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An empirical investigation of tax buoyancy in Kenya

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Revenue mobilization is an important goal of tax reform. Thus, tax buoyancy constitutes an essential ingredient for tax policy formulation. This paper utilized a time series approach to estimate tax buoyancy for Kenya for the period 1999/2000 to 2010/2011. Tax buoyancies were computed for income, import, excise, Value Added Tax (VAT) and total taxes. Specifically, the paper examined the buoyancies of tax revenues to changes in economic growth (GDP) and proxy bases using quarterly data instead of annual data of GDP and tax revenues and their bases. This was because 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 year. We also analyzed the tax buoyancy of Pay as You Earn (PAYE), other income tax, as components of income tax and local and import VAT as components of total VAT. This was done to ascertain the response of these specific taxes to their bases. Empirical evidence showed that the total tax was buoyant with a buoyancy value of 2.58 while the individual taxes were not buoyant except the excise duty which was buoyant with respect to the base. Tax bases were found to respond well to economic changes with buoyancy values greater than unity, with an exception of excise duty base to income buoyancy coefficient being less than unity. Based on these findings, we recommend constant review of the tax system as the economic structure changes. Reasons for tax evasion should also be analyzed to help minimize noncompliance.

Key words: Value added tax, excise tax, tax revenue, buoyancy.

INTRODUCTION

Background information and the overarching issues

A primary motivation for tax reforms in developing countries has been the need for increased revenues. The need to raise more revenue against the backdrop of high expenditure has taken added importance when compared to other sources of resource mobilization such as deficit financing and money creation. Tax systems have been revamped and restructured with the objective of maximizing tax revenues from the reform process. In this regard, tax buoyancy constitutes an important ingredient of a tax system. A buoyant tax system is one in which tax revenues rise proportionately faster than income as income increases. Such a tax system becomes desirable for developing countries in order to provide resources for government expenditure, both for consumption purposes and for financing development expenditure. Apart from the need to mobilize resources for revenue purposes, a study of tax buoyancy is also important for revenue forecasting purposes, analyzing the stabilizing properties of a tax system and for examining the progressivity of a tax system. Therefore, an examination of tax buoyancy is crucial for tax policy formulation.

Tax revenues are an important variable for any economy as they have implications for budget deficit depending on how they relate to government expenditure. In many instances, expenditure generally exceeds revenue leading to budget deficits. The budget deficits in turn have macroeconomic implications (depending on how the deficit is financed) as they may have a bearing on inflation, exchange rates, government debt, interest rates, and balance of payments, among other key macroeconomic variables. In view of this, it is important to focus attention on revenues since it is the inadequacy of revenues relative to expenditure which leads to fiscal deficit, other factors held constant. One of the issues of interest is

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therefore how tax revenues respond to changes in economic activity (GDP). This is important because it helps in designing tax policy. Buoyancy and elasticity both measure responsiveness of revenue to changes in income but there is a crucial difference as in the measure of elasticity it is assumed that tax system remains unaltered - no change in the tax laws, including the tax rates or bases. Thus, tax elasticity is a hypothetical construct and measures what tax revenue would have been if last year's laws continued to apply this year. This paper focuses on buoyancy rather than the elasticity of a tax as a dependent variable.

Economic growth increases the taxable capacity of a country and enables a larger share of the private sector's resources to be ceded to the government as taxes to provide public goods and services. Many countries, therefore, depend mainly on taxation as a means of generating the required resources to meet their expenditure requirements. These countries often find themselves in growing fiscal imbalance whenever their revenue productivity falls below their expenditures. The need for fiscal adjustment then becomes particularly necessary to restore balance in the government budget (Newman, 1998).

The magnitude of government budget surplus/deficit has continued to be the key statistic measuring the impact of government fiscal policy in an economy. Fiscal deficit has become a recurring feature of public sector financing worldwide, where government expenditure exceeds revenue (Ariyo, 1997). This has been partly attributed to the desire of various governments to respond positively to the ever-increasing demands of the populace while at the same time enhance accelerated economic growth and development. According to Chipeta (1998), in many instances, tax as a source of revenue for the government has failed to generate adequate revenue to finance the expenditures thereby continuously contributing to budget deficits. As a result, many countries have resorted to internal and external borrowing as alternative sources of revenue especially in the short run to finance the deficit. This tendency toward deficit financing is more pronounced in developing countries where majority of the population are poor and look upon the government for the provision of the necessary public goods. These sources of finance are however, not sustainable in the medium and long terms and have partly contributed towards inflationary conditions.

A buoyancy greater than unity is a desirable feature of a tax system if there is increasing demand for public services and if a country would like to pursue relative financial stability. If buoyancy is low, discretionary changes may make up for it and may be correspondingly high. But, unlike high elasticity, high buoyancy does not necessarily imply that buoyancy will continue to be high in future, since rates may have been pushed up to their limit so that they cannot be raised any further.

