-2.63	Reject at 10%
			1st difference	-6.13	-3.72	-2.99	-2.63	Reject
		C&T	Level	-2.26	-4.35	-3.59	-3.23	Accept
			1st difference	-6.21	-4.37	-3.60	-3.23	Reject
Log excise taxes	ADF	C	Level	-1.89	-3.63	-2.95	-2.61	Accept
			1st difference	-4.34	-3.64	-2.95	-2.61	Reject
		C&T	Level	-2.41	-4.24	-3.54	-3.20	Accept
			1st difference	-4.46	-4.25	-3.55	-3.21	Reject
Log total GDP	ADF	C	Level	-2.76	-3.64	-2.95	-2.61	Reject at 10%
			1st difference	-3.29	-3.64	-2.95	-2.61	Reject at 5%
		C&T	Level	-1.46	-4.25	-3.55	-3.21	Accept
			1st difference	-4.45	-4.26	-3.55	-3.21	Reject
Log volume of imports	ADF	C	Level	-2.27	-3.64	-2.95	-2.61	Accept
			1st difference	-2.93	-3.64	-2.95	-2.61	Reject at 10%
		C&T	Level	-2.03	-4.25	-3.55	-3.21	Accept
			1st difference	-3.42	-4.26	-3.55	-3.21	Reject
Log volume of trade	ADF	C	Level	-2.39	-3.64	-2.95	-2.61	Accept
			1st difference	-2.26	-3.64	-2.95	-2.61	Accept
		C&T	Level	-173	-4.25	-3.55	-3.21	Accept
			1st difference	-2.88	-4.26	-3.55	-3.21	Accept
Log monetary GDP	ADF	C	Level	-2.66	-3.64	-2.95	-2.61	Reject at 10%
			1st difference	-2.46	-3.64	-2.95	-2.61	Accept
		C&T	Level	-1.13	-4.25	-3.55	-3.21	Accept
			1st difference	-3.74	-4.26	-3.55	-3.21	Reject at 5%

Appendix V: Diagnostic tests results

Table A 13: Diagnostic test results for regression residuals (at 1% critical value)

Dependent variable	Tax base	Unit root tests for regression residuals				Other criteria		
		ADF test		PP test		Akaike	Schwarz	Theil's coefficient
		Statistic	Critical value	Statistic	Critical value			
Log total tax revenue	Log total GDP	-4.1*	-3.7	-5.0*	-3.7	-1.71	-1.33	0.004
	Log monetary GDP	-4.5*	-3.7	-5.6*	-3.7	-1.87	-1.96	0.003
Log direct tax revenue	Log total GDP	-4.6*	-3.7	-4.6*	-3.7	-2.50	-1.99	0.003
	Log monetary GDP	-4.2*	-3.6	-5.9*	-3.6	-1.80	-1.30	0.005
Log indirect tax revenue	Log total GDP	-4.1*	-3.6	-4.6*	-3.6	-1.80	-1.50	0.005
	Log monetary GDP	-4.1*	-3.6	-5.7*	-3.6	-1.50	-1.10	0.005
Log income tax revenue	Log total GDP	-3.2*	-3.7	-5.1*	-3.7	-1.40	-1.10	0.005
	Log monetary GDP	-4.6*	-3.7	-6.4*	-3.7	-2.80	-2.20	0.002
Log import duty	Log imports	-3.7*	-3.6	-6.4*	-3.6	-0.78	-0.56	0.008
Log trade taxes	Log volume trade	-3.8*	-3.6	-6.7*	-3.6	-0.60	-0.40	0.009
Log sales tax/VAT revenue	Log total GDP	-2.6*	-3.7	-4.6*	-3.6	-1.02	-0.79	0.006
	Log monetary GDP	-2.6*	-3.7	-6.0*	-3.7	-2.59	-2.30	0.003
	Log imports	-3.7*	-3.6	-5.2*	-3.7	-2.30	-1.90	0.003
	Log volume trade	-3.7*	-3.6	-5.0*	-3.6	-0.38	-0.04	0.008
Log excise duties	Log total GDP	-5.5*	-3.7	-9.7*	-3.6	-1.40	-0.89	0.006
	Log volume trade	-3.9*	-3.7	-5.0*	-3.6	-1.00	-0.69	0.008
	Log imports	-3.7*	-3.7	-5.4*	-3.7	-0.91	-0.55	0.01

Source: Own calculations

Table A 14: Jarque-Bera test results

Dependent variable	Independent variable	With population		Per capita taxes	
		Test stat.	Prob.	Test stat.	Prob.
Log total tax revenue	Log total GDP	1.40	0.50	1.37	0.50
	Log monetary GDP	1.04	0.59	0.46	0.80
Log direct tax revenue	Log total GDP	0.85	0.65	1.01	0.60
	Log monetary GDP	1.76	0.41	1.51	0.47
Log indirect tax revenue	Log total GDP	0.03	0.99	0.05	0.97
	Log monetary GDP	0.53	0.77	1.33	0.51
Log income tax revenue	Log total GDP	0.34	0.85	0.09	0.96
	Log monetary GDP	2.10	0.35	0.84	0.66
Log imports duty	Log volume of imports	0.28	0.87	2.40	0.30
Log trade taxes	Log volume of trade	1.57	0.46	6.10*	0.05
Log sales taxes/VAT revenue	Log total GDP	1.99	0.37	1.10	0.57
	Log monetary GDP	0.93	0.63	9.90*	0.01
	Log volume of imports	0.46	0.79	1.12	0.57
	Log volume of trade	0.87	0.65	2.40	0.30
Log excise taxes	Log total GDP	1.59	0.45	1.42	0.49
	Log volume of trade	5.40*	0.07	4.50	0.11
	Log volume of imports	0.88	0.64	1.11	0.57

