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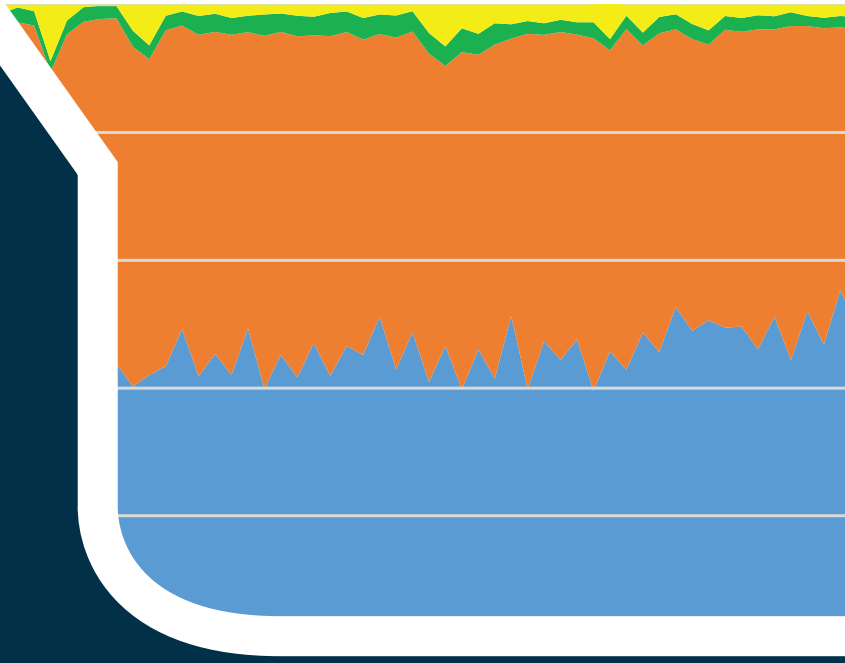
RESEARCH SERIES No. 125

Tax Revenue Effects of Sectoral Growth and Public Expenditure in Uganda



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ABSTRACT

This paper contributes to a growing strand of literature on the determinants of tax revenue performance in developing countries, particularly in Sub-Saharan Africa. More specifically we estimate the tax elasticities of sectoral output growth and public expenditure. The unique features of this paper are twofold: First we develop a simple analytical model for tax revenue performance taking into account some structural features pervasive in most developing countries with large informal sectors. Second we test the model predictions on Ugandan time series data using ARDL bounds testing techniques. Results indicate that dominance of the agricultural and informal sectors pose the largest impediments to tax revenue performance. In addition development expenditures, trade openness, and industrial sector growth are positively associated with tax revenue performance. We propose policies to support the development of value added linkages between agricultural and industrial sectors while emphasizing the need to unlock the potentially large contributions of the informal sector with a view of widening the tax base.

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1. INTRODUCTION

Interest in improving tax revenue performance has gained increased momentum in recent years across many developing countries (Drummond et al 2012; IMF 2011; AfDB 2010a). This has been on account of increased financing needs for service delivery, concerns over debt sustainability, and waning donor support across many countries. In Uganda, the Government has over the years implemented reforms in tax policy and tax administration aimed at boosting revenue performance (Ulriksen & Katusiimeh 2014; Cawley & Zake 2010). The major reforms included the institution of the Uganda Revenue authority – meant to improve tax administration; the introduction of VAT; the new income tax act; and the abolition of graduated tax, the latter majorly for political rather than economic reasons. These reforms were largely successful and helped to improve the tax revenue performance from 6.8 percent of GDP in 1991/92 to 12.7 percent in 2006/07 (Cawley & Zake 2010). The abolition of graduated tax, however, was less successful and has constrained local government revenue mobilization thus undermining service delivery at the lower levels of Government (Ulriksen & Katusiimeh 2014). The graduated tax has since been replaced with the Local Service Tax and the Hotel Tax in the 2008/09 financial year. However, the early momentum in tax revenue performance improvements has not been sustained. Over the last decade tax revenues have not been responsive to overall GDP growth with the result being that tax revenue performance measured as the tax-to-GDP ratio has stagnated at about 12-13% (MFPED 2015). Consequently the government expenditure has continuously exceeded revenue leading to widening budget deficits with deleterious macroeconomic effects (Lwanga and Mawejje 2014).

In the meantime, the need to expand public expenditure to support improved service delivery has brought to the fore renewed policy discussions on how Uganda could innovatively improve its revenue performance. There is now a renewed focus on domestic resource mobilization and how financing requirements for development initiatives such as the second National Development Plan (NDP II) and the vision 2040 can be realized. This is especially important given the dwindling donor budget support (MFPED 2015), narrow tax base (Ssennoga et al 2009), and large informal sector (Muwonge et al. 2007).

The government's concerns have been raised in various budget speeches highlighting possible mismatches between the sectoral contributions to GDP and overall tax revenue performance (Ssewanyana & Kasirye 2015). While the tax revenue performance has not been responsive to overall GDP growth, it is not clear which particular sectors of the economy are responsive or not. A clearer understanding of sector-specific tax elasticities can provide better policy options for improving tax revenue performance.

Against this background this paper examines the principal determinants of tax revenue performance in Uganda. The unique features of this paper are twofold: first we provide the first attempt at estimating tax elasticities of sectoral output growth for Uganda; second we account for some important structural features of the Ugandan economy - an agrarian open economy with a large informal sector. In particular, the paper seeks to examine the responsiveness of tax revenue to growth in the broad sectors of agriculture, industry and services and how public expenditure can be better prioritized to stimulate tax revenue growth. Employing ARDL bounds testing techniques, we show that dominance of the agricultural and informal sectors pose the largest impediments to tax revenue performance in Uganda. In addition trade openness, industrial sector growth and development expenditures are positively associated with tax revenue performance. The rest of the paper is organized as follows: section two provides an over view of Uganda's tax, public expenditure and economic performance. Section three presents the literature survey and analytical framework. Section four presents the methods and data used in the paper. The results and discussions thereof are presented in section five. Finally conclusions and policy options are presented in section six.

2. OVERVIEW OF UGANDA'S REVENUE, EXPENDITURE AND ECONOMIC PERFORMANCE

This section examines Uganda's recent trends with regard to revenue mobilization, public expenditure and economic performance. We critically examine the structure of taxes, GDP performance, and public expenditure, and how these have evolved over time.

2.1 Tax revenue performance

Uganda's tax system is comparable to global benchmarks. Income and corporate tax rates in Uganda are 30 percent; value added tax rate is 18 percent; and import duty rate is 25 percent of the import value. The major tax handles are: 1) direct domestic taxes – including pay as you earn; corporation tax, withholding tax, tax on bank interest, casino tax, and other incomes taxes 2) indirect domestic taxes including excise duty, value added tax 3) taxes on international trade 4) and Fees and licenses.

Over the past two decades, the Government of Uganda has undertaken reforms to improve tax revenue performance. Some of these reforms included the institution of the autonomous tax body – the Uganda Revenue Authority, reforms to reduce over reliance on international trade, reducing tax exemptions, reform of the income tax, and introduction of the value added tax (see Cawley & Zake 2010 for a detailed discussion of the tax reforms). However, revenue collections are poor in spite of the relatively high tax rates and the reforms in the tax system. Tax revenue performance, as a percentage of GDP, has made only modest improvements over the last decade (Table 1).

Indeed Uganda's tax revenue performance, measured as the ratio of tax revenue – to – GDP, is low even when compared to partner states in the East African region. For example, while tax effort has averaged above 19 - 20 percent in Kenya for the last five years, in Uganda it has averaged 13 percent (Figure 2).

There are various factors that could explain the low tax effort in Uganda. One of them is the low tax morale (Ali et al 2014) which itself can be explained, in part, by limited government investments in infrastructures that are complementary to economic performance (Mawejje 2013). The other is the general public's perception that the rampant corruption and mismanagement of public resources have hindered the delivery of value for money on public investments (AfDB 2010b). These accounts point to the complex relationship between service delivery expenditures and tax effort, not least because public expenditures have to be supported by revenue.

