



Foreign aid and tax revenue in Uganda

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ABSTRACT

This paper analyzes the tax revenue–aid relationship in Uganda using a framework in which fiscal targets and actual outturns differ. The results suggest that grants have a negative association with tax revenue but are offset by the positive association of loans to result in some modest increases in tax revenue in the long run. The coefficient on the per capita income variable suggests that the tax system is inelastic. The error correction model results capture, in a dynamic setting, the offsetting effects of per capita income on the one hand and aid on the other to result in stagnant tax revenue GDP ratio that has been observed in the recent past. Policies that reduce mutation of taxpayers and noncompliance will reduce the country's reliance on aid and its unwanted effects.

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1. Introduction

The shortfall between budgetary requirements and domestic tax revenue collection in the context of limited domestic financing options has led Uganda's economy to rely quite substantially in foreign aid. Uganda has been operating a fairly large and apparently unsustainable fiscal deficit over the last two decades, with deficits as a percentage of GDP peaking at about 14% in 2001/2002 before easing to about 6.5% in 2011/2012. The country's good record at macroeconomic reforms, however, attracted considerable donor resources to fund these deficits. Whereas increased donor aid inflows have been welcomed and even encouraged in some circles to help increase the pace at which some social targets can be attained, others have strongly argued that they complicate short run macroeconomic management and may generally not be sustainable in the long run (Brownbridge and Mutebile, 2007). This view contends that donor inflows can have many adverse consequences for the economy including putting pressure on the domestic price level (inflation) and domestic currency appreciation and debt sustainability. These in turn can hurt export competitiveness and stifle the role of the private sector in economic activity.

These conceptual links between foreign aid and macroeconomic outcomes such as inflation, export competitiveness and debt sustainability have been the subject of considerable empirical attention in Uganda (see Brownbridge and Mutebile, 2007; Hisali, 2012a; Hisali and Guloba, 2011). Whereas a number of the standard macroeconomic effects of aid have been studied in Uganda, evidence on the relationship between aid and taxation is largely not available. But, at a more general level the nature of the relationship is inconclusive since increased aid inflows may enhance or curtail the tax revenue effort of the recipient country.

Tax policy reforms associated with donor conditionality can affect either the tax rates or the tax base or both. Intuitively, a huge debt burden arising from increased aid may 'force' recipient countries to find avenues of increasing total tax revenue in order to enhance their ability to repay the loans. Increased aid inflows may also enlarge the budget and may require an increase in tax revenue for sustainability. In any case, total tax revenues would increase. An opposing set of arguments contends that increasing donor inflows can actually result in a slowdown in total tax revenue growth. This is partly because increased aid may reduce the incentive to implement certain policies and other administrative actions that expand total tax revenue. In addition, certain policies associated with aid conditionality (such as international trade liberalization) can reduce the tax base and hence total tax revenue.

This study sought to provide evidence on the relationship between aid inflows and tax revenue in Uganda. Examining Uganda's experience is particularly interesting because the period over which it received much of the aid initially coincided with an expansion in total tax revenue but which has now stagnated at levels below the sub-Saharan Africa average.¹

The approach used in this paper explicitly recognizes the limited applicability of the widely used fiscal response models in situations where major disconnects exist between actual fiscal outturns and targets. The paper also endeavors to provide insights into the direct effects of aid on domestic tax institutions and structures, as well as indirect effects such as those mediated through donor conditionality.

After the introduction, the rest of the paper is organized as follows. Section two presents an overview of the literature. Section three builds on the standard pathways to provide descriptive insights into the

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¹ Uganda's average tax revenue GDP ratio of about 12.5% for the past five years is below the current sub-Saharan Africa average of about 25%.

nature of the relationship between aid inflows and tax revenue performance in Uganda. The econometric methodology and results of the study are presented in section four followed by a summary and the policy implication in section five.

2. Literature review

2.1. Theoretical literature

The static model of taxation conceptualizes an optimizing policy maker working within a given budget constraint to balance the efficiency costs of taxation and benefits associated with public spending (Mirrlees, 1971, 1976, 1986). Foreign aid receipts can thus enable the recipient country to reduce costs of taxation without compromising the level of public service delivery. Extensions to this basic model seek to incorporate specific mechanisms through which aid receipts can affect fiscal policy formulation and outcomes, and include the analysis of aid fungibility, fiscal response and effects of foreign aid on domestic tax structures.

Aid is fungible when the increase in expenditure is less than the increase in aid (McGuire, 1978). Aid that is fungible in this sense has the effect of delaying the development of domestic tax structures and governance institutions. Fiscal response theories maintain the tax-expenditure tradeoff but allow for variable fiscal targets – either exogenously or endogenously (Heller, 1975; McGillivray, 2009). An important limitation of the exogenous models of fiscal response is their failure to provide clear mechanisms that link aid receipts and tax policy formulation. Endogenous fiscal targets vary over time making it possible for them to be conditioned on country characteristics such as aid receipts. The implications of aid receipts for domestic tax revenue in these models are ambiguous and depend partly on the nature of aid (for example whether grants or loans) as well as incentives of policy makers.