The Kenyan scenario

Kenya's tax system has undergone more or less continual reform over the last twenty years. On the policy side, rate schedules have been rationalized and simplified, a new value-added tax introduced, and external tariffs brought in line with those of neighboring countries in East Africa. At the same time, administrative and institutional reforms have taken place. Most notable among these was the creation of the semi-autonomous Kenya Revenue Authority (KRA) in 1995, which centralized the administration of tax collection. Kenya has the trappings of a modern tax system, including, for example, a credit-invoice VAT, a PAYE individual income tax with graduated but arguably moderate rates, and a set of excise taxes focused on the usual suspects (alcohol, cigarettes, gasoline, etc.), Nada and William (2009).

Tax revenues grew as a proportion of GDP from around 10 percent in the 1960s to about 20 percent by the early 1980s (Karingi et al., 2004). In the years immediately following the introduction of the Tax Modernization Programme (TMP) revenues gradually increased, reaching 24.6 percent of GDP 1995-96, after which they stabilized at around 23 percent until the end of the decade. In 1999-2000 revenues fell below 20 percent of GDP, and this decline continued until they reached a low of 17.8 percent of GDP in 2001-02.Since then there has been a slow increase to 20 percent of GDP in 2004-05.

Currently, tax revenues play a vital role in Kenya's economic development. This is evidenced by the serious attention that taxation issues have received over the years (Republic of Kenya, 1994, 2000). The Tax Management Administration Guidelines and the Kenya Vision 2030 documents 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 these documents consist of broadening the tax base to include additional sector activities and strengthen tax administration.

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/VAT and income tax. The trade taxes, sales tax/VAT on various imported products are vulnerable to external shocks 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, lack of fiscal discipline, reluctance of the government to control its expenditure, and lack of information about the behavior of Kenya's tax revenue functions, among others. The latter formed the thrust of this study in which we focus on the behavior of Kenya's tax revenue functions.

Over time, Kenya has moved from being a low tax burden country to a high tax burden country yet the country faces the obvious need for more tax revenues to maintain public services. Kenyans are yet to accept a tax paying "culture". On one hand, those with political power and economic ability are few and do not want to pay tax. On the other hand, those without political power are many, have almost nothing to tax, and do also resist paying taxes. Since no one enjoys paying taxes, there is mistrust between those collecting taxes and taxpayers. This mistrust generates a game theoretic coexistence between tax agents and tax payers, with agents perceiving taxpayers as criminals unwilling to pay their taxes, and tax payers wary of government agencies' high-handedness in collection of taxes (KRA, 2004).

With some Kenyan firms reporting that about 68.2% of profit is taken away in taxes, tax competitiveness is low and the country remains among the most tax unfriendly countries globally. Not surprisingly, tax evasion remains high, with a tax gap of about 35% and 33.1% in 2000/1 and 2001/2 respectively (KIPPRA, 2004a). The tax code is still complex and cumbersome, characterized by uneven and unfair taxes, a narrow tax base with very high tax rates and rates dispersions with respect to trade, and low compliance (KIPPRA, 2004b).

This paper measures the buoyancy of Kenya's tax system for the period 1999/2000 - 2010/2011 in an attempt to provide some insights regarding revenue responsiveness of Kenya's tax structure. The objective of the paper is to analyze the responsiveness of tax revenue to changes in national income and proxy tax bases in Kenya. This is achieved through assessing the response of tax revenue to changes in the tax bases. The innovation made in this paper is the use of quarterly data as opposed to annual data used by most previous studies. The study also decomposes major tax components of income tax and VAT into their constituency tax components in a bid to unravel how each specific tax contributes to the general economy.

LITERATURE REVIEW

Overview

Previous studies have measured the impact of GDP on tax revenues. For instance 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 and tax revenue elasticity using the proportional adjustment method. 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.

Ariyo (1997) evaluated the productivity of the Nigerian tax system for the period 1970 - 1990. The aim was to devise a reasonable estimation of Nigeria's sustainable revenue profile. In the study, tax buoyancy and tax revenue elasticity were estimated. The slope dummy equations were used for the oil boom and Structural Adjustment Programmes (SAPs). It was found that on the overall, productivity level was satisfactory. Results indicated wide variations in the level of tax revenue by tax source. Chipeta (1998) evaluated effects of tax reforms on tax yields in Malawi for the period 1970 to 1994. 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.

Twerefou et al. (2010) used the Dummy Variable Technique to control for the effects of the Discretionary Tax Measures on the time series data 1970 – 2007 to estimate the elasticity of the Ghanaian tax system. They found that the overall tax system in Ghana was buoyant and elastic in the long run, with overall tax elasticity estimated to be 1.03

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 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 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 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, according to Wawire (2011) the results could not be relied upon because the study never took into account time series properties of the data.

Adari's (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. 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. 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

Table 1. Proxy tax bases.

Tax revenue	Proxy base
Income tax	GDP at factor cost current prices
VAT	Private consumption
Excise Tax	Private consumption
Import Duties	Imports of goods and services
Total Taxes	GDP at current market prices

individual taxes responsive to changes in national 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.