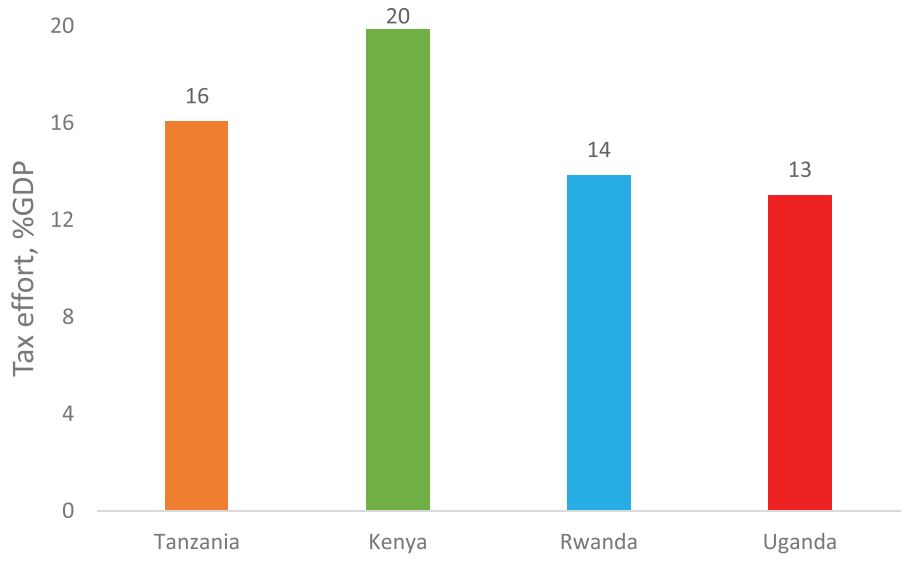
Other factors that explain the poor tax revenue performance includes: the weak legal and regulatory frameworks that are not deterrent enough to enforce compliance (Mawejje 2013); the narrow tax base

Table 1: Evolution of Government Revenue by percentage share

		2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
1.	Taxes On Income, Profits and Capital Gains	19.8	22.6	36.6	28	26.0	26.4
2.	Taxes On Property	0.2	0.2	0.0	0.0	0.0	0.0
3.	Value Added Tax (VAT)	26.5	26.5	22.6	25.7	29.9	29.6
4.	Excise Taxes	19.0	19.7	16.2	17.6	16.6	17.4
5.	Fees And Licenses	1.2	1.4	1.0	1.0	1.0	0.8
6.	International Trade Taxes	9.3	8.8	8.3	8.9	10.2	10.4
7.	Other Taxes	3.3	2.8	2.2	3.6	3.7	4.0
8.	Non-Tax Revenue	20.8	18.0	13	15.2	12.7	11.4
9.	Total Revenue	100.0	100.0	100.0	100.0	100.0	100.0
10.	**TAX-GDP ratio (%)**	**12.2**	**12.2**	**13.1**	**12.3**	**13.4**	**13.1**

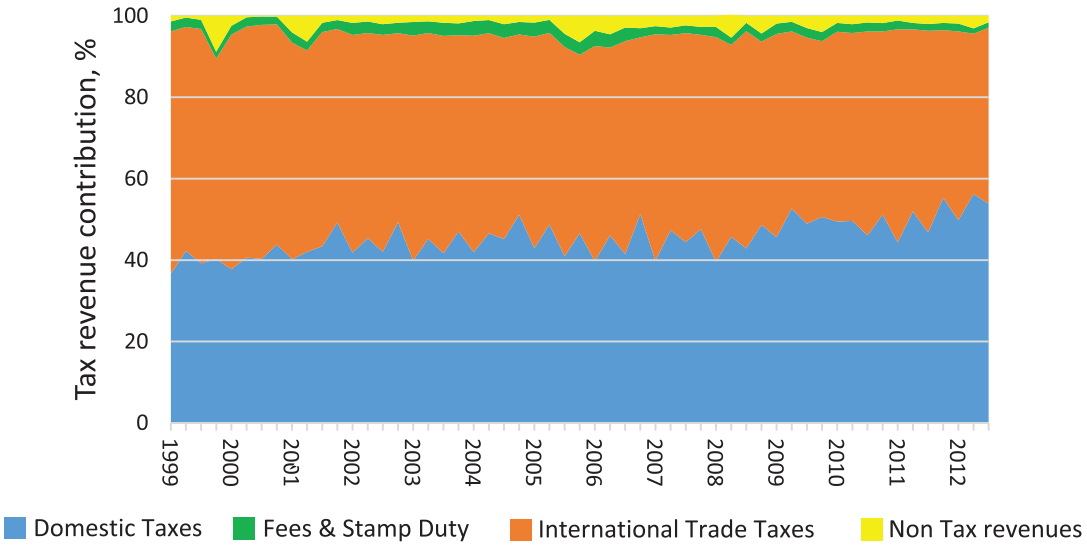
Source: UBOS Statistical Abstracts 2012 and 2014; MFPED Background to the Budget FY 2013/2014

Figure 2: Tax revenue performance in selected EAC states



Data source: World Bank development indicators, 2013

Figure 3: Distribution of Uganda's tax revenues



Source: Ministry of Finance, Planning and Economic Development

(Sennoga et al 2009), large informal sector (Muwonge et al 2007), tax breaks (Gauthier and Reinikka 2006), institutional weaknesses (Robinson 2006), as well as a limited institutional capacity to enforce compliance (Fjeldstad 2005). All these factors have ensured that improvements in tax effort have only been modest over the last two decades.

The composition of the domestic tax revenues is characterized by a gradual shift away from international trade taxes towards domestic indirect taxes. For example the share of international trade taxes has declined to 46 percent in 2012 from 59 percent in 1999 while the importance of domestic taxes has increased from 37 percent to 50 percent during the same time period (figure 3).

The shift to domestic revenue from international trade can be explained by several factors. First, the effects of trade liberalization due to the systematic decline in tariff rates, particularly for products originating from within Uganda's regional trading blocs. These reductions in tariff rates appear to have negatively affected trade tax revenues, particularly from import duties (Shinyekwa

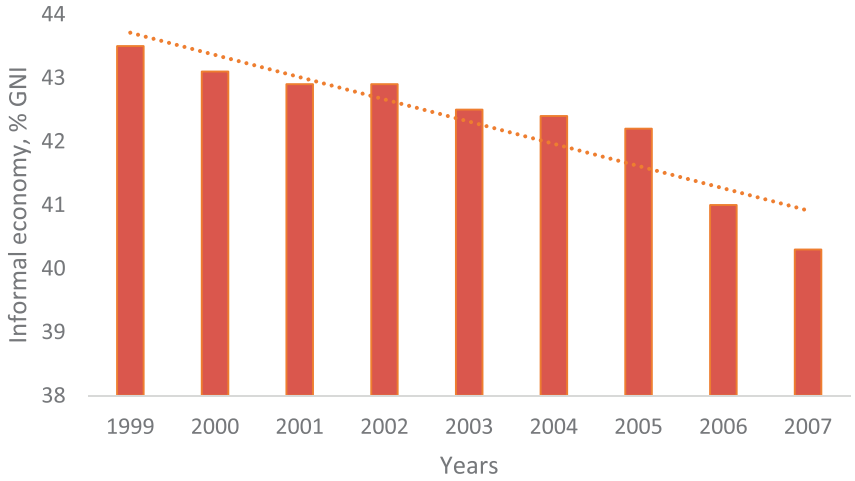
& Mawejje 2013). Also, the improved performance of domestic tax revenues may reflect improved efficiency in ensuring compliance and other efforts geared towards improving tax administration (Cawley & Zake 2010).

2.2 The informal sector

The informal sector in Uganda is large, albeit with a declining trend (figure 4), and is one of the major hindrances to improvements in tax revenue performance. Recent estimates by Buehn & Schneider (2012) indicate that the size of the informal sector or "the shadow economy" expressed as a percentage of gross national income stands at 40.3 percent. A study by Muwonge et al. (2007) estimates that 87 percent of all business establishments in Uganda; 80 percent of Uganda's economic total active labour force and 88 percent of Ugandan women workers are all categorised within the informal sector. This evidence points to the ubiquitous nature of informality in Uganda.