The asterisk (*) denotes a significant coefficient

Source: Own calculations

Table A 15: Autocorrelation test results

Dependent variable	Independent variable	Durbin-Watson test statistic		LM test			
				With pop.		Per capita taxes	
		With pop.	Per capita taxes	Test stat.	Prob.	Test stat.	Prob.
Log total tax revenue	Log total GDP	1.90	1.70	0.27	0.77	0.32	0.73
	Log monetary GDP	2.00	2.00	0.46	0.64	0.24	0.79
Log direct tax revenue	Log total GDP	1.80	1.90	1.22	0.32	2.16	0.15
	Log monetary GDP	1.90	1.90	0.00	1.00	0.00	0.99
Log indirect tax revenue	Log total GDP	1.60*	1.60	1.00	0.38	1.05	0.36
	Log monetary GDP	1.90	2.00	0.04	0.96	0.10	0.90
Log income tax revenue	Log total GDP	1.70*	1.80	0.16	0.86	0.18	0.84
	Log monetary GDP	2.30	2.20	0.87	0.44	0.50	0.61
Log imports duty	Log volume imports	2.20	2.20	0.52	0.60	1.02	0.37
Log trade taxes	Log volume trade	2.30	2.20	0.73	0.49	0.95	0.40
Log sales tax/VAT revenue	Log total GDP	1.80	1.50*	1.30	0.31	1.66	0.19
	Log monetary GDP	2.40	1.80	1.20	0.31	0.39	0.54
	Log volume imports	2.20	2.00	0.48	0.63	0.03	0.97
	Log volume trade	2.20	1.60	0.39	0.69	0.12	0.89
Log excise taxes	Log total GDP	2.8	2.80	3.58	0.03*	1.87	0.15
	Log volume trade	1.80	1.8.	0.15	0.86	0.16	0.85
	Log volume imports	2.00	2.00	0.03	0.97	0.05	0.96

The asterisk (*) imply a relatively low Durbin-Watson statistic and significant LM test statistic
Source: Own calculations

Table A 16: Homoscedasticity and Heteroscedasticity tests results

Dependent variable	Independent variable	ARCH test				White test			
		With population		Per capita taxes		With population		Per capita taxes	
		F-stat	Prob.	F-stat	Prob.	F-stat	Prob.	F-stat	Prob.
Log Total tax revenue	Log total GDP	0.28	0.60	0.82	0.37	0.94	0.54	0.30	0.98
	Log monetary GDP	1.57	0.20	0.29	0.60	0.30	0.98	0.79	0.64
Log direct tax revenue	Log total GDP	2.00	0.13	1.30	0.27	0.65	0.79	0.59	0.84
	Log monetary GDP	0.92	0.47	1.20	0.31	1.31	0.28	2.60	0.03
Log indirect tax revenue	Log total GDP	1.49	0.23	1.48	0.23	1.30	0.30	1.25	0.31
	Log monetary GDP	0.15	0.70	0.00	0.99	0.58	0.82	0.63	0.75
Log income tax revenue	Log total GDP	0.15	0.70	0.03	0.87	1.33	0.29	3.00*	0.02
	Log monetary GDP	0.00	0.95	0.04	0.84	1.60	0.24	2.58*	0.06
Log imports duty	Log volume imports	0.03	0.87	0.01	0.92	2.20	0.06	0.99	0.44
Log trade taxes	Log volume trade	0.30	0.59	0.00	0.96	1.90	0.11	1.20	0.32
Log sales taxes/VAT revenue	Log total GDP	0,02	0.88	0.01	0.91	0.90	0.53	0.51	0.77
	Log monetary GDP	1.12	0.30	0.78	0.39	2.00	0.11	0.51	0.77
	Log volume imports	1.85	0.19	0.26	0.61	0.48	0.63	1.13	0.42
	Log volume trade	0.54	0.47	0.47	0.50	0.57	0.82	5.50*	0.00
Log excise duties	Log total GDP	1.30	0.26	0.18	0.67	2.10	0.09	1.74	0.15
	Log volume trade	0.62	0.44	0.27	0.60	0.50	0.87	0.57	0.79
	Log volume imports	1.59	0.22	1.80	0.20	0.60	0.81	1.10	0.43

Source: Own calculations

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Table A 17: Ramsey RESET and Chow forecast tests

Dependent variable	Independent variable	Ramsey RESET				Chow test			
		With population		Per capita taxes		With population		Per capita taxes	
		F	Prob.	F	Prob.	F	Prob.	F	Prob.
Log total tax revenue	Log total GDP	2.04	0.16	0.04	0.85	0.41	0.86	0.75	0.62
	Log monetary GDP	1.95	0.18	0.28	0.60	0.44	0.84	0.96	0.48
Log direct tax revenue	Log total GDP	0.00	0.96	0.00	0.94	0.40	0.87	0.92	0.51
	Log monetary GDP	4.40*	0.01	1.93	0.15	0.66	0.68	0.93	0.50
Log indirect tax revenue	Log total GDP	1.80	0.17	2.44	0.13	1.04	0.43	0.61	0.72
	Log monetary GDP	1.56	0.22	0.73	0.40	0.21	0.97	0.42	0.86
Log income tax revenue	Log total GDP	1.32	0.26	1.73	0.20	0.55	0.76	0.18	0.98
	Log monetary GDP	0.07	0.79	2.40	0.12	1.50	0.26	1.68	0.20
Log imports duty	Log volume imports	0.60	0.44	0.43	0.52	0.12	0.99	0.31	0.93
Log trade taxes	Log volume trade	0.91	0.35	1.11	0.30	0.11	0.99	0.27	0.95
Log sales taxes/VAT revenue	Log total GDP	1.54	0.24	1.70	0.21	1.11	0.39	1.97	0.13
	Log monetary GDP	0.37	0.55	3.50	0.07	2.20*	0.10	4.98*	0.01
	Log volume imports	0.29	0.60	1.99	0.18	1.30	0.35	2.28	0.13
	Log volume trade	5.40	0.01	2.30	0.00*	0.55	0.76	0.66	0.68
Log excise taxes	Log total GDP	0.99	0.33	0.21	0.65	1.03	0.45	0.82	0.57
	Log volume trade	0.89	0.35	1.80	0.19	1.48	0.23	1.36	0.27
	Log volume imports	0.04	0.84	0.1.	0.76	1.82	0.15	1.61	0.20