Foreign aid inflows and domestic tax policy can also be linked through the effect of the former on domestic tax structures and inflows (Knack, 2008). Technical assistance targeting legal, administrative and policy reforms can be expected to result in increased domestic tax revenue collection (Carter, 2010) and an improvement in the quality of domestic governance and political institutions (Moss et al., 2008; Ross, 2004). Foreign aid can also impact domestic tax revenue through short term changes to certain aspects of the tax base such as imports and salaries (Carter, 2010). There are also secondary (but ambiguous) effects of foreign aid on tax revenue that work through aspects of donor conditionality such as privatization and trade policy reform. The effects of privatization depend on the pre-privatization condition of the affected enterprises. Loss making parastatals that become profit making after privatization undoubtedly contribute to increased tax revenues. There is, however, a risk of losing revenue if profitable public enterprises are privatized. There are also sections of theoretical work that builds on utility functions² which are maximized with respect to the government budget constraint. This results in specifications which depend on GDP and some other conventional determinants of tax revenue (Pack and Pack, 1990, 1993; Stotsky and WoldeMariam, 1997).

2.2. Empirical literature

Most of the existing empirical work on the relationship between foreign aid inflows and domestic tax revenue is grounded in the fiscal response framework. Studies based on this approach estimate structural and reduced form equations from the policy maker's utility maximization and constraints on revenue (including borrowing) and expenditure. Public expenditures and revenues in this setting are linked through

budget constraint. The coefficients of the structural equations are usually obtained using linear and nonlinear solution approaches to simultaneous equations (Franco-Rodriguez, 2000; Gang and Khan, 1991; McGillivray and Outarra, 2005). The reduced form specifications capture the indirect effects of aid on other variables in the system and are simulated from the structural equations (Gang and Khan, 1991). The findings in much of the literature suggest that aid inflows reduce tax revenue (Franco-Rodriguez, 2000; McGillivray and Outarra, 2005; Otim, 1996). This is usually interpreted to capture the reduced incentives by aid recipient governments to rapidly increase revenue from domestic sources in the face of what is, in some respects, free money. Some studies (Gupta et al., 2004; Remmer, 2004) go further step and disaggregate aid into loans and grants.

Moss et al. (2008) summarize the revenue response to aid literature and suggest that there is broad consensus that aid reduces the incentive to levy taxes and slows the growth of institutions.

In spite of the wide use of fiscal response models in empirical work, their ability to link foreign aid inflows and domestic fiscal outcomes can be severely limited. In particular, utility will not be maximized if theoretically optimal values of target variables are considerably different than what can be obtained from empirical estimations. This will be the case if targets used in planning documents are disconnected from actual outturns (White, 1994). Failure to meet expenditure targets through discretionary reallocation of budgeted resources and supplementary budgets has been a common feature of Uganda's fiscal policy in recent years. This precludes the use of fiscal response models in analyzing the association between fiscal policy and foreign aid in Uganda. In addition, both fiscal response and aid fungibility models fail to capture the direct effects of aid on domestic tax institutions and structures, as well as indirect effects that are mediated through certain aspects of donor conditionality.

Recent approaches explicitly recognize that aid can affect both revenue flows and tax structures, and focus on the latter. Main contributions to the literature on the effect of aid on domestic tax and governance institutions include that of Moore (2007), Knack (2008), and Besley and Persson (2009a). Besley and Persson (2009b) predict that investment in fiscal capacity reduces as the share of national income generated by natural resources increases. Aid inflows are predicted to have the same impact (Carter, 2010). Knack (2008) shows that increased aid inflows slow down the development of good quality of institutions for tax policy and administration.

There have also been attempts to study the indirect effect of certain aspects of donor conditionality on tax revenue. Gambaro et al. (2007) report that whereas aid is associated with an increase in revenue from taxes on trade, it decreases revenue from income taxes.

Data limitations preclude a quantitative analysis of the link between aid inflows and institutions in Uganda. This study, however, attempts to link in a descriptive manner the relationship between aid inflows and institutions for tax policy and administration. The limited applicability of the fiscal response approach in Uganda's situation dictates that the standard single equation tax revenue specification is initially employed.³ Feedback effects (if any) among the variables in the tax revenue specification are then explored using the vector autoregression framework and the Granger non-causality tests.

3. Foreign aid inflows and fiscal operations in Uganda

Uganda's fiscal operations have over the last two and a half decades been considerably influenced by donor resource inflows. Donor financial support increased substantially during the late 1980s – initially intended to stabilize and revamp the productive capacity of the economy⁴ following mismanagement and civil unrest in the 1970s and early

³ See Section 4.

⁴ Aid was subsequently extended to social service provision as well as public administration reform.

² With public goods as one of the arguments.

1980s respectively. Donor agencies (both bilateral and multilateral) have also been instrumental in providing technical assistance aimed at institutional and policy development.

The commitment of the government to prudent macroeconomic management and programs that promote inclusive growth (such as infrastructural development, and provision of basic health care and education) has over the years attracted even more donor resource inflows. This has made it possible for expenditure to increase without increased domestic tax revenue collection (Fig. 1) or recourse to domestic borrowing.⁵

In as much as aid funded deficits reduce the disincentive and political costs of taxation it is imperative to weigh this benefit against the costs of foreign aid. The inelastic nature of tax revenue coupled with the need to maintain macroeconomic stability⁶ has meant that public expenditure has had to vary directly with fluctuations in aid inflows (Fig. 2). Interestingly, the direct relationship between public spending and aid suggests that aid has not been fungible in the sense that it has not been used to reduce the tax burden. There are no readily available data that can be used to assess whether part of the aid meant for development expenditures does not leak into unintended (consumption) expenditures.

Apart from being disruptive, downward adjustments in aid disbursements can also come with second round effects that impede expansion of the tax revenue base. Non wage expenditures are particularly vulnerable.

Uganda's aid inflows have generally taken the form of grants or loans that have come at highly concessional rates. Much as this has been the case, aid has come at a huge debt and repayment burden (Fig. 3).