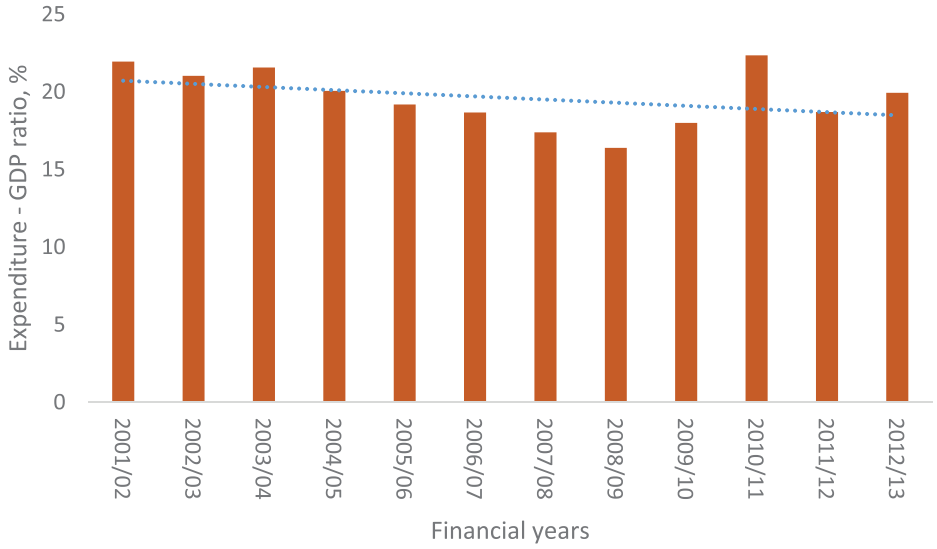
Although the informal sector in Uganda, expressed as a percentage of gross national income (GNI) is declining it is still higher than Kenya (29.5 percent), Rwanda (40.1 percent) and Burundi (39.6 percent) and only less than Tanzania (53.7 percent) among the East African Community (EAC) states (for details see Buehn & Schneider 2012).

Figure 4: The informal sector in Uganda



Data source: Buehn & Schneider (2012)

Figure 5: Government expenditure as a proportion of GDP



Source of data: Ministry of Finance, Planning and Economic Development

2.3 Government expenditure

While nominal government expenditure has increased fivefold from UGX 2,097.2 billion in FY 2000/01 to 10,926.5 billion in FY 2012/13, government expenditure as a proportion of GDP declined from about 21.96 percent in financial year (FY) 2001/02 to about 16.38 percent in 2008/09 (figure 5), before it started rising again peaking at about 22.35 percent in 2010/11.

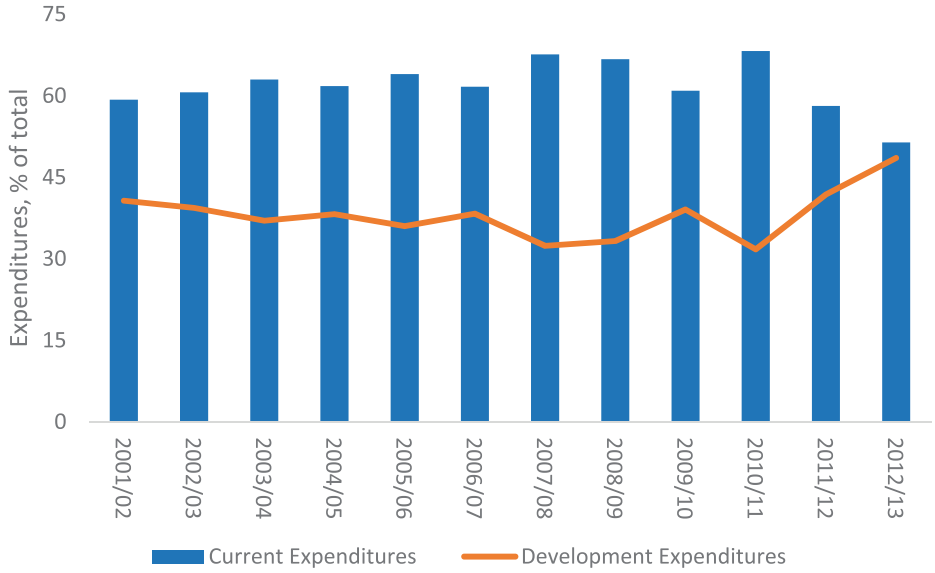
However, Government spending priorities have shifted towards development expenditure over the last decade. Subsequently the proportion of development expenditures in total expenditures has increased from 40.7 percent in 2001/2 to 41.9 percent in 2011/12. Likewise the proportion of recurrent expenditure decreased from 59.2 percent to 58.1 percent during the same time period (Figure 6). By 2012/2013 development and recurrent expenditures were almost equally allocated at 51.4 percent and 48.6 percent respectively.

The evolution of expenditure allocations is consistent with the change in the Government medium term development strategy frameworks from the Poverty Eradication Action Plan (PEAP) which emphasized social spending for poverty reduction and social protection to the National Development Plans (NDP) which emphasize expenditure on physical infrastructure such as in the energy, transport sectors and the productive sectors.

2.4 Economic performance

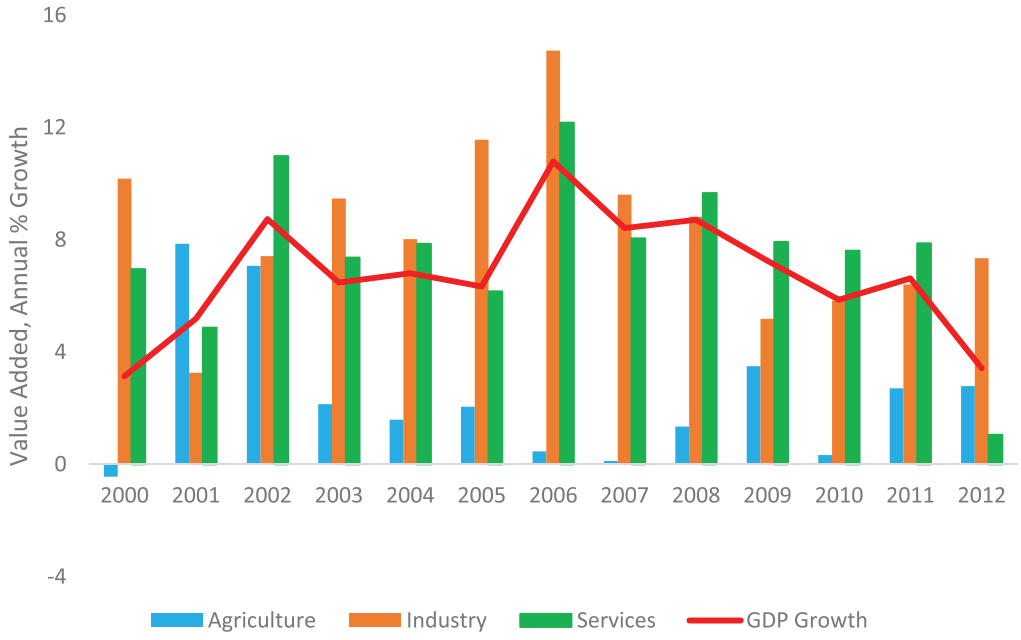
The Ugandan economy suffered greatly in the years following independence. Specifically, the economy was marred by economic crises resulting from extreme political instability during 1971 – 1986. Most productive sectors collapsed during that period, and real growth rates during 1980 – 1987 were effectively negative. The restoration of peace and stability coupled with policy reforms that mostly focused price stabilization, privatization and liberalization formed the basis of economic recovery in the post conflict (Kuteesa et al. 2010; Okidi et al. 2005). Subsequently the economy recorded impressive growth rates in the post crisis era. Real economic growth averaged 6.9 percent during the period 1990 – 1999 and accelerated to 7.2 percent during the period 2000 – 2010. This spurt of high growth was driven by the strong performances in the services and industrial sectors, with agriculture posting rather weak growth rates, except in 2001 and 2002 when the sector grew at 7.9 and 7.1 percent respectively. The fisheries and cash crops subsectors experienced a boom in those two years. Since then the agricultural sector has grown only about 2 percent per annum. GDP performance peaked in 2006 when the economy expanded by 10.8 percent, majorly driven by the strong performances of the industry and services sectors which grew by 14.8 and 12.2 percent