The asterisk (*) denotes a significant coefficient at 10 percent level.
Source: Own calculations

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Table A 18: Means and standard deviations of variables in the tax equations (see tables 4.1 to 4.7)

Variable	Mean	Standard deviation
log total GDP	12.66	0.247
First lag of log total GDP	12.63	0.261
Second lag of log total GDP	12.59	0.283
Third lag of log total GDP	12.55	0.307
Fifth lag of log total GDP	12.46	0.349
Sixth lag of log total GDP	12.41	0.374
Seventh lag of log total GDP	12.37	0.395
log population	3.03	0.268
log total tax revenue	11.44	0.191
First lag of log total tax revenue	11.41	0.222
Sixth lag of log total tax revenue	11.16	0.499
log monetary GDP	12.63	0.281
First lag of log monetary GDP	12.59	0.310
Second lag of log monetary GDP	12.54	0.346
Third lag of log monetary GDP	12.49	0.381
Fifth lag of log monetary GDP	12.38	0.445
Sixth lag of log monetary GDP	12.33	0.478
log direct tax revenue	10.39	0.193
Fifth lag of log direct tax revenue	10.20	0.360
log indirect tax revenue	11.01	0.207
First lag of log indirect tax revenue	10.97	0.256
log income tax revenue	10.39	0.197
First lag of log income tax revenue	10.37	0.209
log sales taxes/VAT	10.17	0.286
First lag of log sales taxes/VAT	10.05	0.661
log volume of imports	11.92	0.109
First lag of log volume of imports	11.89	0.139
Third lag of log volume of imports	11.84	0.245
Fourth lag of log volume of imports	11.79	0.321
log volume of trade	12.52	0.092
First lag of log volume of trade	12.49	0.151
Second lag of log volume of trade	12.47	0.218
Third lag of log volume of trade	12.43	0.300
Fourth lag of log volume of trade	12.38	0.383
log excise duty	9.28	0.382
First lag of log excise duty	9.25	0.369
Sixth lag of log excise duty	8.98	0.305
log of import duty	9.79	0.241
log trade taxes	9.83	0.262
First lag of log trade taxes	9.81	0.274
log per capita total tax revenue	8.40	0.183
log per capita direct tax revenue	7.35	0.185
log per capita indirect tax revenue	7.97	0.199
log per capita income tax revenue	7.35	0.183
log per capita sales tax/VAT	7.14	0.233
log per capita excise duty	6.25	0.237
log per capita import duty	6.76	0.356
log per capita trade tax revenue	6.79	0.377

Source: Own calculations

Appendix VI: Additional tax effort indices

Table A 19: Tax effort indices for aggregate taxes

Fiscal Year	Total taxes		Direct taxes		Income taxes		Indirect taxes	
	GDP	Monetary GDP	GDP	Monetary GDP	GDP	Monetary GDP	GDP	Monetary GDP
1966/67	na	na	na	0.99	na	na	0.99	0.99
1967/68	na	na	na	0.99	na	na	1.00	1.00
1968/69	na	na	na	1.00	na	na	0.99	0.99
1969/70	na	na	na	0.99	na	na	0.99	1.00
1970/71	0.99	0.99	na	1.02	na	na	1.01	1.01
1971/72	0.99	1.00	na	1.01	0.98	1.00	1.00	1.01
1972/73	1.00	1.00	1.00	1.02	1.01	1.01	1.00	1.00
1973/74	0.99	0.99	0.99	0.99	0.99	1.00	1.00	0.98
1974/75	1.01	1.02	1.00	0.99	0.99	1.00	1.02	1.03
1975/76	1.01	1.00	1.00	1.00	1.01	0.99	1.00	1.00
1976/77	1.01	1.00	1.00	1.00	1.02	1.01	1.00	1.00
1977/78	0.99	0.99	1.00	1.00	1.00	1.00	0.99	0.99
1978/79	0.99	1.00	1.01	0.99	1.01	1.00	1.00	1.00
1979/80	1.01	1.01	1.00	1.01	1.01	1.00	1.00	1.01
1980/81	1.01	1.01	1.00	1.01	1.01	1.01	1.01	1.01
1981/82	1.00	1.00	1.01	1.00	1.00	1.00	1.00	1.01
1982/83	1.00	1.00	0.99	0.99	0.98	1.00	1.00	1.01
1983/84	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00
1984/85	1.00	1.00	1.00	1.00	1.00	0.99	1.01	1.00
1985/86	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
1986/87	1.01	1.00	1.00	1.01	1.00	1.00	1.01	1.01
1987/88	1.01	1.01	1.00	1.00	1.00	1.00	1.01	1.01
1988/89	1.01	1.00	1.01	1.01	1.00	1.00	1.00	1.00
1989/90	1.01	1.01	1.01	1.00	1.01	1.00	1.00	1.00
1990/91	0.99	0.99	0.99	0.99	0.99	1.00	1.00	0.98
1991/92	1.00	1.00	0.99	1.01	0.99	1.00	1.00	1.00
1992/93	0.99	0.99	1.00	0.99	0.99	0.99	0.99	0.99
1993/94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1994/95	1.01	1.01	1.00	1.00	1.00	1.00	1.02	1.01
1995/96	1.00	1.00	1.00	0.99	1.01	1.01	1.01	1.00
1996/97	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
1997/98	0.99	0.99	1.00	1.00	1.01	1.00	0.99	0.99
1998/99	1.01	1.01	1.00	1.01	1.00	1.00	1.00	1.00
1999/00	1.01	1.01	1.00	1.00	1.01	1.00	1.00	1.00
2000/01	0.99	0.99	0.99	1.00	1.00	1.00	0.99	0.99
2001/02	1.01	1.01	1.00	1.00	1.01	1.00	1.00	1.00
2002/03	1.01	1.01	1.00	1.01	1.00	1.00	1.00	1.00