At the conceptual level, an increase in the debt burden should be followed by an improvement in the tax effort. The stagnant share of tax revenue to GDP suggests that this has not been the case in Uganda.⁷ In fact, even debt relief under the highly indebted poor country (HIPC) initiative did very little to improve the country's capacity for repayment. Uganda was also among the first countries to qualify for debt relief under the highly indebted poor country (HIPC) initiative. This has been very helpful in improving the debt indicators and creating certainty. But also this has not had a lagged effect on tax revenue. Instead, the recent improvement in the different debt sustainability indicators is the result of gains in export performance (and with it GDP) due to new market opportunities in the region.

Aid funded deficits can also slow down the pace at which structures and institutions for increased domestic tax collection develop (Carter, 2010). Studies (Ayoki, 2008; Wamibu, 2007) have documented the main reforms that have taken place in the policy, legal and administration in Uganda's tax system. Donors have been instrumental in contributing to these reforms both directly and indirectly through policy conditionality. It is possible, however, that some of the existing loopholes (such as mutation of taxpayers) which still remain in the tax system would have been fixed if the country was unable to easily access foreign aid (Mwenda, 2006).

The need to maintain macroeconomic stability has, in Uganda's case, meant that donor inflows have had to be followed by corresponding liquidity management operations. Unfortunately these actions reduce the tax revenue potential. The main instruments that the central bank can employ in response to liquidity pressure stemming from aid funded

deficits are sale and purchase of treasury bills⁸ and foreign exchange market operations. The direct consequences of these operations on other macroeconomic aggregates such as upward pressure on lending interest rates and poor export performance in Uganda are well documented (BrownBridge and Mutebile, 2007; Hisali, 2012a; Hisali and Guloba, 2011). By discouraging private sector investment and business, high interest rates reduce tax revenue flows through multiplier effects.

Computations based on the World Bank's productivity and investment climate survey of 2006 rank availability and cost of credit as the second most severe constraint to doing business in Uganda's manufacturing sector. In fact only 13% of the firms that participated in this survey indicated that availability and cost of credit was not an obstacle to their operations. This situation must have certainly worsened in view of the recent hikes in the bank lending rates which resulted from actions of the central bank aimed at curbing rising prices.⁹ The discouraging effect of the high cost of borrowing on private investment activity and by implication the potential for tax revenue growth is also discernible at the aggregate level (Fig. 4).

Liquidity management operations also reduce the resources available for private sector borrowing since treasury bills are risk free, yet high yield investment opportunity to commercial banks. Commercial banks in Uganda hold about 90% of all the outstanding stock of treasury bills. It is perhaps these other constraints that have hindered the expansion of the private sector in spite of the favorable tax regime that has been in part made possible by donor inflows. The pace at which infrastructural developments have been made is slow in spite of the fact that most of the donor financing is developing in nature. This stifles private sector development and by implication expansion of the tax revenue base.

The tariff code allows for import duty exemptions on certain categories of inputs that are deemed important in the production process (such as capital inputs and other raw materials) and final products that are not locally available but are nonetheless welfare enhancing (such as pharmaceutical products). The proportion of zero rate tariff lines has gone up from around one percent in 1994 to about ten percent presently (Fig. 5). Tariffs have on average been reduced quite substantially.

A reduction in tariffs can result in increased revenue through the effects of lower rates on voluntary compliance. It can also reduce the cost of imports and ultimately increase tax revenue through the volume effect. It is, however, possible for tax revenue collection to decline if for some reason import volumes stay unchanged. Empirical evidence from Uganda suggests that the tariff reform process has not had any significant effect on the long term international trade tax revenue (Hisali, 2012b). Exchange rate liberalization has been one other prominent donor driven policy reform implemented in Uganda. The exchange rate has depicted a depreciating trend since the market was first liberalized in 1993. Hisali (2012b) has shown that depreciation of the exchange rate increases trade tax revenues only in the short run. Depreciation passes through the domestic cost of imports to reduce underlying or long term trade tax revenue.

Generally, the reform process (largely donor driven) has been guided by a philosophy that promotes the role of the market in the allocation of resources. This led to implementation of policies such as privatization and deregulation so as to encourage development of the private sector. In this framework government's role would entail provision of a conducive macroeconomic environment and infrastructure in order to enhance investment as well as regulatory and

⁵ The fiscal deficit (excluding grants) as a percentage of GDP has averaged to about 9% over the 1993/94–2011/12 period with a peak of 14.2% in the 2000/01 fiscal year.

⁶ By avoiding the use of domestic financing of the fiscal deficit and hence the need to print money.

⁷ This might be due to the fact that most of the aid has been spent on social sectors and infrastructural constraints continued to bite.

⁸ In 1992, the government surrendered the treasury bills instrument to the Bank of Uganda and since then it has been entirely a monetary policy instrument.

⁹ The central bank rate was raised from 13% in July 2011 to 23% in March 2012. Commercial banks responded by increasing their lending rates and reducing borrowing. The growth in banking system claims on the private sector as a result declined from about 45% in July 2011 to about 20% one year later.