Figure 6: Recurrent and Development Expenditures, % of total



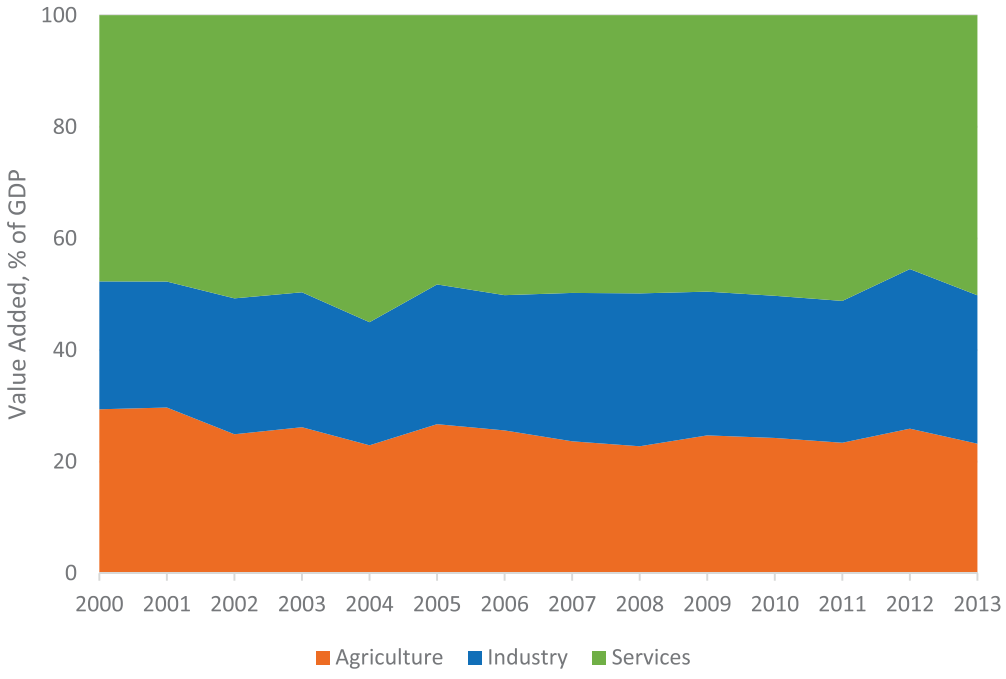
Data source: Ministry of Finance, Planning and Economic Development

Figure 7: The performance of Uganda's economic sectors



Data source: Uganda Bureau of Statistics

Figure 8: Sector GDP composition



Data source: Uganda Bureau of Statistics

respectively. During that year, the agricultural sector recorded a dismal growth rate of 0.4 percent (figure 7).

However, economic growth slowed down during the years beginning 2010. During the four years during 2010 – 2013 the economy grew by an average of 5.5 percent lower than during any other period since 1990. For illustration the economy expanded by 3.4 percent during 2012, the lowest growth rate in over a decade. The poor performance of the economy during this period can be attributed to several factors. First, the services and agricultural sectors recorded weak

growth. Second, the economy suffered external shocks due to the effects of a weak global economy, owing to a slow recovery from the global financial crisis of 2007/8 (Ssewanyana & Bategeka 2010). Third, the energy crisis that occurred between 2005 and 2012 (Mawejje et al. 2013) hampered industrial and services growth and raised import of fuel oil. Fourth, the post-election macroeconomic instability of 2011 had a negative impact on growth (IMF 2012). In the subsection that follows, we discuss, in brief, the structure of the economy.

2.2 The structure of Uganda's Economy

The structure of Uganda's economy has changed since the early 1990's and has continued to do so until the early 2000s. In particular, the services and industry sectors expanded their contributions to GDP tremendously during the period between the early 1990's to early 2000's.

The expansion of the services sector has been majorly driven by innovation and technology, mainly due to developments in the banking, telecommunication, and transport sub sectors (UBOS 2013). However, a large proportion of the services sector is still dominated by low-productivity micro and small businesses (ACET 2014).

The industrial sector expanded modestly, owing to some infrastructural, human capital and institutional constraints that limited its growth and competitiveness (Obwona et al. 2014). The agricultural sector, too, only expanded modestly due to, among others, institutional bottlenecks (Bategeka et al. 2013), limited adoption of improved technology and inputs (Kasirye 2013), and limited supportive infrastructures hindering market access, commercialization and value addition (Adong et al. 2014).

By 2013 the agricultural sector contributed 23.2 percent of GDP, while industry and services contributed 26.6 percent and 50.2 percent respectively (Figure 8). However, agriculture remains the dominant sector in terms of employment. Indeed up to 65.6 percent of Uganda's working population are engaged in agriculture, 28.4 percent are located in the services sector, while only 9 percent are employed in industry (UBOS 2013). That the agricultural sector provides the most employment opportunities but has the least contribution to GDP points to limited productivity in that sector. As such, the declining contribution of the agricultural sector to total GDP could be attributed to structural and/or institutional constraints other than systematic structural transformation.

3. LITERATURE REVIEW AND ANALYTICAL FRAMEWORK

3.1 Literature Review

The literature on tax revenue performance has put across two major schools of thought that explain the determinants of tax effort: 1) Structural factors which include the composition of economic activity; 2) Institutional factors which include the government policies and political economy constraints. Structural factors that influence a country's tax effort include agriculture share in GDP, per capita income, and trade openness (Gupta 2007); the extent of dependence on windfall revenues such as aid (Thornton 2014; Hisali & Ddumba-Ssentamu 2013; Clist & Morrissey 2011), and natural resource endowments such as gas and oil (Treviño & Thomas 2013; Botlhole et al. 2012; Bornhorst et al. 2009) and the shares of direct and indirect taxes (Gupta 2007).The institutional factors that impact the ability and efficiency of tax collection include Government quality, policies and corruption (Bird & Martinez-Vazquez 2008; Ghura 1998).

Agriculture share in national income is often used as one of the structural factors that can explain tax effort especially in cross-country studies. Countries that are heavily dependent on agriculture are usually under-developed with their agricultural sectors usually smallholder and subsistent in nature making them potentially difficult to tax. It is not surprising, therefore, that many cross country studies find a negative relationship between agriculture share in GDP and tax revenue performance (Pession & Fenochietto 2010; Gupta 2007). Furthermore, it is possible that for political rather than economic reasons some countries exempt a large share of agricultural activities from taxes (Bird & Martinez-Vazquez 2008) and this affects the tax revenue performance. Generally, the level of development of the economy is expected to positively

influence tax revenue performance and a large non-agricultural sector, urbanization and high per capita income levels are all expected to positively influence tax revenue mobilization (Moore 2013).

Pessino & Fenochietto (2010) utilized the stochastic frontier analyses to determine the tax effort of 96 countries. They showed that the tax effort is determined by the level of development as proxied by the per capita GDP, the level of trade openness, and public expenditure on education. Further, they show that these positive effects can, however, be undermined by macroeconomic instability (for example through extended periods of high inflation) and disparities in income distribution.

The effect of trade openness particularly trade liberalization has received considerable attention in the literature with mixed results. Whereas trade openness is generally shown to be positively linked with revenue mobilization, possibly due to the ease of revenue collection (Gupta 2007), the exact effect of trade liberalization is not clear. Baunsgaard & Keen (2010) show that developing countries have not succeeded in offsetting reductions in trade tax revenues due to trade liberalization by increasing revenues from other sources. Similarly, Hisali (2012) found that tariff harmonization and reduction due to trade liberalization has not had a significant impact on the equilibrium tax relationship in Uganda.