na - means that tax effort indices could not be calculated due to missing statistics

Source: Own calculations

Table A 20: Tax effort indices for individual taxes

Fiscal year	Sale taxes/VAT				Excise taxes			Import duty	Trade taxes
	Total GDP	Monetary GDP	Imports	Trade	Total GDP	Imports	Trade		
1965/66	na	na	na	na	na	na	na	0.99	1.00
1966/67	na	na	na	na	na	na	na	0.99	0.99
1967/68	na	na	na	na	na	na	0.99	1.00	1.00
1968/69	na	na	na	na	na	na	0.99	0.99	0.99
1969/70	na	na	na	na	na	0.99	0.98	1.00	1.00
1970/71	na	na	na	na	na	1.00	1.01	1.02	1.02
1971/72	na	na	na	na	0.99	0.98	1.00	1.00	1.01
1972/73	na	na	na	na	1.02	1.03	1.04	1.04	1.04
1973/74	1.00	1.00	na	0.97	0.99	0.99	0.99	0.98	0.98
1974/75	0.98	1.00	na	1.01	1.01	1.00	1.00	1.00	1.01
1975/76	0.98	0.99	na	1.00	0.99	1.00	0.99	0.98	0.98
1976/77	0.99	0.99	na	1.03	1.00	0.99	0.99	0.99	0.99
1977/78	1.00	1.00	na	0.98	1.01	1.01	1.00	0.97	0.97
1978/79	1.02	1.00	na	0.98	1.00	1.00	1.02	1.03	1.04
1979/80	1.00	1.00	1.00	1.00	1.00	1.01	1.02	1.00	0.99
1980/81	0.99	1.00	1.00	0.98	1.01	1.00	1.00	0.99	0.99
1981/82	1.02	0.99	1.00	0.98	0.98	0.98	0.99	1.01	1.01
1982/83	1.01	1.01	0.99	0.97	1.00	0.99	0.99	1.02	1.02
1983/84	1.00	0.99	1.00	0.99	1.01	1.00	1.00	1.00	1.00
1984/85	1.02	1.01	1.00	1.03	1.01	0.98	0.99	1.00	1.00
1985/86	1.012	1.00	0.99	0.99	1.00	1.00	0.99	0.98	0.99
1986/87	1.012	1.00	1.00	0.99	0.99	0.99	1.01	1.02	1.03
1987/88	1.00	1.00	1.00	1.01	0.99	1.00	1.01	1.01	1.01
1988/89	1.01	1.00	1.01	1.01	0.99	0.99	1.01	1.01	1.00
1989/90	1.01	1.01	1.00	1.01	1.01	1.00	1.01	1.00	1.01
1990/91	1.02	1.01	0.99	0.98	0.98	0.98	0.98	0.98	0.99
1991/92	0.99	0.99	1.00	0.98	0.99	1.01	0.98	0.98	0.98
1992/93	1.01	1.01	1.00	1.02	1.01	1.03	1.00	1.00	1.00
1993/94	0.99	1.00	1.00	0.99	1.00	1.00	1.00	0.97	0.98
1994/95	1.01	1.00	1.01	1.02	0.99	1.00	1.00	1.01	1.01
1995/96	0.99	1.00	1.00	0.99	1.01	1.03	1.03	1.01	1.01
1996/97	0.98	1.00	1.00	1.01	0.99	1.00	1.00	1.00	1.00
1997/98	1.00	0.99	0.99	1.00	1.01	1.00	1.00	1.00	1.00
1998/99	0.99	1.00	1.00	0.98	1.01	1.02	1.01	1.00	1.01
1999/00	0.99	0.98	1.00	1.03	1.00	1.00	0.99	1.01	1.01
2000/01	0.99	1.00	1.01	1.01	1.00	0.99	0.99	0.99	1.00
2001/02	0.99	1.00	1.00	0.99	1.01	1.03	1.03	1.01	1.01
2002/03	0.99	1.00	1.00	0.98	1.01	1.02	1.01	1.00	1.01

na -means that tax effort indices could not be calculated due to missing statistics
Source: Own calculations

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Appendix VII: Predicted real tax revenues and GDP at constant (1995) prices (in Khs. millions) (The 2003/04 figures are in actual real values)

Table A 21: Total tax revenue and GDP predicted based on growth rate in GDP, 2003/04 - 2015/16