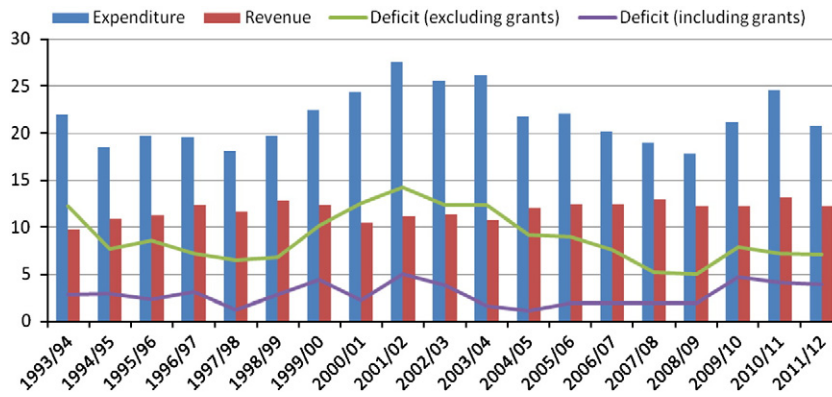


Fig. 1. Government fiscal accounts (% of GDP).

policy oversight. Conceptually, market institutions and activities are easier to tax. It is possible that gains that were realized in tax revenue collection in the early 1990s can be attributed to this market reforms.

In conclusion, aid receipt has made it possible for public spending on priority areas to increase without destabilizing macroeconomic outcomes such as inflation. It has also enabled the tax policy regime to remain largely predictable which has in turn minimized the disincentive and other costs of taxation. This is in addition to possible revenue gains through second round effects (such as increased imports and the multiplier effects of development spending), and donor contributions to the development of legal, policy and administrative aspects of the tax system in Uganda. On the down side, the liquidity management operations have kept interest rates abnormally high and stifled private investment and by implication, expansion of the tax base. There are also other aspects of donor conditionality with a high potential to slow the growth of tax revenue. The disincentive and political costs of taxation thus need to be weighed against the costs of foreign aid. The stagnant tax revenue share appears to suggest that the donor induced revenue gains have been offset by the effects of donor inflows on investment and incentive of policy makers to result in impacts that are not discernible. The next section approaches the tax revenue–aid relationship quantitatively.

4. Econometric methodology and results

The description of the relationship between tax revenue and foreign aid in the preceding section is complemented with econometric analysis. Revenue specifications which are functions of GDP and some other variables, all of which are observable (Stotsky and WoldeMariam, 1997), are employed in the econometric analysis.

4.1. Econometric approach

The econometric techniques sought to establish the general relationship between tax revenue and aid inflows, both in the long run and the short run.

The long run tax revenue and aid equilibrium relationship was obtained using the Johansen multivariate approach. The Johansen procedure estimates the stochastic process of the form:

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i^* \Delta y_{t-i} + \varepsilon_t \tag{1}$$

where y_t is an $m \times 1$ vector of variables, $\Pi y_t = \alpha \beta' y_{t-1}$ represent the stationary cointegrating relations. The β parameters are the cointegrating parameters that form linear stationary relations with the non-stationary data series in y_t . α contains the short run adjusting parameters towards the long run steady state relationship. The Γ_i^{*} 's are $m \times m$ coefficient matrices and provide information about the short run dynamics. μ is the vector of deterministic terms. The $m \times 1$ vector ε_t is assumed to have mean zero ($E\varepsilon_t = 0$), with no autocorrelation ($E\varepsilon_t \varepsilon_{t-s}' = 0 \forall s \neq 0$) but can be correlated across equations ($E\varepsilon_t \varepsilon_t' = \Omega$). Ω may have non zero off diagonal elements. These assumptions imply that ε_t is $I(0)$. It is also assumed that each member of y_t is either $I(1)$ or $I(0)$.

The process of obtaining the long run equilibrium relationship was done in the following sequence. In the first step, the optimal lag length required to make the residuals a white noise process was selected. This was followed by determination of both the rank of Π as well as selection of the deterministic specification in the second step and estimation of the cointegrating relations to determine the long run equilibrium relationship in the third step. In the final step, residual analysis were undertaken to determine whether the model

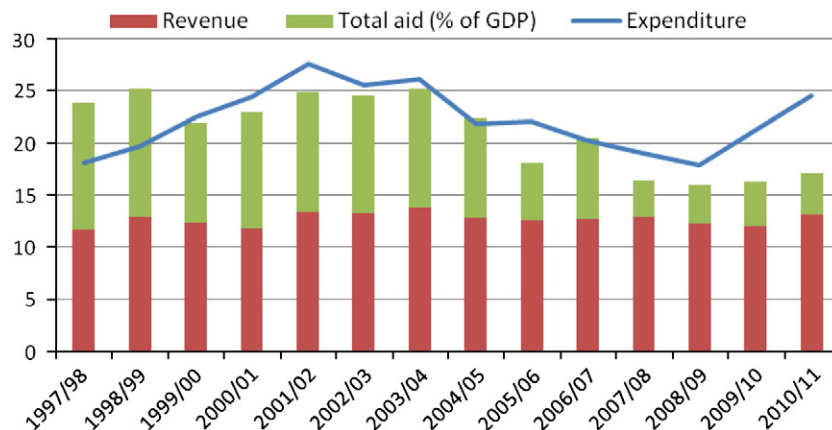


Fig. 2. Aid inflows and public expenditure (% of GDP).