THEORETICAL FRAMEWORK AND MODEL SPECIFICATION

The analysis in this paper closely follows GDP-based tax forecasting models that follow the static approach as described by Glenn et al. (2000). First, the model requires the construction of data series for tax revenues. Second, we then collect information on the tax bases from which these taxes were collected. In exploring the tax buoyancy for Kenya, we regress the variable of tax buoyancy on other variables that serve as proxies for a country's tax handles. Several studies (Wawire, 2000) have used the Gross Domestic Product (GDP) as a determinant of tax revenue in which a model is formulated showing the tax revenue as being a function of the gross domestic product of the country.

MATERIALS AND METHODS

Relationship between tax revenue and tax base

The next step for setting up the GDP-based forecasting model is to establish an exact relationship between the tax data and the economic variables (proxy base). In order to do this, it is necessary to determine the correct base for each tax using the national accounts. The task is then to find out which component of the national account corresponds most closely to the base for a particular tax. Even though items in national accounts may look quite similar to specific tax bases, there may not be a corresponding match. One should be careful in building up ad-hoc national accounts that closely mirror particular tax bases.

As legal bases were not available for all tax categories, proxy bases were used for estimating tax revenue buoyancies. The proxy bases used for the empirical estimation constituted variables from the national accounts and the balance of payments. The tax categories chosen for the estimation can be associated with bases that cover large parts of economic activity in the country (Table 1).

All these tax bases are assumed to be predetermined and are obtained from macroeconomic variables derived from national accounts and balance of payments aggregates.

GDP at factor cost constituted the proxy base for income taxes as the growth of personal and corporate income is reflected in the Gross Domestic Product. Private consumption expenditure is used as a proxy base for VAT taxes as consumption expenditure reflects such taxes which are borne by consumers. Private consumption is also used for the estimation of excise tax elasticities as excise elasticities are estimated on a proxy base consisting of imports of goods and services in value terms as import duties are levied on this tax base. Gross Domestic Product at current market prices constitutes the proxy base for total tax revenue.

The historical data series of tax revenues have embedded in them the effects of increases in national income or expenditures, as well as discretionary changes made in the tax system over time.

The Empirical Model

Estimating Buoyancy of tax revenue

Buoyancy of taxes with respect to their bases is derived from logarithmic regression of unadjusted revenue data for discretionary changes on these bases. The study estimates buoyancies of tax-to-base and base-to-income, for each tax and for total tax revenue. The decomposition of tax buoyancies is helpful in identifying the dynamic and the lagging components of the tax system. Furthermore, it is instructive that government can influence the tax to base component to improve the buoyancy of a particular tax.

The multiplicative functional form of tax revenue model is specified as:

$$\mathbf{T = e^{\alpha} Y^{\beta} e^{\epsilon}} \quad (1)$$

Where:
T= tax revenue
β= estimated parameter
Y= income (GDP)
α= constant term
e = natural number
ε = error term

As noted in the literature review, this specification follows the standard practice in this area (Osoro, 1993; Ariyo, 1997; Wawire, 2000; Muriithi and Moyi, 2003). To estimate the parameters using OLS method, the multiplicative equation is linearized by taking the logarithms of the variables in the model and introducing an error term є and the subscript *i*, for a particular source of tax revenue. Therefore, the general estimating equation is specified as follows:

$$LnT_i = \alpha_i + \beta_i \ln Y + \epsilon_i \quad (2)$$

Where,
T_i = revenue from the i^{th} source
α_i= constant term
β_i = buoyancy coefficient
Y = Tax base
ε= error term

RESULTS AND DISCUSSION

Buoyancy Estimates

We used the Augmented Dickey Fuller (ADF) tests to conduct unit root tests. The variables were stationary either at level or after the first difference as shown in Table 3 in the appendix. Co-integration analysis was done through estimation of Engel-Granger co-integrating relationships. The ADF unit root tests were performed on the regression residuals for this purpose as presented in Table 4 in the appendix. After performing unit root and co-integration tests, the estimation of buoyancy rates were performed by using equation 2 above.

The t-statistic was used to test the hypothesis that a coefficient was equal to zero. The method used was to observe its estimated value. If the computed t-statistic for a coefficient was greater than 1.96 or smaller than -1.96, taxation constitutes a consumption based tax. Import duty

Table 2. Buoyancy of tax revenues.