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	114649	115773	116907	118053	119210	120378	121558	122749	123952	125,167	126394	127,632	128883
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	114649	11,896	119188	121524	123906	126334	128810	131335	133909	136534	139210	141938	144720
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	114649	118,020	121490	125062	128738	132523	136419	140430	144559	148809	153184	157687	162323
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	114649	119144	123814	128667	133711	138953	144400	150060	155943	162055	168408	175010	181870
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	114649	120267	126160	132342	138827	145629	152765	160251	168103	176340	184981	194045	203553
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	114649	121391	128528	136086	144088	152560	161531	171029	181085	191733	203007	214944	227582
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	114649	122514	130919	139900	149497	159752	170711	182422	194936	208309	222599	237869	254187
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	114649	123,638	133331	143,784	155,057	167,213	180,323	194,460	209,706	226,147	243,877	262,997	283,615

Source: Own construction

***Table A 22: Direct tax revenue and GDP predicted based on growth in GDP, 2003/04 - 2015/16* (in Kns. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	42,295	42,726	43,162	43,602	44,047	44,496	44,950	45,409	45,872	46,340	46,812	47,290	47,772
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	42,295	43,158	44,038	44,937	45,853	46,789	47,743	48,717	49,711	50,725	51,760	52,816	53,893
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	42,295	43,589	44,923	46,298	47,714	49,174	50,679	52,230	53,828	55,475	57,173	58,922	60,725
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	42,295	44,021	45,817	47,686	49,631	51,656	53,764	55,958	58,241	60,617	63,090	65,664	68,343
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	42,295	44,452	46,719	49,102	51,606	54,238	57,004	59,911	62,967	66,178	69,553	73,100	76,828
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	42,295	44,883	47,630	50,545	53,639	56,921	60,405	64,102	68,025	72,188	76,606	81,294	86,269
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	42,295	45,315	48,550	52,017	55,731	59,710	63,973	68,541	73,435	78,678	84,296	90,314	96,763
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	42,295	45,746	49,479	53,517	57,883	62,607	67,715	73,241	79,218	85,682	92,673	100,235	108,415

Source: Own construction

Table A 23: Indirect tax revenue and GDP predicted based on growth rate in GDP, 2003/04 - 2015/16 (in Khs. millions)

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	72,354	74,163	76,017	77,918	79,866	81,862	83,909	86,007	88,157	90,361	92,620	94,935	97,309
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	72,354	75,972	79,771	83,759	87,947	92,345	96,962	101,810	106,900	112,245	117,858	123,751	129,938
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	72,354	77,781	83,615	89,886	96,627	103,874	111,665	120,040	129,042	138,721	149,125	160,309	172,332
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	72,354	79,590	87,549	96,304	105,934	116,527	128,180	140,998	155,098	170,608	187,669	206,436	227,079
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	72,354	81,399	91,574	103,020	115,898	130,385	146,683	165,018	185,646	208,852	234,958	264,328	297,369
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	72,354	83,208	95,689	110,042	126,548	145,531	167,360	192,464	221,334	254,534	292,714	336,621	387,114
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	72,354	85,016	99,894	117,376	137,917	162,052	190,411	223,733	262,886	308,891	362,947	426,463	501,094
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	72,354	86,825	104,190	125,028	150,034	180,041	216,049	259,259	311,111	373,333	447,999	537,599	645,119

Source: Own construction

Table A 24: VAT revenue and GDP predicted based on growth rate in GDP, 2003/04 - 2015/16 **(in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	34,458	35,123	35,801	36,492	37,196	37,914	38,646	39,392	40,152	40,927	41,717	42,522	43,343
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	34,458	35,788	37,170	38,604	40,094	41,642	43,250	44,919	46,653	48,454	50,324	52,266	54,284
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	34,458	36,453	38,564	40,797	43,159	45,658	48,301	51,098	54,057	57,186	60,498	64,000	67,706
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	34,458	37,118	39,984	43,071	46,396	49,977	53,836	57,992	62,469	67,291	72,486	78,082	84,110
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	34,458	37,783	41,429	45,427	49,811	54,618	59,888	65,668	72,005	78,953	86,572	94,926	104,087
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	34,458	38,448	42,901	47,869	53,412	59,597	66,498	74,199	82,791	92,378	103,075	115,011	128,330
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	34,458	39,113	44,398	50,396	57,204	64,932	73,705	83,662	94,965	107,795	122,358	138,889	157,652
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	34,458	39,778	45,920	53,010	61,195	70,644	81,551	94,142	108,678	125,458	144,829	167,190	193,004

Source: Own construction

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Table A 25: Income revenue and GDP predicted based on growth rate in GDP, 2003/04 - 2015/16 **(in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	42295	42646	43000	43357	43717	44080	44445	44814	45186	45561	45940	46321	46705
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	42295	42997	43711	44436	45174	45924	46686	47461	48249	49050	49864	50692	51534
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	42295	43348	44428	45534	46668	47830	49021	50241	51492	52774	54088	55435	56816
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	42295	43699	45150	46649	48198	49798	51451	53159	54924	56748	58632	60578	62590
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	42295	44050	45878	47782	49765	51831	53981	56222	58555	60985	63516	66152	68897
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	42295	44401	46612	48934	51371	53929	56615	59434	62394	65501	68763	72187	75782
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	42295	44752	47352	50104	53015	56095	59354	62802	66451	70312	74397	78720	83293
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	42295	45103	48098	51292	54698	58330	62203	66333	70738	75435	80443	85785	91481