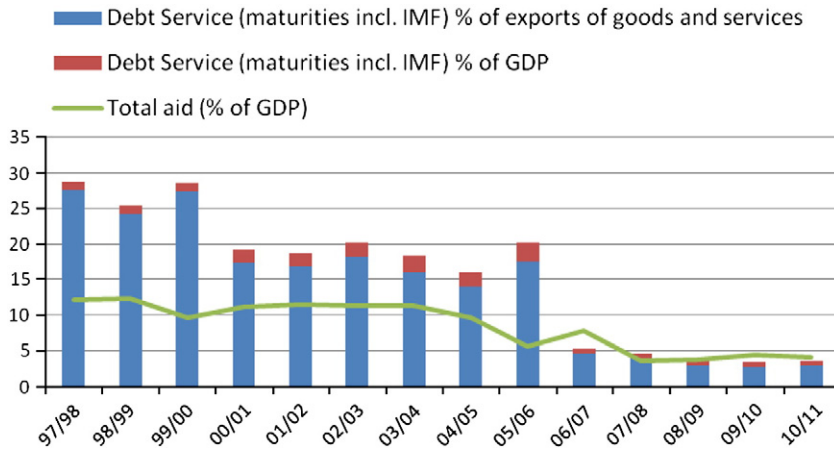


Fig. 3. Aid and sustainability indicators (% of GDP).

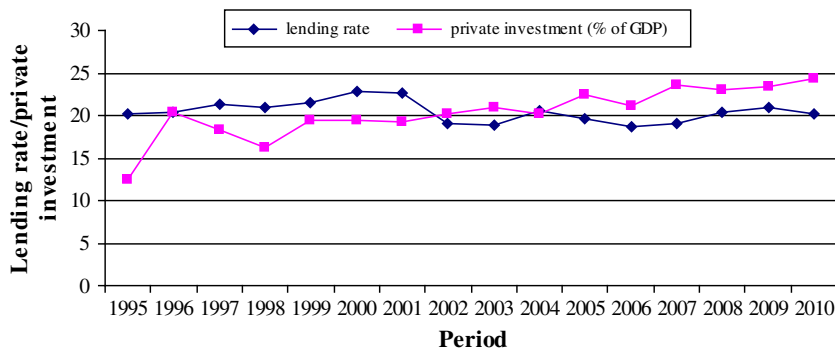


Fig. 4. Commercial bank lending rate and private investment in Uganda.

is acceptable or not. The Johansen procedure assumes that the error terms are independent and

$$\varepsilon_t \sim N(0, \Sigma).$$

It was thus necessary to check for normality, autocorrelation and heteroskedasticity of the residual process. A multivariate Granger non-causality test was also used to validate the cointegrating test results and also to test for the possibility of reverse causality from tax revenues to foreign aid.

An over-parameterized error correction specification, with variables in first difference was employed to provide insights into the nature of the contemporaneous relationship between tax revenue and foreign aid inflows. The general specification that was utilized is of the form

$$\Delta taxgdp_t = \alpha + \sum_{i=1}^k \Delta taxgdp_{t-i} + \sum_{i=0}^k \beta_i \Delta Z_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \quad (2)$$

where Δ is the first difference operator, and β is the vector of coefficients on parameters that are hypothesized to influence tax revenue, Z including aid and its components, per capita income, and the degree of openness of the economy. ECT_{t-1} is the error correction term which comprises the one-period lagged residuals of the tax to GDP regression estimated in levels,

$$taxgdp = \varphi + \phi_1 gdp_{ppc} + \phi_2 open + \phi_4 aidgdp + \eta_t. \quad (3)$$

The error correction term measures the speed of adjustment to the long run equilibrium. The validity of the model reduction was guided by the F test, the R squared and the SC and AIC.

4.2. Data and data sources

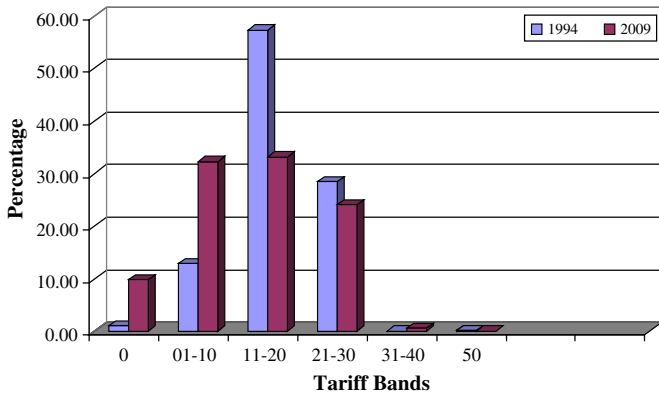
Data on tax revenue were obtained from the Uganda Revenue Authority whereas the balance of payments series and aid were obtained from the Bank of Uganda. Data on GDP and GDP per capita were obtained from the Uganda Bureau of Statistics. The tax to GDP ratio (TAXGDP) is total tax revenue divided by GDP whereas openness (OPEN) is computed as the ratio of imports plus exports to GDP. Aid (AIDGDP) and its components of loans (LOANSGDP) and grants (GRANTS GDP) are also scaled by GDP. Per capita GDP (GDPPC) is the total GDP divided by population. Part of the GDP and GDPPC series are not available on a quarterly basis. The existing annual data for these periods were spliced into quarterly series. The balance of payment variables, tax revenue, GDP, and aid and its components are measured in millions of Uganda shillings whereas the population is measured in millions of people.

4.3. The long run tax revenue relationships¹⁰

Equilibrium analysis of the tax revenue relationship was undertaken for aggregate aid inflows as well as at a more disaggregated level where loans and grants were separated. The estimation process commenced with selection of an optimal lag length to yield residuals as close as possible to a white noise process. A vector error correction model (VECM) of order five was subsequently chosen for the aggregate aid specification (Table 1) whereas four lags were found optimal for the disaggregated specification (Table 2).

This was followed by choice of the deterministic specification and determination of the number of cointegrating equations that span the

¹⁰ This is based on Johansen's test for cointegration. The order of integration of the series is presented in Appendix Tables A1 and A2.