	Tax to base			Base to income		
Tax revenue	**Buoyancy estimates**	**t- statistic**	**Adjusted R^2**	**Buoyancy estimates**	**t- statistic**	**Adjusted R^2**
Import duty	-0.097779	-1.708959	0.038472	3.430157	13.84625	0.798927
Excise duty	2.363776	7.156800	0.511300	0.196342	11.32959	0.753553
Income tax	0.541832	12.36439	0.762779	2.418718	7.100985	0.507308
PAYE	0.287352	5.672747	0.575033	3.546356	3.303639	0.292328
Other income tax	0.411080	2.750512	0.311674			
VAT	0.329368	8.942698	0.626901	2.500906	10.299003	0.686418
Local VAT	0.212884	1.371516	0.035411			
Import VAT	0.217341	2.568278	0.166650	2.833139	3.597008	0.332192
Total tax revenue	2.584848	13.85148	0.799048			

the null hypothesis was rejected. If, on the other hand, the computed t-statistic was smaller than 1.96 or greater than -1.96 the null hypothesis was accepted (Koutsoyiannis, 1988).

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, 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.

The results presented in Table 2 indicate that the buoyancy for Kenya's overall tax system is 2.58. On this basis, it can be argued that a 1 percentage point growth in real GDP spurred a more than 1 proportionate total increase in tax revenue. Thus, an increasing proportion of incremental income was transferred to the government in the form of tax revenues, meaning that the tax structure in Kenya was buoyant. Buoyancy for import duties is exceptionally low at negative 0.098 which shows loss of revenue. This adversely affected the overall buoyancy of the total tax where base to GDP buoyancy is extremely high and GDP being a very important determinant of imports as the coefficient is statistically significant. The low tax to base buoyancy is an indication of loopholes in the efforts to improve the tax imposition and implementation. For excise duty, the tax to base buoyancy is significantly higher than the base to income buoyancy. Thus, there is high revenue collection. Both coefficients are statistically significant. PAYE and other income tax buoyancy coefficients are statistically significant but very low, contributing to low buoyancy for the total income tax. Base to income buoyancy coefficients are significantly high and statistically significant. Both local and import VAT have very low buoyancy rate and hence correspondingly low buoyancy for total VAT, but statistically significant. With reference to GDP base, the broad VAT base can be attributed to extension of VAT to electricity and petroleum products. These items constitute the basic input to all production and distribution network in the economy.

The low tax to base buoyancy is an indication of inefficiency in tax administration, low tax compliance and tax evasion. Generally, individual tax bases responded favorably to changes in income. Unfortunately, the growth in tax revenue lagged behind the growth in individual bases. This further dampens the responsiveness of tax revenue to changes in Kenya's GDP.

The overall tax buoyancy for the Kenyan economy is a great improvement from the conclusion reached by Ole in 1975 that the tax structure was not buoyant and that the country badly needed foreign assistance. Thus, the conclusions of buoyancy from this current study could be attributed to the many reforms that have been carried out by the Kenyan authorities, over time. Further, this is supported by the fact that over the last few years, Kenya's budget is 95% funded from internal resources, with a mere 5% external support.

CONCLUSION AND POLICY IMPLICATIONS

The study found overall tax buoyancy of 2.58. Tax to base buoyancy of imports was lowest with negative 0.098 and excise duty showing the highest buoyancy. Base to income buoyancy for all the tax revenues was greater than unity, except the base to income buoyancy for excise duty which had relatively low buoyancy. This shows that all tax bases have grown more than the GDP. For the tax system to mitigate the dangers of perpetual fiscal imbalances, it is expected that the structure would ensure tax revenue grew faster than national income as required by the growth in expenditure. Tax policy is expected to ensure that every individual tax is designed to respond to national income changes, and that predominant taxes in the revenue are those with high buoyancy with respect to national income or proxy bases.

The study established the existence of a buoyant overall tax structure, as estimated buoyancy is greater than unity, meaning the government receives an increasing share of the rising GDP as tax revenue. The tax to base buoyancy estimate for excise duty was greater than unity suggesting that excise duty was responding positively to changes in private consumption. However, the base to income buoyancy was very low. It is possible that excise duties were affected negatively by other government policies that influence private consumption such as trade taxes and exchange rates, among others.

Tax to base buoyancy estimates of all other taxes were less than unity, implying that they grew less than their respective bases. Import duty had the lowest and negative buoyancy, an indication for loss of revenue from this source. The base to income buoyancy estimates for other taxes were greater than unity showing that the bases respondent well to changes in GDP. The low tax to base buoyancies can suggest laxity and deficiencies in tax administration, especially in import duty and VAT parts of the tax structure. As the economy changes, there should be constant review of the tax structure to improve on shortcomings in the administration of tax system. We recommend that tax evasion magnitude, composition, growth and determinants be estimated and handled to help minimize noncompliance as this effectively defrauds the government of legally due tax revenues, thereby reducing the government's ability to provide public services, while increasing the nation's debt burden.

Although the overall tax seemed to respond well to changes in national income, individual taxes were not responding positively to changes in their respective bases. Kenya Revenue Authority should work on enhancing tax collection strategies by improving public confidence and trust. Tax authorities should improve tax information system to enhance the evaluation of its performance and facilitate adequate macroeconomic planning and implementation.

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APPENDIX 1. Unit root tests and co-integration analysis

Table 3. Unit root test- Augmented Dickey Fuller test (ADF).