Source: Own construction

***Table A 26: Excise taxes revenue and GDP predicted based on growth rate in GDP, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	GDP	482080	486901	491770	496687	501654	506671	511737	516855	522023	527244	532516	537841	543220
	Tax	23,924	23,776	23,628	23,482	23,336	23,192	23,048	22,905	22,763	22,622	22,482	22,342	22,204
2%	GDP	486853	496590	506522	516652	526985	537525	548275	559241	570426	581834	593471	605340	617447
	Tax	23,924	23,627	23,334	23,045	22,759	22,477	22,198	21,923	21,651	21,383	21,118	20,856	20,597
3%	GDP	491626	506375	521566	537213	553329	569929	587027	604638	622777	641460	660704	680525	700941
	Tax	23,924	23,479	23,042	22,614	22,193	21,780	21,375	20,978	20,588	20,205	19,829	19,460	19,098
4%	GDP	496399	516255	536905	558381	580717	603945	628103	653227	679356	706531	734792	764183	794751
	Tax	23,924	23,331	22,752	22,188	21,638	21,101	20,578	20,067	19,570	19,084	18,611	18,150	17,699
5%	GDP	501172	526231	552542	580169	609178	639637	671618	705199	740459	777482	816356	857174	900033
	Tax	23,924	23,182	22,464	21,767	21,093	20,439	19,805	19,191	18,596	18,020	17,461	16,920	16,395
6%	GDP	505945	536302	568480	602589	638744	677069	717693	760754	806400	854784	906071	960435	1018061
	Tax	23,924	23,034	22,177	21,352	20,558	19,793	19,057	18,348	17,665	17,008	16,376	15,766	15,180
7%	GDP	510718	546468	584721	625652	669447	716309	766450	820102	877509	938935	1004660	1074986	1150235
	Tax	23,924	22,886	21,893	20,942	20,034	19,164	18,332	17,537	16,776	16,048	15,351	14,685	14,048
8%	GDP	515491	556731	601269	649371	701320	757426	818020	883461	954138	1030469	1112907	1201940	1298095
	Tax	23,924	22,737	21,610	20,538	19,519	18,551	17,631	16,756	15,925	15,135	14,385	13,671	12,993

Source: Own construction

***Table A 27: Import duty and volume of imports predicted based on growth rate in volume of imports, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	Imports	160473	162078	163698	165335	166989	168659	170345	172049	173769	175507	177262	179035	180825
	Duties	12,370	12,453	12,536	12,620	12,705	12,790	12,875	12,962	13,048	13,136	13,224	13,313	13,402
2%	Imports	162062	165303	168609	171981	175421	178929	182508	186158	189881	193679	197552	201503	205534
	Duties	12,370	12,535	12,703	12,874	13,046	13,221	13,398	13,578	13,760	13,944	14,131	14,320	14,512
3%	Imports	163651	168560	173617	178825	184190	189716	195407	201270	207308	213527	219933	226531	233327
	Duties	12,370	12,618	12,872	13,131	13,395	13,664	13,938	14,219	14,504	14,796	15,093	15,397	15,706
4%	Imports	165239	171849	178723	185872	193307	201039	209081	217444	226142	235187	244595	254379	264554
	Duties	12,370	12,701	13,042	13,391	13,750	14,118	14,497	14,885	15,284	15,694	16,115	16,546	16,990
5%	Imports	166828	175170	183928	193125	202781	212920	223566	234744	246481	258805	271746	285333	299600
	Duties	12,370	12,784	13,212	13,655	14,112	14,585	15,074	15,579	16,101	16,640	17,197	17,774	18,369
6%	Imports	168417	178522	189234	200588	212623	225380	238903	253237	268431	284537	301609	319706	338888
	Duties	12,370	12,867	13,384	13,922	14,482	15,064	15,670	16,300	16,955	17,636	18,345	19,083	19,850
7%	Imports	170006	181906	194640	208265	222843	238442	255133	272992	292102	312549	334428	357837	382886
	Duties	12,370	12,950	13,557	14,193	14,859	15,556	16,285	17,049	17,848	18,686	19,562	20,479	21,440
8%	Imports	171595	185322	200148	216160	233453	252129	272299	294083	317610	343019	370460	400097	432105
	Duties	12,370	13,033	13,731	14,467	15,243	16,060	16,921	17,827	18,783	19,790	20,851	21,968	23,146

Source: Own construction

***Table A 28: VAT revenue and volume of imports predicted based on the growth rate in volume of imports, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
	Imports	160473	162078	163698	165335	166989	168659	170345	172049	173769	175507	177262	179035	180825
1%	Duties	34,458	36,033	37,680	39,401	41,202	43,085	45,054	47,113	49,266	51,518	53,872	56,334	58,908
	Imports	162062	165303	168609	171981	175421	178929	182508	186158	189881	193679	197552	201503	205534
2%	Duties	34,458	37,608	41,045	44,796	48,891	53,359	58,236	63,559	69,369	75,709	82,629	90,181	98,423
	Imports	163651	168560	173617	178825	184190	189716	195407	201270	207308	213527	219933	226531	233327
3%	Duties	34,458	39,182	44,554	50,663	57,608	65,507	74,487	84,700	96,312	109,516	124,531	141,604	161,018
	Imports	165239	171849	178723	185872	193307	201039	209081	217444	226142	235187	244595	254379	264554
4%	Duties	34,458	40,757	48,207	57,020	67,443	79,772	94,354	111,602	132,002	156,132	184,673	218,432	258,361
	Imports	166828	175170	183928	193125	202781	212920	223566	234744	246481	258805	271746	285333	299600
5%	Duties	34,458	42,332	52,005	63,888	78,486	96,420	118,452	145,518	178,769	219,618	269,801	331,450	407,186
	Imports	168417	178522	189234	200588	212623	225380	238903	253237	268431	284537	301609	319706	338888
6%	Duties	34,458	43,907	55,946	71,286	90,833	115,739	147,474	187,912	239,437	305,091	388,747	495,342	631,164
	Imports	170006	181906	194640	208265	222843	238442	255133	272992	292102	312549	334428	357837	382886
7%	Duties	34,458	45,481	60,031	79,235	104,582	138,037	182,195	240,480	317,409	418,948	552,970	729,865	963,349
	Imports	171595	185322	200148	216160	233453	252129	272299	294083	317610	343019	370460	400097	432105
8%	Duties	34,458	47,056	64,260	87,753	119,835	163,647	223,477	305,180	416,754	569,119	777,189	1,061,329	1,449,350