Source: Author’s computation from the TRAINS data set in WITS.

Fig. 5. Patterns in tariff band coverage.

system. In as much as the Akaike information criterion (AIC) suggests use of a quadratic specification with a trend, a linear specification without a trend but with an intercept was used instead.¹¹ The linear specification without a time trend is of interest because only then can the cointegration results be interpreted to represent an equilibrium relationship. The AIC suggests one cointegrating equation for the disaggregated aid specification and two for the aggregated aid inflow system (Table A3 and A4).

The estimated cointegrated relations are presented in Eqs. (4)–(6).

$$taxgdp_t = \underset{(1.72)}{1.34} loansgdp_t - \underset{(-1.80)}{0.62} grantsgdp_t - \underset{(-0.90)}{0.000006} gdppc_t + 14.56 \quad (4)$$

$$open_t = - \underset{(-3.37)}{4.38} loansgdp_t - \underset{(-0.69)}{0.40} grantsgdp_t - \underset{(-0.79)}{0.000008} gdppc_t + 51.75 \quad (5)$$

$$taxgdp_t = \underset{(3.70)}{1.16} open_t + \underset{(2.22)}{1.20} aidgdp_t + \underset{(1.97)}{0.00001} gdppc_t + 39.09. \quad (6)$$

The equilibrium tax relationship is negatively influenced by grants but bears a positive relationship with loans. This is a common finding in the literature. A huge debt stock and the associated future loan repayment burden should induce improvements in tax administration and collection. This cannot be a concern when aid inflows take the form of grants. Loans (and the associated debt stock and repayment) are also negatively related to the degree of openness. This is plausible if fiscal authorities recourse to upward adjustments in some categories of imports to raise the required revenue to finance loan repayment. The protective effect of the tariff code in Uganda is indeed highly variable, which reflects policy makers’ concern about the revenue effects of recent tariff reforms (Hisali, 2012b). It is important to note that per capita gross domestic product (gdppc) has not had a statistically significant relationship with tax revenue in the disaggregated aid specification or even openness.

Total foreign aid is positively related to tax revenue. This suggests that in the long run, the positive effect of loans on tax revenue outweighs the negative effect of grants. The positive effect is conjectured to mimic some improvements that have taken place in the tax system to increase revenue collection for general government spending but also for loan repayment obligations. There has also been considerable technical assistance especially from the IMF and the World Bank aimed at improving Uganda’s tax system. The positive relationship from aid to tax revenue in the long run (Eq. (6)) is borne out by the Granger non-causality tests. The Granger non-causality test results

¹¹ This actually turns out to be an appropriate specification. The residual processes have intercepts but with a zero mean which rules a systematic trend (Figs. A1–A2).

Table 1
Lag length selection criteria for the aggregate aid model.

Variables: TAXGDP1 OPEN AIDGDP1 GDPPC1						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	–1321.018	NA	9.89e + 11	38.97112	39.10168	39.02285
1	–924.0093	735.6339	13,450,594	27.76498	28.41777 ^a	28.02364
2	–891.8885	55.73904	8,415,429.	27.29084	28.46587	27.75642 ^a
3	–871.4033	33.13770	7,470,450.	27.15892	28.85619	27.83143
4	–861.9273	14.21401	9,272,823.	27.35080	29.57031	28.23024
5	–829.7608	44.46550	5,999,439.	26.87532	29.61706	27.96168
6	–804.5473	31.88770 ^a	4,863,382. ^a	26.60433 ^a	29.86831	27.89762

LR: sequential modified LR test statistic (each test at 5% level).

FPE: final prediction error.

AIC: Akaike information criterion.

SC: Schwarz information criterion.

HQ: Hannan–Quinn information criterion.

^a Indicates lag order selected by the criterion.

Table 2
Lag length selection criteria for the disaggregated aid model.

Variables: TAXGDP1 OPEN LOANS GDP GRANTS GDP GDPPC1						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	–1394.797	NA	5.22e + 11	41.17049	41.33369	41.23515
1	–911.8160	880.7295	739,245.8	27.70047	28.67967 ^a	28.08846
2	–863.6511	80.74711	378,548.4	27.01915	28.81434	27.73046 ^a
3	–836.0254	42.25095	361,299.8	26.94192	29.55311	27.97656
4	–822.2581	19.03135	533,449.4	27.27230	30.69948	28.63025
5	–778.1827	54.44603 ^a	336,538.4	26.71126	30.95443	28.39253
6	–744.7435	36.38977	307,381.2 ^a	26.46304 ^a	31.52222	28.46764

LR: sequential modified LR test statistic (each test at 5% level).

FPE: final prediction error.

AIC: Akaike information criterion.

SC: Schwarz information criterion.

HQ: Hannan–Quinn information criterion.

^a Indicates lag order selected by the criterion.

also show that an increase in tax revenue reduces foreign aid inflows. The direction of the relationship between aid and tax revenue in the Granger non-causality framework is inferred from the vector autoregression estimates in Table A5. Details of the Granger non-causality test are presented in Table A6. Openness and per capita GDP are also positively associated with increased tax revenue. Controlling for the degree of openness gives a positive coefficient on the variable per capita GDP in the aggregate aid specification. This is interpreted to reflect the relative ease with which international trade taxes are collected especially in settings like the one in Uganda where limited administrative enforcement has resulted in problems of rampant noncompliance and mutation of taxpayers. A study by Abibi and Banyendera (2006) and surveys both by the Uganda Bureau of Statistics in 2009 and the URA in 2007 give insights into these problems.¹²

The specification tests show absence of any material correlation in the residual process (Table 3).