Tax revenue	ADF Test	Ho	Stationary at
Import Duty	-9.724955	Reject	First difference
Imports	-8.295856	Reject	First difference
Excise Duty	-3.527023	Reject	Level
Private Consumption (excise duty portion)	4.931622	Reject	Level
Total income tax	-19.14849	Reject	First difference
Domestic factor income	3.070533	Reject	Level
Total VAT	-5.762412	Reject	First difference
Private consumption(VAT portion)	-4.075412	Reject	First difference
PAYE	-6.973843	Reject	First difference
Other income tax	-3.735979	Reject	Level
Local VAT	-7.091522	Reject	First difference
Import VAT	-5.689110	Reject	First difference
Total tax revenue	-5.898071	Reject	First difference
GDP	-10.19597	Reject	First difference

Table 4. Co-integration test: (All the data is in natural log form).

PAIR	Likelihood value	Ho	Co-integrating
Import duty/Imports	19.05448	Rejected	Yes
Excise duty/Private consumption (excise proportion)	29.10362	Rejected	Yes
Income tax/Domestic factor income	30.41487	Rejected	Yes
PAYE/Domestic factor income	28.19205	Rejected	Yes
Other income tax/Domestic factor income	21.73468	Rejected	Yes
TOTALVAT/Private consumption(VAT proportion)	25.98721	Rejected	Yes
Local VAT/Private consumption(VAT Proportion)	20.91929	Rejected	Yes
Import VAT/Private consumption(VAT proportion)	20.49714	Rejected	Yes
TOTAL TAX REVENUL/GDP	61.68437	Rejected	Yes

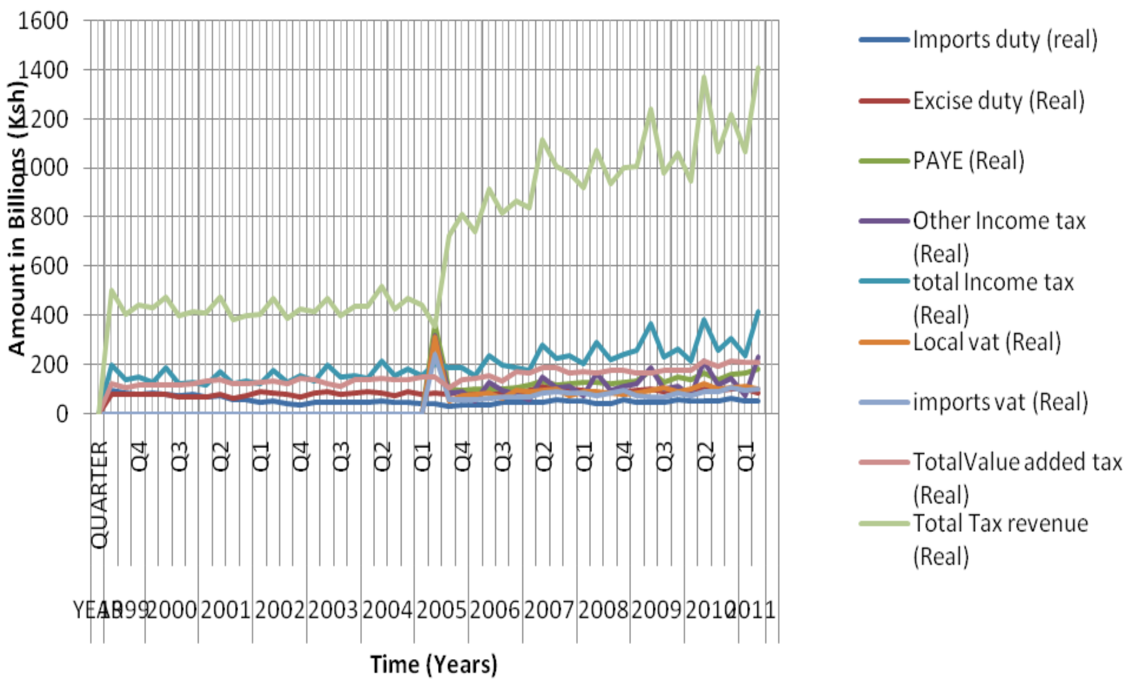

Figure 1. Real tax Revenues, 1999Q2–2011Q2.