Source: Own construction

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***Table A 29: Excise duties revenue and volume of imports predicted based on growth rate in volume of imports, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	Imports	160473	162078	163698	165335	166989	168659	170345	172049	173769	175507	177262	179035	180825
	Duties	23,924	23,888	23,852	23,817	23,781	23,745	23,710	23,674	23,639	23,603	23,568	23,532	23,497
2%	Imports	162062	165303	168609	171981	175421	178929	182508	186158	189881	193679	197552	201503	205534
	Duties	23,924	23,852	23,781	23,709	23,638	23,567	23,497	23,426	23,356	23,286	23,216	23,146	23,077
3%	Imports	163651	168560	173617	178825	184190	189716	195407	201270	207308	213527	219933	226531	233327
	Duties	23,924	23,816	23,709	23,603	23,496	23,391	23,285	23,181	23,076	22,972	22,869	22,766	22,664
4%	Imports	165239	171849	178723	185872	193307	201039	209081	217444	226142	235187	244595	254379	264554
	Duties	23,924	23,781	23,638	23,496	23,355	23,215	23,076	22,937	22,800	22,663	22,527	22,392	22,257
5%	Imports	166828	175170	183928	193125	202781	212920	223566	234744	246481	258805	271746	285333	299600
	Duties	23,924	23,745	23,567	23,390	23,214	23,040	22,868	22,696	22,526	22,357	22,189	22,023	21,858
6%	Imports	168417	178522	189234	200588	212623	225380	238903	253237	268431	284537	301609	319706	338888
	Duties	23,924	23,709	23,495	23,284	23,074	22,867	22,661	22,457	22,255	22,055	21,856	21,659	21,464
7%	Imports	170006	181906	194640	208265	222843	238442	255133	272992	292102	312549	334428	357837	382886
	Duties	23,924	23,673	23,424	23,178	22,935	22,694	22,456	22,220	21,987	21,756	21,527	21,301	21,078
8%	Imports	171595	185322	200148	216160	233453	252129	272299	294083	317610	343019	370460	400097	432105
	Duties	23,924	23,637	23,353	23,073	22,796	22,523	22,252	21,985	21,722	21,461	21,203	20,949	20,698

Source: Own construction

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***Table A 30: Trade tax revenue and volume of trade predicted based on the growth rate in volume of trade, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	Trade	265883	268542	271228	273940	276679	279446	282241	285063	287914	290793	293701	296638	299604
	Tax	12,370	12,436	12,504	12,571	12,639	12,707	12,776	12,845	12,914	12,984	13,054	13,125	13,195
2%	Trade	268516	273886	279364	284951	290650	296463	302393	308440	314609	320901	327319	333866	340543
	Tax	12,370	12,503	12,638	12,775	12,913	13,052	13,193	13,336	13,480	13,625	13,772	13,921	14,072
3%	Trade	271148	279283	287661	296291	305180	314335	323765	333478	343483	353787	364401	375333	386593
	Tax	12,370	12,570	12,774	12,981	13,191	13,405	13,622	13,842	14,067	14,295	14,526	14,761	15,001
4%	Trade	273781	284732	296121	307966	320285	333096	346420	360277	374688	389676	405263	421473	438332
	Tax	12,370	12,637	12,910	13,189	13,474	13,765	14,062	14,366	14,676	14,993	15,317	15,648	15,986
5%	Trade	276413	290234	304746	319983	335982	352781	370420	388941	408389	428808	450248	472761	496399
	Tax	12,370	12,704	13,047	13,399	13,761	14,132	14,514	14,906	15,308	15,721	16,146	16,582	17,030
6%	Trade	279046	295789	313536	332348	352289	373426	395832	419582	444757	471442	499729	529713	561495
	Tax	12,370	12,770	13,184	13,611	14,052	14,508	14,978	15,463	15,964	16,481	17,015	17,567	18,136
7%	Trade	281678	301396	322494	345068	369223	395069	422723	452314	483976	517854	554104	592891	634394
	Tax	12,370	12,837	13,323	13,826	14,349	14,891	15,454	16,038	16,644	17,274	17,927	18,604	19,307
8%	Trade	284311	307056	331620	358150	386802	417746	451166	487259	526240	568339	613806	662911	715943
	Tax	12,370	12,904	13,462	14,043	14,650	15,283	15,943	16,632	17,350	18,100	18,881	19,697	20,548