The normality test relies on skewness and kurtosis of the residuals. The residuals fail the normality test (Table 4). However, the multivariate test is to some extent robust to non-normality provided that the residuals are symmetrically distributed, a condition that is satisfied by our specification.

The diagnostic tests also suggest that the long run error process is homoskedastic. The chi-squared test values and the associated probability values for the aggregated and disaggregated specification were 417.32 [0.53] and 671.64 [0.368], respectively.

4.4. The short run error correction model

The general model estimation results are presented in Table A7. Most of the coefficients are statistically insignificant and cannot be given any meaningful interpretation. The model reduction process

¹² A summary of these findings are given in Section 4.4.

Table 3
Long run residual serial correlation tests.

Lags	LM-stat	Probability value
<i>Disaggregated aid inflow equation</i>		
1	25.48659	0.4354
2	9.885136	0.9970
3	29.08828	0.2602
4	50.88377	0.0017
<i>Aggregate aid inflow equation</i>		
1	7.212285	0.9689
2	18.28469	0.3075
3	16.19897	0.4392
4	43.43120	0.0002
5	9.639705	0.8848

resulted in a parsimonious specification (Table 5) without loss of any useful information. The Akaike information criterion and Schwarz criterion declined quite substantially between the general and the parsimonious specifications which validate the model reduction process. The F and the adjusted R² statistics increased considerably.

The results point to a contemporaneous reduction in tax revenue in response to increased aid inflows. This changes subsequently possibly because of the need to raise sufficient tax revenue required for general functioning of the government but for loan repayment as well. Of particular interest is the relationship between per capita GDP and tax revenue. Whereas the contemporaneous per capita GDP is positively associated with tax revenue, there is a negative association between lagged per capita GDP and tax revenue. It seems to be the case that the latter is a reflection of problems of noncompliance and mutation which are rampant in Uganda's tax system. Many business activities (and hence potential taxpayers) in Uganda continue to operate outside of the tax net. A survey by Abibi and Banyendera (2006) for example established that about 56% of the traders in the capital city of Kampala were not registered for VAT in as much as most of them met the minimum turnover requirements. The Uganda Bureau of Statistics suggests that there are up to 234,000 taxpayers who had been doing business for the last 20 years. But the Uganda Revenue Authority (URA) tax register had only about 102,000 taxpayers (URA, 2010). The URA client satisfaction survey of 2007 also revealed that some taxpayers on the register could not be located. In particular, the URA could not locate 40% of the registered taxpayers on the basis of the addresses that were supplied at the time of registration. This makes the tax system unfair to the few registered taxpayers and provides an incentive to registered taxpayers to engage in tax evasion activities (such as under-invoicing, not issuing receipts and not keeping proper records of their transactions) in the future periods. Adjustment to the long run equilibrium tax relationship is about sixteen percent in each quarter.

5. Summary and policy implication

The relationship between tax revenue and aid receipts remains largely inconclusive. Technical assistance may directly support reforms necessary for increased revenue collection and a huge debt stock coupled with the future repayment burden should ideally 'force' fiscal authorities to implement reforms that enhance revenue collection. But aid also provides 'free' resources to support public spending and may in the process delay the pace at which domestic institutions for tax revenue collection develop. This study contributes to the debate on the tax revenue–aid relationship using Ugandan data over the 1993 and 2011 period. Whereas aid has enabled the country to fund its priority programs without recourse to borrowing from the domestic banking system or even having to increase tax rates, it has had undesirable

Table 4
Residual normality test.

Component	Chi-sq	df	Prob.
<i>Disaggregated aid inflow equation</i>			
Skewness	6.32	5	0.280
Kurtosis	20.94	5	0.001
Jarque–Bera	27.26	10	0.002
<i>Aggregate aid inflow equation</i>			
Skewness	3.34	4	0.502
Kurtosis	16.35	4	0.003
Jarque–Bera	19.69	8	0.012

consequences as well. Other than the usual problems associated with huge debt stock, the liquidity management operations that have been associated with aid inflows in Uganda have kept interest rates artificially high which has undoubtedly slowed the expansion of private investment and by implication the tax base. In general, the stagnant tax revenue share for the last one and a half decades appears to suggest that the contribution of aid (through technical assistance, for example) to tax revenue has been offset by its second order effects. The econometric analysis provides a clearer picture. The long run results show some modest increases in tax revenue in spite of the fact that the positive effect of loans gets partly offset by the negative effect of grants. The per capita GDP coefficients in the short run specification appear to provide insights into problems of mutation of taxpayers and non-compliance which offset the effects of increased income on tax revenue collection. There is also evidence that the incentive and disincentive effects of aid on tax revenue turn out to be offsetting in the short run. The behavior of per capita GDP and aid coefficients appears to mimic Uganda's largely stagnant tax revenue GDP shares over the last one and a half decades. The results point to the need to address loopholes in the tax system that some sections of the taxpayers take advantage of continuing mutating and evading taxes. Strengthening the recently created business intelligence arm of the Uganda Revenue Authority is one possible option. This will increase the pace at which aid receipts are reduced and together with it, reduce disincentive (and other) effects of aid.

Table 5
Error correction model estimation results.