Stationarity test

Null Hypothesis: LNIMPORTDUTYY has a unit root			
Exogenous: None			
Lag Length: 1 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.876461	0.3311
Test critical values:	1% level	-2.615093	
	5% level	-1.947975	
	10% level	-1.612408	
Null Hypothesis: D(LNIMPORTDUTYY) has a unit root			
Exogenous: None			
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.724955	0.0000
Test critical values:	1% level	-2.615093	
	5% level	-1.947975	
	10% level	-1.612408	
Null Hypothesis: LNIMMPORTS has a unit root			
Exogenous: None			
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.808789	0.8836
Test critical values:	1% level	-2.614029	
	5% level	-1.947816	
	10% level	-1.612492	
Null Hypothesis: D(LNIMMPORTS) has a unit root			
Exogenous: None			
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.295856	0.0000
Test critical values:	1% level	-2.615093	
	5% level	-1.947975	
	10% level	-1.612408	
Null Hypothesis: EXICISEDUTY has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.527023	0.0113
Test critical values:	1% level	-3.574446	
	5% level	-2.923780	
	10% level	-2.599925	
Null Hypothesis: PRIVATECONSUMPTION has a unit root			
Exogenous: Constant			
Lag Length: 8 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.931622	1.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	
Null Hypothesis: DOMESTICFACTORINCOME has a unit root			
Exogenous: Constant			
Lag Length: 7 (Automatic based on SIC, MAXLAG=10)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.070533	1.0000
Test critical values:	1% level	-3.600987	

	5% level	-2.935001	
	10% level	-2.605836	

Null Hypothesis: TOTALINCOMETAX has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.363329	0.9999
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNPAYE,2)
Method: Least Squares
Date: 07/05/12 Time: 10:17
Sample(adjusted): 2006:1 2011:2
Included observations: 22 after adjusting endpoints

ADF Test Statistic	-6.973843	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

*MacKinnon critical values for rejection of hypothesis of a unit root.
Null Hypothesis: D(TOTALINCOMETAX) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-19.14849	0.0001
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PRIVATECONSVAT,2)
Method: Least Squares
Date: 06/27/12 Time: 13:32
Sample(adjusted): 2000:2 2011:2
Included observations: 45 after adjusting endpoints

ADF Test Statistic	-4.075412	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TOTALVAT,2)
Method: Least Squares
Date: 06/27/12 Time: 13:39
Sample(adjusted): 2000:2 2011:2
Included observations: 45 after adjusting endpoints

ADF Test Statistic	-5.762412	1% Critical Value*	-3.5814
		5% Critical Value	-2.9271
		10% Critical Value	-2.6013

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DOMESTICFACRINCO)
Method: Least Squares
Date: 06/27/12 Time: 14:17
Sample(adjusted): 2006:1 2011:2
Included observations: 22 after adjusting endpoints

ADF Test Statistic	-1.894940	1% Critical Value*	-3.7667

		5%	Critical Value	-3.0038
		10%	Critical Value	-2.6417
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(DOMESTICFACRINCO,2)				
Method: Least Squares				
Date: 06/27/12 Time: 14:13				
Sample(adjusted): 2006:2 2011:2				
Included observations: 21 after adjusting endpoints				
ADF Test Statistic	-3.859857	1%	Critical Value*	-2.6819
		5%	Critical Value	-1.9583
		10%	Critical Value	-1.6242
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(OTHERINCOMETAX)				
Method: Least Squares				
Date: 06/27/12 Time: 14:22				
Sample(adjusted): 2005:4 2011:2				
Included observations: 23 after adjusting endpoints				
ADF Test Statistic	-3.735979	1%	Critical Value*	-3.7497
		5%	Critical Value	-2.9969
		10%	Critical Value	-2.6381
ADF Test Statistic	-2.522095	1%	Critical Value*	-3.7497
		5%	Critical Value	-2.9969
		10%	Critical Value	-2.6381
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Dependent Variable: D(LOCALVAT)				
Method: Least Squares				
Date: 06/27/12 Time: 14:33				
Sample(adjusted): 2005:4 2011:2				
Included observations: 23 after adjusting endpoints				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(IMPORTVAT)				
Method: Least Squares				
Date: 06/27/12 Time: 14:41				
Sample(adjusted): 2005:4 2011:2				
Included observations: 23 after adjusting endpoints				

IMPORT VAT

ADF Test Statistic	-1.643529	1%	Critical Value*	-3.7497
		5%	Critical Value	-2.9969
		10%	Critical Value	-2.6381
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(IMPORTVAT,2)				
Method: Least Squares				
Date: 06/27/12 Time: 14:30				
Sample(adjusted): 2006:1 2011:2				
Included observations: 22 after adjusting endpoints				
ADF Test Statistic	-5.689110	1%	Critical Value*	-2.6756
		5%	Critical Value	-1.9574
		10%	Critical Value	-1.6238
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				

Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 06/27/12 Time: 15:13				
Sample(adjusted): 1999:4 2011:2				
Included observations: 47 after adjusting endpoints				
ADF Test Statistic	-0.778406	1%	Critical Value*	-3.5745
		5%	Critical Value	-2.9241
		10%	Critical Value	-2.5997
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(GDP,2)				
Method: Least Squares				
Date: 06/27/12 Time: 15:14				
Sample(adjusted): 2000:1 2011:2				
Included observations: 46 after adjusting endpoints				
ADF Test Statistic	-10.19597	1%	Critical Value*	-3.5778
		5%	Critical Value	-2.9256
		10%	Critical Value	-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(TOTALTAXREVENUE)				
Method: Least Squares				
Date: 06/27/12 Time: 15:15				
Sample(adjusted): 1999:4 2011:2				
Included observations: 47 after adjusting endpoints				
ADF Test Statistic	0.122244	1%	Critical Value*	-3.5745
		5%	Critical Value	-2.9241
		10%	Critical Value	-2.5997
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(TOTALTAXREVENUE,2)				
Method: Least Squares				
Date: 06/27/12 Time: 15:15				
Sample(adjusted): 2000:1 2011:2				
Included observations: 46 after adjusting endpoints				