Using elaborate vector error correction methods, Hisali & Ddumba-Ssentamu (2013) examine the short and long-run dynamics between foreign aid and tax revenue in Uganda. They show that the long run equilibrium tax relationship is positively influenced by loans but bears a negative relationship with grants. This is a relatively familiar finding in the literature and is similar to earlier findings by among others (Crivelli et al. 2012; Gupta et al. 2003). However, recent work by Alonso and Garcimartin (2011) indicates that once the distributions of income and institution quality are accounted for the relationship between aid and tax revenue effort collapses. In addition, there is an emerging strand of literature on the aid-tax nexus that indicates that foreign aid need not suppress tax effort (Ouattara 2006; Clist & Morrissey 2011). Admittedly, the composition of aid (Gupta et al. 2003) and quality of institutions (Azam et al. 1999) might be some of the factors that determine the aid-revenue relationship.

More recently, the literature has considered the effect of natural resource endowments on domestic tax revenue effort. Using a panel data set of 30 oil and gas producing countries Bornhorst et al (2009) show evidence of an offset of up to 20 percent between government revenues from natural resource related activities and revenues from other sources. The effect of natural resource endowments on tax effort is rooted in the resource curse literature. For example, Kiiza et al. (2011) argue that when states gain a large portion of their revenues from windfall resources, they may relax the efforts to collect domestic taxes thus eroding the citizens' duties and obligations to the state. Another explanation is that natural resource abundance affects growth in countries with poor institutional quality (Mehlum et al. 2006) resulting in deleterious consequences for tax revenue mobilization (Treviño & Thomas 2013; Botlhole et al. 2012).

The quality of institutions and corruption have been examined in the literature as some of the important determinants of tax revenue mobilization. For example, Bird and Martinez-Vazquez (2008) examine the effect on tax effort of various indicators of institutional quality that include corruption, voice and accountability in a set of high income countries. They show that quality institutions that are characterized by low corruption, voice and accountability are important drivers of tax effort.

The literature examining the roles that fiscal policy, such as targeted public expenditure, plays in supporting improved tax revenue mobilization is limited. Aschauer (1989) provides early insights on the extent to which productive public expenditure on physical infrastructure can stimulate private sector productivity and profitability. Sennoga & Matovu (2010) used Computable General Equilbrium (CGE) approaches on Uganda to show that efficient public expenditures are important in promoting growth and poverty reduction.

Ghura (1998) analysed data for 39 sub-Saharan African countries during 1985-96 showing that the variations in tax revenue-GDP ratios within this

group are influenced by among others, rising human capital - a proxy for the provision of public services by the government. These findings are consistent with Pessino & Fenochietto (2010) who showed that public expenditure on education improves tax effort.

More recent analyses have used micro-econometric foundations to investigate firm-level tax evasion behavior arising out of perceived limited government provision of public capital. For example Mawejje (2013) shows that a poor business environment, characterized by deficiencies in public capital, incentivizes firm level tax evasion behavior. Taken together, these results suggest that, other things being equal, productive public expenditure would improve tax effort on two fronts: 1) more taxes can be raised from increased productivity and profitability of the private sector and 2) a better business environment, characterized by adequate supply of public capital, would improve willingness to pay tax at the firm level. The latter argument is in the broader realm of fiscal legitimacy and fiscal exchange as important determinants of tax compliance behavior (see Alm et al. 1993 for detailed discussions).

3.2 Analytical Framework

We develop a simple framework in which firms and government interact. Firms are the major micro production units that engage in the production of a final good but must rely on government expenditures for the provision of quality public infrastructures, G. The firms hire labour units L_i and invest in private capital K_i. Government investment in public infrastructures acts as a catalyst for the productivity of labour and capital and as such, government expenditure is complimentary to firm performance. We assume that Government expenditures are financed by levying a constant tax rate, τ on firm profits, π.

The firms' production technology follows a Cobb-Douglas constant returns to scale function as below;

$$Y_i = AK_i^{\alpha} L_i^{1-\alpha} G \qquad 1)$$

The production function is assumed to be twice differentiable with positive marginal products and diminishing marginal rate of substitution, such that $f' > 0$ and $f'' < 0$. L_i. is the amount of labour employed by the i^{th} firm, K_i is the private capital investment, is the amount of public capital supplied by government and A is a measure of a firm's productivity from other sources. The return to labour is a wage w_i, and the return on private capital investment is the rate of return r_i. G is a catalyst to firm productivity financed through Government expenditure on public capital, such as in energy, water, communication, transport, education and health infrastructures, among others.

The firms' profit function is given as

$$\pi_i = AK_i^{\alpha} L_i^{1-\alpha} G - w_i L_i - r_i K_i \qquad 2)$$

Profit maximization, therefore, implies that $\mathrm{r_i} = \alpha \mathrm{AK_i^{\alpha-1} L_i^{1-\alpha} G}$ while.

$\mathrm{w_i} = (1-\alpha)\mathrm{AK_i^{\alpha-1} L_i^{-\alpha} G}.$

Firms can either locate in the formal (F) or informal (N) sectors. Firms in the formal sector can either be in Agriculture (A), Services (S) or Industry (I). The aggregate economic activity in the formal sector is defined by a weighted geometric function that takes the form

$$\mathrm{F = A^{\alpha} S^{\beta} I^{\gamma}} \qquad 3)$$

Where α, β, and γ are the shares of agriculture, industry and services sectors in the formal economy respectively. Taking natural logarithms of the expression in 3) above yields:

$$\mathrm{\log F = \alpha \log A + \beta \log S + \gamma \log I} \qquad 4)$$

Expression 4) allows us to evaluate the broad sectors of the economy independent of each other. Firms in the formal sector report all their profits (π_i) for tax purposes; firms in the informal sector on the other hand only report an amount $\theta_i < \pi_i$ such that $0 \leq \frac{\theta_i}{\pi_i} < 1$.

Tax revenue performance in the formal sector

In the formal sector, firms pay taxes on profit given as. π_i It then follows that the tax-to-output ratio is

$$\frac{\tau \pi_i}{Y_i} = \frac{\tau}{Y_i}(\mathrm{AK_i^{\alpha} L_i^{1-\alpha} G - w_i L_i - r_i K_i}).$$

Differentiating the tax-output ratio with respect to π_i

gives the response of increased profitability to the tax-to-output ration at the margin, such that

$$\frac{d}{d\pi_i}\left(\frac{\tau\pi_i}{Y_i}\right) = \frac{\tau}{Y_i} > 0 \quad 5)$$

This expression implies that as firms in the formal sector expand their profitability the tax-to-output ratio should increase, i.e there is a positive relationship between output/profit expansion and tax-to-output ratio.

Tax revenue performance in the informal sector

In the informal sector, firms pay taxes on only the proportion $\frac{\theta_i}{\pi_i}$ of profit reported. It therefore follows that the total tax equals

$\frac{\theta_i}{\pi_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i)$. It then follows

that the tax-to-output ratio is

$\tau\frac{\theta_i}{Y_i\pi_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i)$.

Differentiating the tax-output ratio in the informal sector with respect to gives the response of increased profitability to the tax-to-output ration at the margin, such that

$$\frac{d}{d\pi_i}\left(\tau\frac{\theta_i}{Y_i\pi_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i)\right) =$$

$$-\frac{\tau\theta}{\pi_i^2 Y_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i) < 0 \quad 6)$$

This expression implies that as firms in the informal sector expand their profitability the tax-to-output ratio should decrease, i.e there is a negative relationship between value added and tax-to-output ratio.

Tax revenue performance and government expenditures

Government infrastructural expenditures provide public goods that are non-excludable. Therefore, firms both in the formal and informal sectors equally benefit from the productivity gains from such public investments. Given the profit function

$\pi_i = AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i$, the total tax to output ratio can be given as

$\frac{\tau\pi_i}{Y_i} = \frac{\tau}{Y_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i)$.

Differentiating the above expression with respect to G yields the response of tax-to-output ratio due a marginal increase in G such that:

$$\frac{d}{dG}\left(\frac{\tau}{Y_i}(AK_i^{\alpha}L_i^{1-\alpha}G - w_iL_i - r_iK_i)\right) =$$

$$\frac{\tau}{Y_i}AK_i^{\alpha}L_i^{1-\alpha} > 0 \quad 7)$$

This expression implies that public expenditure should lead to increased competitiveness and hence profitability of firms at the margin and hence the firm's ability to pay taxes.