Source: Own construction

***Table A 31: Excise duties revenue and volume of trade predicted based of the growth rate in volume of trade, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	Trade	265883	268542	271228	273940	276679	279446	282241	285063	287914	290793	293701	296638	299604
	Tax	23,924	24,034	24,145	24,256	24,367	24,479	24,592	24,705	24,819	24,933	25,048	25,163	25,279
2%	Trade	268516	273886	279364	284951	290650	296463	302393	308440	314609	320901	327319	333866	340543
	Tax	23,924	24,144	24,366	24,590	24,817	25,045	25,275	25,508	25,743	25,979	26,219	26,460	26,703
3%	Trade	271148	279283	287661	296291	305180	314335	323765	333478	343483	353787	364401	375333	386593
	Tax	23,924	24,254	24,589	24,928	25,272	25,621	25,975	26,333	26,696	27,065	27,438	27,817	28,201
4%	Trade	273781	284732	296121	307966	320285	333096	346420	360277	374688	389676	405263	421473	438332
	Tax	23,924	24,364	24,813	25,269	25,734	26,208	26,690	27,181	27,681	28,190	28,709	29,237	29,775
5%	Trade	276413	290234	304746	319983	335982	352781	370420	388941	408389	428808	450248	472761	496399
	Tax	23,924	24,474	25,037	25,613	26,202	26,805	27,421	28,052	28,697	29,357	30,033	30,723	31,430
6%	Trade	279046	295789	313536	332348	352289	373426	395832	419582	444757	471442	499729	529713	561495
	Tax	23,924	24,584	25,263	25,960	26,677	27,413	28,170	28,947	29,746	30,567	31,411	32,278	33,168
7%	Trade	281678	301396	322494	345068	369223	395069	422723	452314	483976	517854	554104	592891	634394
	Tax	23,924	24,694	25,490	26,310	27,158	28,032	28,935	29,866	30,828	31,821	32,845	33,903	34,995
8%	Trade	284311	307056	331620	358150	386802	417746	451166	487259	526240	568339	613806	662911	715943
	Tax	23,924	24,805	25,717	26,664	27,645	28,662	29,717	30,811	31,944	33,120	34,339	35,602	36,913

Source: Own construction

***Table A 32: VAT revenue and volume of trade predicted based on growth rate in volume of trade, 2003/04 - 2015/16* (in Khs. millions)**

Growth rate		2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
1%	Trade	265883	268542	271228	273940	276679	279446	282241	285063	287914	290793	293701	296638	299604
	Tax	34,458	35,423	36,415	37,434	38,483	39,560	40,668	41,806	42,977	44,180	45,417	46,689	47,996
2%	Trade	268516	273886	279364	284951	290650	296463	302393	308440	314609	320901	327319	333866	340543
	Tax	34,458	36,388	38,425	40,577	42,850	45,249	47,783	50,459	53,285	56,269	59,420	62,747	66,261
3%	Trade	271148	279283	287661	296291	305180	314335	323765	333478	343483	353787	364401	375333	386593
	Tax	34,458	37,353	40,490	43,891	47,578	51,575	55,907	60,603	65,694	71,212	77,194	83,678	90,707
4%	Trade	273781	284732	296121	307966	320285	333096	346420	360277	374688	389676	405263	421473	438332
	Tax	34,458	38,317	42,609	47,381	52,688	58,589	65,151	72,448	80,562	89,585	99,618	110,776	123,182
5%	Trade	276413	290234	304746	319983	335982	352781	370420	388941	408389	428808	450248	472761	496399
	Tax	34,458	39,282	44,782	51,051	58,198	66,346	75,635	86,223	98,295	112,056	127,744	145,628	166,016
6%	Trade	279046	295789	313536	332348	352289	373426	395832	419582	444757	471442	499729	529713	561495
	Tax	34,458	40,247	47,009	54,906	64,130	74,904	87,488	102,186	119,353	139,405	162,825	190,179	222,129
7%	Trade	281678	301396	322494	345068	369223	395069	422723	452314	483976	517854	554104	592891	634394
	Tax	34,458	41,212	49,289	58,950	70,504	84,323	100,851	120,617	144,258	172,533	206,349	246,794	295,165
8%	Trade	284311	307056	331620	358150	386802	417746	451166	487259	526240	568339	613806	662911	715943
	Tax	34,458	42,177	51,624	63,188	77,342	94,667	115,872	141,828	173,597	212,483	260,079	318,337	389,644

Source: Own construction

Appendix VIII: Guidelines used for collecting data

Table A 33: Guidelines used for collecting time series data

Fiscal year	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5
1963/64					
1964/65					
1965/66					
1966/67					
1967/68					
1968/69					
1969/70					
1970/71					
1971/72					
1972/73					
1973/74					
1974/75					
1975/76					
1976/77					
1977/78					
1978/79					
1979/80					
1980/81					
1981/82					
1982/83					
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89					
1989/90					
1990/91					
1991/92					
1992/93					
1993/94					
1994/95					
1995/96					
1996/97					
1997/98					
1998/99					
1999/00					
2000/01					
2001/02					
2002/03					
2003/04					

Table A 34: Guidelines used for collecting data on discretionary changes and unusual circumstances

Fiscal year	Discretionary changes and unusual circumstances				
1964/65					
1965/66					
1966/67					
1967/68					
1968/69					
1969/70					
1970/71					
1971/72					
1972/73					
1973/74					
1974/75					
1975/76					
1976/77					
1977/78					
1978/79					
1979/80					
1980/81					
1981/82					
1982/83					
1983/84					
1984/85					
1985/86					
1986/87					
1987/88					
1988/89					
1989/90					
1990/91					
1991/92					
1992/93					
1993/94					
1994/95					
1995/96					
1996/97					
1997/98					
1998/99					
1999/00					
2000/01					
2001/02					
2002/03					
2003/04					

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