Regression results

Dependent Variable: LNIMPORTDUTY				
Method: Least Squares				
Date: 07/05/12 Time: 14:17				
Sample: 1999:2 2011:2				
Included observations: 49				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNIMPORTS	-0.097779	0.057216	-1.708959	0.0941
C	5.099769	0.668124	7.632967	0.0000
R-squared	0.058504	Mean dependent var		3.959376
Adjusted R-squared	0.038472	S.D. dependent var		0.236468
S.E. of regression	0.231875	Akaike info criterion		-0.045280
Sum squared resid	2.526994	Schwarz criterion		0.031937
Log likelihood	3.109364	F-statistic		2.920540
Durbin-Watson stat	0.360680	Prob(F-statistic)		0.094055
ADF Test Statistic	-5.898071	1% Critical Value*		-3.5778
		5% Critical Value		-2.9256
		10% Critical Value		-2.6005
*MacKinnon critical values for rejection of hypothesis of a unit root.				

Dependent Variable: LNEXCISEDUTY
Method: Least Squares
Date: 07/05/12 Time: 18:52
Sample: 1999:2 2011:2
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRVTECNSEXDTY	2.363776	0.330284	7.156800	0.0000
C	-1.517332	0.836752	-1.813359	0.0762
R-squared	0.521481	Mean dependent var		4.470561
Adjusted R-squared	0.511300	S.D. dependent var		0.116206
S.E. of regression	0.081236	Akaike info criterion		-2.142950
Sum squared resid	0.310169	Schwarz criterion		-2.065733
Log likelihood	54.50227	F-statistic		51.21979
Durbin-Watson stat	1.197573	Prob(F-statistic)		0.000000

Dependent Variable: LNTOTALINCOMETAX
Method: Least Squares
Date: 06/27/12 Time: 12:14
Sample (adjusted): 1999Q3 2011Q2
Included observations: 48 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDOMESTICINCOME	0.541832	0.043822	12.36439	0.0000
ERR(-1)	0.375381	0.146533	2.561745	0.0138
C	-1.618077	0.557086	-2.904539	0.0057
R-squared	0.772873	Mean dependent var		5.264016
Adjusted R-squared	0.762779	S.D. dependent var		0.315588
S.E. of regression	0.153708	Akaike info criterion		-0.847060
Sum squared resid	1.063179	Schwarz criterion		-0.730110
Log likelihood	23.32945	Hannan-Quinn criter.		-0.802865
F-statistic	76.56364	Durbin-Watson stat		2.066927
Prob(F-statistic)	0.000000			

Dependent Variable: LNTOTALVAT
Method: Least Squares
Date: 06/27/12 Time: 13:48
Sample(adjusted): 1999:3 2011:2
Included observations: 48 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRIVATECONSVAT(-1)	0.329368	0.036831	8.942698	0.0000
C	0.855871	0.464255	1.843536	0.0717
R-squared	0.634839	Mean dependent var		5.004905
Adjusted R-squared	0.626901	S.D. dependent var		0.188497
S.E. of regression	0.115137	Akaike info criterion		-1.444612
Sum squared resid	0.609802	Schwarz criterion		-1.366645
Log likelihood	36.67068	F-statistic		79.97185
Durbin-Watson stat	1.594546	Prob(F-statistic)		0.000000

Dependent Variable: LNTOTALTAXREVENUE
Method: Least Squares
Date: 07/05/12 Time: 12:59
Sample: 1999:2 2011:2
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	2.584848	0.186612	13.85148	0.0000
C	-26.08631	2.350805	-11.09675	0.0000
R-squared	0.803235	Mean dependent var		6.473465
Adjusted R-squared	0.799048	S.D. dependent var		0.440764
S.E. of regression	0.197584	Akaike info criterion		-0.365345
Sum squared resid	1.834855	Schwarz criterion		-0.288128