Summary

In summary our theoretical framework has shown that: 1) In the formal sectors (that can also disaggregated into lower categories of agriculture, industry and services) tax-output ratio is expected to be positively associated with output; 2) In the informal sector tax-output ratio is expected to be negatively associated with output; 3) Productive Government expenditures are expected to be positively associated with profitability and output.

The basic reduced form model arising from the analytical framework takes the form: $TAXGDP_t = f(F_t, N_t, G_t)$; but since $F_t = f(A_t, S_t, I_t)$ it then follows that the basic model that we estimate takes the form:

$$TAXGDP_t = f(A_t, S_t, I_t, N_t, G_t) \quad 8)$$

4. METHODS AND DATA

4.1 The ARDL modeling procedure

We adopt the Auto Regressive Distributed Lag (ARDL) approach to cointegration analysis to assess the responsiveness of tax revenue to sectoral GDP performance and public expenditure. We examine the responsiveness of domestic tax revenue to the broad sectors of the economy (Agriculture, Industry, and Services) and components of public expenditure disaggregated at their broad levels of recurrent and development expenditures. The major drawback of the ARDL procedure is that it assumes the existence of a single cointegrating relationship. There are several

alternative methods for conducting cointegration analysis. These include the maximum likelihood based Johanssen (1988) procedure and the residual based Engle-Granger (1987) two-step estimation procedures.

However, the major disadvantage of the Johannsen (1998) procedure is that it requires all variables to follow I (1) processes. Based on this limitation, we adopt the Auto Regressive Distributed Lag (ARDL) bounds testing econometric methods, developed by Pesaran et al. (2001), to examine the long-run cointergration relationship for tax effort. Our choice of approach is plausible because our variables follow a mixture I(1) and I(0) processes as shown in table 2. In addition, the ARDL has been shown to provide consistent estimates of the long-run coefficients that are asymptotically normal irrespective of whether the underlying regressors are I(1) or I(0) (Pesaran and Shin 1998). In addition the ARDL approach allows for sufficient numbers of lags to capture the data generating process in a general-to-specific modeling framework.. The ARDL model we use in this study, assuming k lags for each variable and regressors, is expressed as:

$$\Delta taxgdp_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta taxgdp_{t-i} + \sum_{j=1}^{n} \sum_{i=1}^{k} \alpha_{2ji} \Delta x_{jt-i} + \alpha_3 taxgdp_{t-1} + \sum_{i=1}^{n} \alpha_{4i} x_{it-1} + \varepsilon_t \quad (9)$$

Where:

$taxgdp_t$	Represents tax-GDP ratio, a measure of tax revenue performance
x_t	Represents a vector of variables that explain changes in .
ε_t	Represents a white noise error term

The ARDL bounds testing procedure is based on the Wald or the joint F-statistic for the parameters α_{4i} whose joint significance implies a valid long-run relationship among variables. Therefore, significance of the joint F-statistic implies cointegration. The asymptotic distribution of the F-statistics under the null hypothesis of no cointegration is provided by Pesaran et al. (2001). The critical values have two sets: one set assumes that all variables included in the ARDL model follow an I(0) process while the other set is calculated on the assumption that variables are I(1). If the computed Wald/F-statistic test statistic is greater than the upper critical bounds then the null hypothesis of no cointegration is rejected; the null hypothesis of no cointegration cannot be rejected if the computed value is lower than the lower bounds value; the test is inconclusive if the statistic falls within the bounds.

4.2 Data

The paper utilizes quarterly data from several sources, spanning a 15 year period, from 1999Q3 to 2013Q4. Data on tax revenue, GDP and its sectoral composition, and consumer price index were obtained from the Uganda bureau of statistics (UBOS), monetary and trade data was obtained from the Bank of Uganda (BOU), expenditure and aid data were obtained from the Uganda Ministry of Finance, Planning and Economic Development (MFPED).

The descriptive statistics for the data are provided in table 2. The specific data that we use is as follows: LTAXGDP is the natural logarithm of total tax revenues divided by GDP (expressed as a percentage), LAGRIC is the natural logarithm of agricultural output, LIND is the natural logarithm of industrial output, and LSERVE is the natural logarithm of output in the services sector. LINFSEC is the proxy for the size of the informal or shadow economy expressed as the natural logarithm of the percentage of currency outside banks (COB) in broad money (M2). LDEV is the natural logarithm of the ratio of development expenditure to GDP (expressed as a percentage). Development expenditures as opposed to recurrent expenditures are non consumptive.

LCUR is the natural logarithm of the ratio of recurrent expenditures to GDP (expressed as a percentage). LCPI is the natural logarithm of consumer price index. LOPEN is the natural logarithm of the ratio of the sum of exports and imports to GDP (expressed as a percentage) and finally AIDGDP is total aid grants that include direct budget support, project aid and HIPC assistance expressed as a ratio of GDP,

The Graphical expositions of the data are provided in appendix 1. The Augmented Dickey Fuller and Phillips-Peron unit root tests indicate that the expenditure and

Table 2: Descriptive statistics for the model variables

Variable	Obs	Mean	Std. Dev.	Min	Max
LTAXGDP	58	2.217	0.139	2.019	2.401
LAGRIC	58	6.556	0.087	6.332	6.699
LIND	58	6.838	0.399	5.926	7.425
LSERV	58	7.617	0.325	6.973	8.119
LINFSEC	58	3.297	0.096	3.075	3.493
LDEVGDP	58	2.140	0.257	1.572	2.752
LCURGDP	58	2.629	0.154	0.154	3.017
LCPI	58	4.749	0.342	4.322	5.368
LOPEN	58	3.072	0.395	2.502	3.576
AIDGDP	58	3.387	1.888	0.468	8.195

Table 3: Stationarity tests

Variable	Unit roost test in levels		Unit roost test in first differences		Order of Integration
	ADF	P-P	ADF	P-P	
LTAXGDP	-1.373	-0.739	-9.837***	-12.119***	I(1)
LAGRIC	-2.690	-2.687	-13.868***	-17.675***	I(1)
LIND	-1.455	-1.264	-13.047***	-14.741***	I(1)
LSERV	-1.484	-1.563	-7.317 ***	-7.365***	I(1)
LINFSEC	-2.188	-1.768	-11.154***	-11.967***	I(1)
DEVGDP	-7.261***	-7.437***			I(0)
CURGDP	-5.473***	-5.575***			I(0)
LCPI	1.644	1.234	-5.034***	-5.107***	I(1)
OPEN	-0.865	-0.890	-7.547***	-7.547***	I(1)
AIDGDP	-5.904***	-6.105***			I(0)

Source: Author computations

aid data are stationary in levels, I(0), while the rest of the variables are integrated of the first order, I(1) as shown in table 3. In carrying out the Stationarity tests, we considered trend and intercept in the series.

5. RESULTS AND DISCUSSIONS

5.1 Lag length criteria

The ARDL model allows each variable to have its own lag optimal lag length structure. In estimating the ARDL model used in this paper, we applied the Schwartz Information Criterion (SIC) to arrive at the optimal lag structures (table 4) for each of the variables used in our analysis.

5.2 Empirical Results

In estimating the ARDL model for tax revenue performance, we followed the general to specific procedure to arrive at a parsimonious representation in which all short run coefficients are significant. To achieve this we started out with the optimal lag lengths for each short run variable and systematically eliminated the insignificant ones, one at a time, starting with ones with the largest p-values. The model was

Table 4: Optimal lag length structures

Variable	LTAX	LAGRIC	LIND	LSERV	LINFSEC	LDEV	LCUR	LCPI	LOPEN	AID
Lag	1	4	4	0	4	3	4	1	0	3

estimated with an intercept and no trend. The bounds testing procedure indicates that there exists a valid long run (or cointegrating relationship) between tax effort and its determinants. The computed F-statistics for the joint significance of the long run parameters is 8.00 ($p=0.000$) while the asymptotic critical upper bound values for the F-statistic are 3.86, 3.24, and 2.94 percent for the 1, 5, and 10 percent confidence levels respectively. Since the computed F-values exceed the critical values at all conventional levels of significance, we cannot reject the existence of a stable long-run (level) relationship among the variables. In other words, the variables are cointegrated. In addition, various diagnostic and CUSUM tests indicate that the model is well specified (table 5) and stable (appendices 2a and 2b).

5.2.1 The short run determinants of tax revenue performance

The results in table 5 (Panel A) suggest that in the short run growth in the industrial sector, trade openness, and official development assistance (aid) have positive and significant effects on tax revenues performance. On the contrary, growth in the agriculture, the size of the informal sector, development expenditures and recurrent expenditures are negatively associated with tax revenue performance. These results suggest that efforts to improve tax revenue performance in the short run should focus on the growth effects of industry, trade openness and official development assistance while unlocking the constraints in the informal and agricultural sectors. In addition, improving the effectiveness of expenditures to enlist productivity gains can unlock tax-revenue performance. Growth in the services sector and inflation do not seem to have any effect at all on tax revenue performance in the short run. However, we do not dwell so much on the short run coefficients because they represent dynamic adjustments of all variables in the model into the long-run. Following this argument, therefore, we proceed to discuss the long run determinants of tax revenue performance.

5.2.2 Long run determinants of tax revenue performance

Results in table 5 (Panel B) reveal that trade openness, growth in industry and development expenditures have large positive effects on tax revenue performance in Uganda for the period under consideration. The coefficient on trade openness suggests that a one percentage change in trade openness results in a 0.386 percentage change in the tax-to-GDP ratio. These results indicate the importance of trade in improving tax effort and are consistent with earlier findings including Hisali & Ddumba-Ssentamu (2013) and Gupta (2007), among others, and could be interpreted as reflecting the ease of collecting international trade taxes (IMF 2011) and are consistent with Uganda's continued heavy reliance on trade taxes as discussed earlier.

The next most important determinant of tax revenue performance is growth in industry. A one percentage point increase in industrial GDP results in a 0.269 percentage increase in tax-to-GDP ratio. One possible explanation is that industry has both forward and backward linkages: it can support value addition in agriculture through agro-processing (Shifa 2014) and yet ably link to the services sector, for example, through trade in manufactured products, support to banking, telecoms, and other trade-support services. Indeed industrial growth can lead to structural transformation from low productivity jobs in agriculture to higher productivity jobs in industry and manufacturing (Page 2012). This shift to higher productivity jobs widens the tax base as wages improve and taxes become easier to collect. These results suggest that growth in agriculture should be linked to value addition in industry.

Development expenditures have significant positive effects on tax effort: a one percentage increase in the share of development expenditures in GDP results in a 0.26 increase in the tax-GDP ratio. This result highlights the productivity effects of development expenditures and is consistent with among others, Ghura (1998) and Pessino & Fenochietto (2010), who showed that investment in quality public services such as in education improves tax effort

The dominance of the agricultural sector poses the largest impediment to tax revenue performance in Uganda: a one percentage increase in agricultural GDP is associated with a 2.270 percent decrease in the tax-to-GDP ratio. One possible explanation for this large negative effect of agriculture on tax revenue performance is that, as explained earlier, Uganda's

Table 5: Determinants of tax revenue performance

Panel A: Short run coefficient estimates										
					Lag structure					
	0			1		2		3		4
D(LTAX)										
D(LAGRIC)	-1.719[a] (-6.20)									
D(LIND)	0.533[a] (3.82)							0.180[b] (-2.20)		
D(LSERV)										
D(LINFSEC)	-1.180[a] (-4.36)									
D(LDEV)				-0.207[a] (-2.76)		-0.095[b] (-2.19)				
D(LCUR)				-0.236[b] (-2.34)						
D(LCPI)										
D(LOPEN)	0.301[b] (2.07)									
D(AID)						0.008[b] (2.42)				
PANEL B: Lagged long run coefficient estimates										
LTAX	LAGRIC	LIND	LSERV	LINFSEC	LDEV	LCUR	LCPI	LOPEN	AID	
-1.000[a] (-4.95)	-2.270[a] (-6.36)	0.269[b] (2.06)	-0.061 (-0.30)	-1.042[a] (-5.25)	0.262[a] (2.75)	0.009 (0.09)	-0.009 (-0.06)	0.386[a] (3.70)		0.008 (1.42)
R-Squared				0.775						
Adjusted R-Squared				0.650						
Testing for the existence of a level relationship among the variables in the ARDL model										
F-statistic				8.00						
95% Bound (Lower, Upper)				(2.06, 3.24)						
Notes: the estimated coefficients are tabulated; t-values are in parentheses; a, b and c represent coefficient statistical significance at the 1, 5 and 10 percent levels respectively										

agricultural sector is largely small holder and informal and therefore potentially difficult to tax. Up to two-thirds of Uganda's labour force is directly employed in the agricultural sector, but majority of these people engage in low productivity subsistence farming. Therefore, any policies that support agricultural productivity, growth and formalization would increase the incomes of this critical mass of people (Sennoga and Matovu 2010) with positive effects in tax revenue performance. These findings are consistent with a large strand of literature that documents a negative relationship between agriculture GDP shares and tax effort (see for example, Drummond et al. 2012; Gupta 2007).

The informal sector in Uganda has a large negative effect on tax revenue performance. The coefficient on our proxy for the informal sector – the logarithm of the percentage share of currency outside banks (COB) in broad money (M2) is negative and statistically significant. A one percentage point growth in the percentage share of the informal sector is associated with a 1.042 percent reduction in tax effort in the long-run. This result implies possible gains accruing from formalizing the informal sector in order to widen the tax base. The informal sector in Uganda is large and is mostly concentrated in the services sector (Mawejje 2013) usually in the form of self-employment in low productivity micro enterprises (Muwonge et al 2007). A large informal sector makes tax collection difficult and therefore affects tax effort. However, we do not find

Table 6: Model diagnostic tests

Diagnostic test	Computed test statistic	p-value
Durbin – Watson	2.246	N/A
Normality	4.10	0.129
Breusch-Godfrey LM test for autocorrelation	1.153	0.216
ARCH LM test	2.077	0.149
Ramsey RESET test	1.56	0.201
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	0.08	0.220

empirical support for the significance of the services sector, re-current expenditures, inflation (consumer price index), and aid for tax revenue performance.

After determining the tax revenue model, we carried out some diagnostics tests (table 6) to establish the suitability of the statistical properties. Test results in table 6 below indicate that the ARDL model is well specified.

In summary our ARDL results indicate that in the long run tax revenues are positively influenced by trade openness, development expenditures and growth in the industrial sectors, and negatively influences by the agricultural and informal sectors.

6. CONCLUSIONS AND POLICY OPTIONS

Uganda's tax revenue performance recorded impressive improvements following the reforms in tax administration in the early 1990's. However, such impressive performances have not been sustained resulting in the stagnation of the overall tax revenue performance. This paper set out to examine the responsiveness of tax revenue to sectoral GDP growth and how public expenditure can be better prioritized to stimulate tax revenue performance.

By employing Auto Regressive Distributed Lag (ARDL) methods, the paper has demonstrated some mismatches in the sectoral contributions to GDP and overall tax revenue collections. The agricultural sector holds the largest impediment to improve tax revenues in the long run. The industrial sector, trade openness and development expenditures have exhibited a positive long run relationship with tax-GDP growth. The services sector does not seem to influence tax-GDP ratio growth and this should be of policy concern because it has been a major driver of growth in Uganda. Further, the results have also demonstrated the large negative effects of the informal sector on tax revenue performance.

These results suggest that: 1) Improving the responsiveness of tax revenue to GDP growth requires the pursuit of broad-based growth policies as a first step. 2) Improving the productivity of agriculture, agricultural formalization and linking agricultural production to value added agro-processing in the industrial sector can unlock the structural constraints to tax revenue growth. 3) Policy makers should focus on working with the informal sector to improve tax revenue performance. Unlocking the informal sector requires careful policy design to widen the tax base and ensure that the informal activities are brought into the tax net. In addition strengthening the tax body's institutional autonomy, dealing with political interferences and strengthening institutional capacities for tax administration will improve efficiency in tax collection. 4) The positive effect of development expenditures could be strengthened through prudent use of funds. Despite the fact that development projects might take longer periods to mature and ultimately to enlist productivity gains, there are valid concerns that such expenditures are not usually implemented prudently. For example there are serious absorptive capacity constraints that usually delay project implementation. In addition, projects are usually patterned with corruption scandals leading to delays and delivery of sub-standard works which compromise quality. Corruption is likely to affect project selection, execution and quality. In such circumstances, there is scope to improve the productivity of development expenditures. 5) International trade continues to be an

important source of tax revenues and continued efforts in fostering regional integration, trade facilitation and removing trade barriers will strengthen the contribution of trade taxes.