Log likelihood	10.95096	F-statistic		191.8634
Durbin-Watson stat	1.671393	Prob(F-statistic)		0.000000
Dependent Variable: LNPAYE				
Method: Least Squares				
Date: 07/05/12 Time: 18:09				
Sample(adjusted): 2005:3 2011:2				
Included observations: 24 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDMSTCFCTRINCM	0.287352	0.050655	5.672747	0.0000
RESIDPAYE(-1)	0.119277	0.092592	1.288204	0.2117
C	1.119593	0.661930	1.691406	0.1055
R-squared	0.611987	Mean dependent var		4.871065
Adjusted R-squared	0.575033	S.D. dependent var		0.183734
S.E. of regression	0.119775	Akaike info criterion		-1.289931
Sum squared resid	0.301268	Schwarz criterion		-1.142674
Log likelihood	18.47917	F-statistic		16.56095
Durbin-Watson stat	1.107681	Prob(F-statistic)		0.000048
Dependent Variable: LNOTHERINCOMETAX				
Method: Least Squares				
Date: 07/05/12 Time: 17:45				
Sample(adjusted): 2005:3 2011:2				
Included observations: 24 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDMSTCFACTORINCOM	0.411080	0.149456	2.750512	0.0120
RESIDOTHERINCOME(-1)	-0.118505	0.186228	-0.636346	0.5314
C	-0.664761	1.950788	-0.340765	0.7367
R-squared	0.371528	Mean dependent var		4.706600
Adjusted R-squared	0.311674	S.D. dependent var		0.375724
S.E. of regression	0.311721	Akaike info criterion		0.623051
Sum squared resid	2.040568	Schwarz criterion		0.770308
Log likelihood	-4.476614	F-statistic		6.207196
Durbin-Watson stat	2.125359	Prob(F-statistic)		0.007621
Dependent Variable: LNLOCALVAT				
Method: Least Squares				
Date: 07/07/12 Time: 17:30				
Sample: 2005:2 2011:2				
Included observations: 25				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRIVTCNSPTVAT	0.212884	0.155218	1.371516	0.1834
C	1.812089	2.011098	0.901045	0.3769
R-squared	0.075602	Mean dependent var		4.569121
Adjusted R-squared	0.035411	S.D. dependent var		0.304745
S.E. of regression	0.299300	Akaike info criterion		0.501880
Sum squared resid	2.060357	Schwarz criterion		0.599390
Log likelihood	-4.273505	F-statistic		1.881057
Durbin-Watson stat	1.671776	Prob(F-statistic)		0.183447
Dependent Variable: LNDOMESTICFACTORINCOME				
Method: Least Squares				
Date: 07/05/12 Time: 14:26				
Sample: 1999:2 2011:2				
Included observations: 49				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	2.418718	0.340617	7.100985	0.0000
C	-17.76364	4.290860	-4.139879	0.0001
R-squared	0.517573	Mean dependent var		12.70350

Adjusted R-squared	0.507308	S.D. dependent var	0.513797
S.E. of regression	0.360645	Akaike info criterion	0.838113
Sum squared resid	6.113038	Schwarz criterion	0.915330
Log likelihood	-18.53377	F-statistic	50.42399
Durbin-Watson stat	1.568572	Prob(F-statistic)	0.000000

Dependent Variable: LNIMPORTVAT
Method: Least Squares
Date: 07/05/12 Time: 18:27
Sample(adjusted): 2005:3 2011:2
Included observations: 24 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRVTCNSPVAT	0.217341	0.084625	2.568278	0.0179
RESIDIMPORTVAT(-1)	0.069137	0.119390	0.579089	0.5687
C	1.548046	1.097555	1.410450	0.1730
R-squared	0.239115	Mean dependent var		4.365759
Adjusted R-squared	0.166650	S.D. dependent var		0.169511
S.E. of regression	0.154743	Akaike info criterion		-0.777634
Sum squared resid	0.502853	Schwarz criterion		-0.630377
Log likelihood	12.33161	F-statistic		3.299717
Durbin-Watson stat	0.675210	Prob(F-statistic)		0.056735

Dependent Variable: LNPRIVATECONSUMPTIONVAT
Method: Least Squares
Date: 07/05/12 Time: 19:10
Sample: 1999:2 2011:2
Included observations: 49

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	2.500906	0.242829	10.29903	0.0000
C	-18.89333	3.058994	-6.176321	0.0000
R-squared	0.692951	Mean dependent var		12.60908
Adjusted R-squared	0.686418	S.D. dependent var		0.459133
S.E. of regression	0.257107	Akaike info criterion		0.161311
Sum squared resid	3.106888	Schwarz criterion		0.238528
Log likelihood	-1.952119	F-statistic		106.0701
Durbin-Watson stat	1.325097	Prob(F-statistic)		0.000000

Dependent Variable: LNPRIVATECONSUMPTIONVAT (for local VATand import VAT)
Method: Least Squares
Date: 07/05/12 Time: 19:19
Sample: 2005:2 2011:2
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	2.833139	0.787638	3.597008	0.0015
C	-23.10520	10.02412	-2.304962	0.0305
R-squared	0.360017	Mean dependent var		12.95088
Adjusted R-squared	0.332192	S.D. dependent var		0.393605
S.E. of regression	0.321652	Akaike info criterion		0.645924
Sum squared resid	2.379577	Schwarz criterion		0.743434
Log likelihood	-6.074047	F-statistic		12.93847
Durbin-Watson stat	1.255199	Prob(F-statistic)		0.001521