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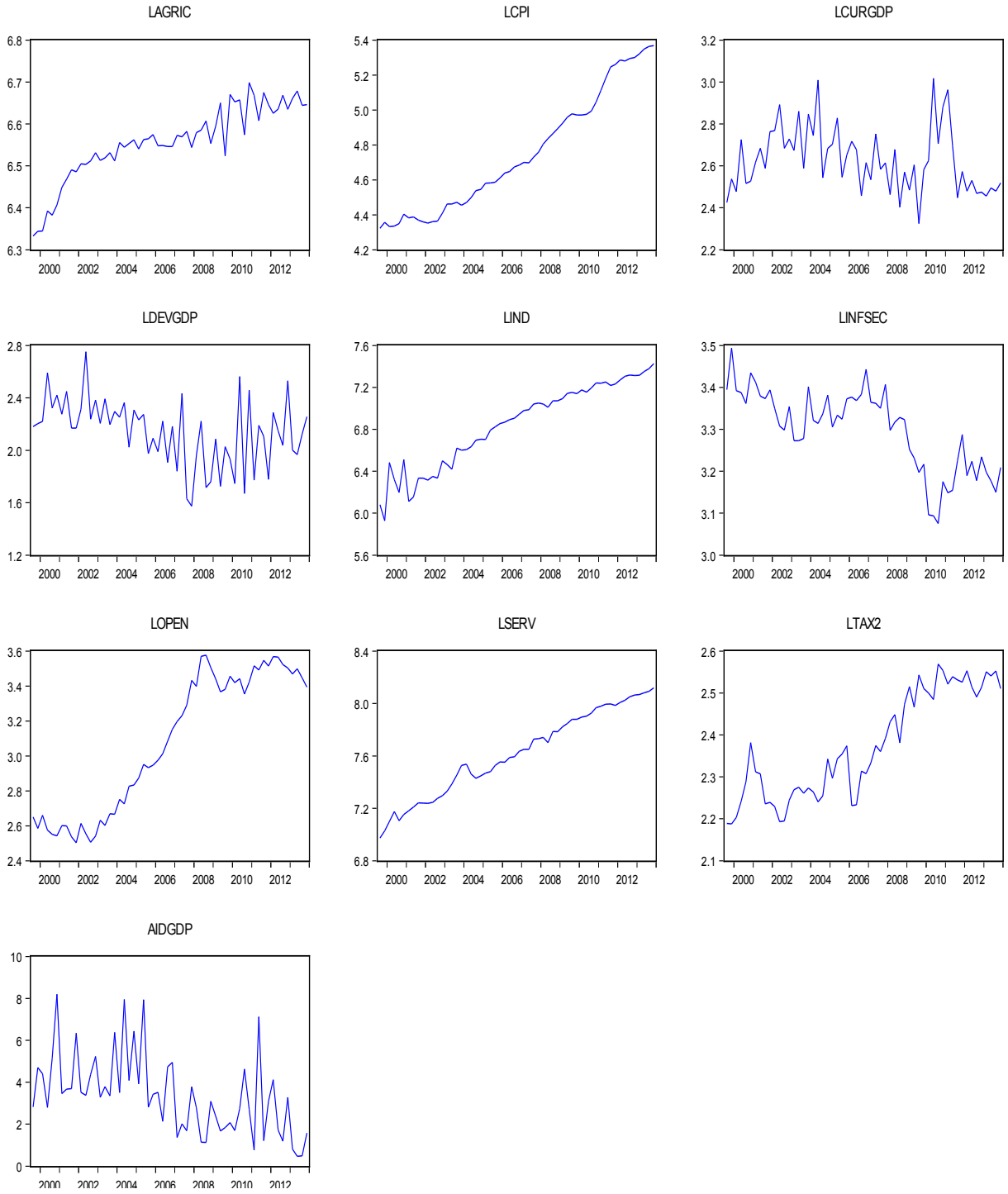
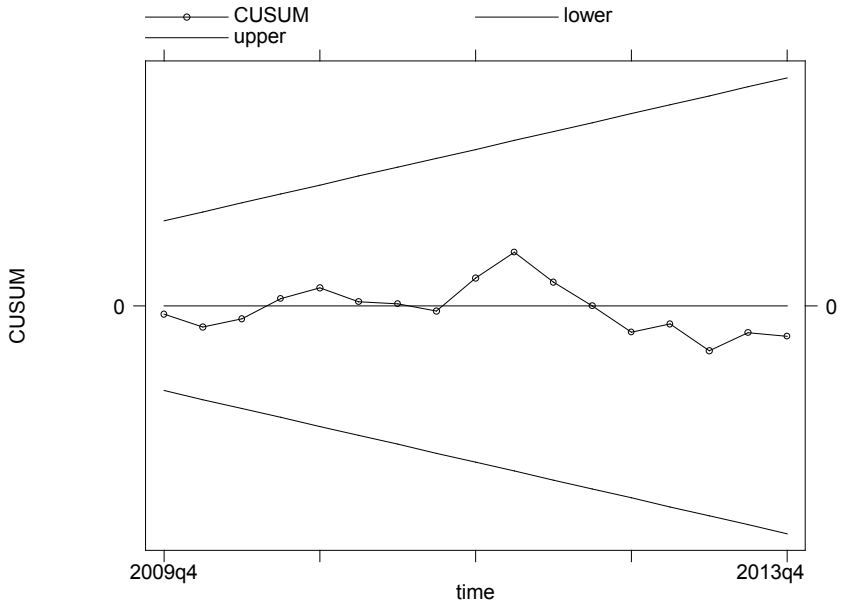
APPENDICES

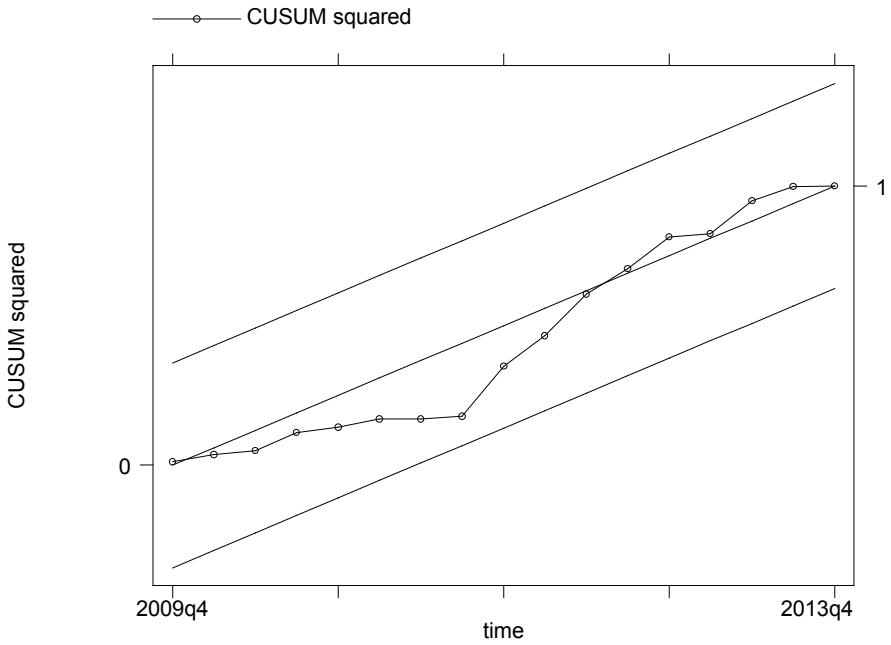
Appendix 1: Graphical expositions of the data



Appendix 2a. CUSUM residual plots



Appendix 2b. CUSUM Squared residual plots



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