Variable	Dependent variable: DTAXGDP	
	Coefficient	S.E.
DAIDGDP	−0.16	0.05*
DAIDGDP(−1)	0.09	0.05**
DGDPPC	0.00	0.00**
DGDPPC(−2)	−0.00	0.00*
DTAXGDP(−1)	0.50	0.10*
ECT	−0.16	0.04*
C	0.07	0.05
Model diagnostics		
Breusch–Godfrey serial correlation LM test = 0.746 [0.478]		
White's heteroskedasticity test: 1.378 [0.203]		
Ramsey reset test: 2.34 [0.13]		
Adj. R-squared = 0.42		
Akaike info criterion = 0.037		
Schwarz criterion = 0.26		
F-statistic = 9.37 [0.000]		
Skewness: 0.002		

Note: * and ** denote statistical significance at the one and ten percent test levels respectively.

Appendix A

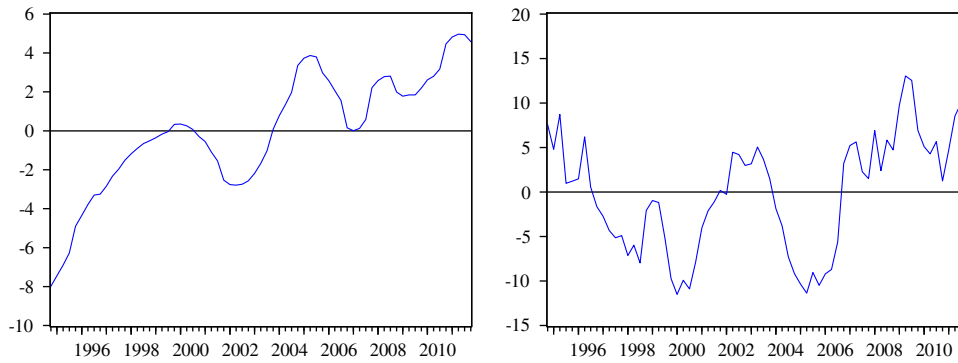


Fig. A1. Cointegration graphs for the disaggregated aid model.

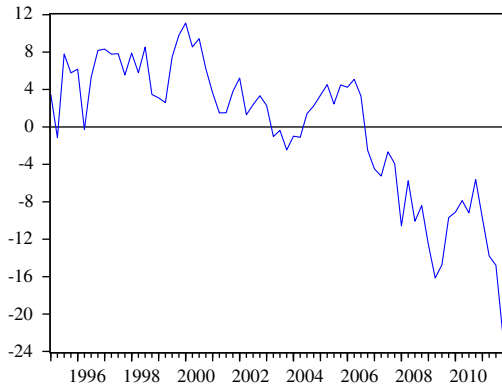


Fig. A2. Cointegration graph for the aggregated aid model.

Table A1
Phillips–Perron unit root tests (levels of variables).

Variable	Phillips–Perron test statistic	Probability value
AIDGDP	-2.419	0.367
GDPPC	3.534	1.000
OPEN	-2.801	0.202
TAXGDP	-2.923	0.161
GRANTSGDP	-1.907	0.641
LOANSGDP	-3.160	0.101

Table A2
Phillips–Perron unit root tests (first difference of variables).

Variable	Phillips–Perron test statistic	Probability value	Conclusion
DAIDGDP	-5.144	0.000	I(1)
DGDPPC	-3.201	0.093	I(1)
DOPEN	-12.752	0.000	I(1)
DTAXGDP	-4.997	0.000	I(1)
DGRANTSGDP	-5.130	0.000	I(1)
DLOANSGDP	-4.780	0.000	I(1)

Note: I(1) denotes that the variable is integrated of order one.

Table A3
Choice of deterministic structure and cointegrating vectors.

Sample: 1993Q3 2011Q4					
Series: TAXGDP1 OPEN LOANSGDP GRANTSGDP GDPPC1					
Lag interval: 1 to 4					
Selected (0.05 level*) Number of cointegrating relations					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Trace	1	2	4	3	1
Max-Eig	1	1	1	1	0
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Log likelihood by rank (rows) and model (columns)					
0	-838.60	-838.60	-837.17	-837.17	-824.12
1	-822.92	-818.71	-817.51	-817.50	-806.58
2	-811.42	-807.20	-806.46	-803.87	-793.58
3	-804.07	-798.90	-798.47	-792.85	-785.33
4	-802.91	-791.55	-791.23	-784.91	-780.35
5	-802.91	-790.50	-790.50	-780.26	-780.26
Akaike information criteria by rank (rows) and model (columns)					
0	27.20575	27.20575	27.30920	27.30920	27.07587
1	27.04114	26.94798	27.02919	27.05791	26.85727
2	26.99766	26.93337	26.99897	26.98177	26.77035*
3	27.07459	27.01151	27.05712	26.98129	26.82118
4	27.33060	27.11753	27.13719	27.06997	26.96654
5	27.62044	27.40582	27.40582	27.25380	27.25380
Schwarz criteria by rank (rows) and model (columns)					
0	30.44358*	30.44358*	30.70893	30.70893	30.63749
1	30.60276	30.54198	30.75270	30.81380	30.74267
2	30.88306	30.88353	31.04626	31.09382	30.97954
3	31.28378	31.31783	31.42819	31.44951	31.35415
4	31.86357	31.78001	31.83205	31.89435	31.82329
5	32.47719	32.42446	32.42446	32.43434	32.43434

* Critical values based on Mackinnon et al. (1999).

Table A4

Choice of deterministic structure and cointegrating vectors.

Sample: 1993Q3 2011Q4					
Series: TAXGDP1 OPEN AIDGDP1 GDPPC1					
Lag interval: 1 to 5					
Selected (0.05 level*) Number of cointegrating relations					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Trace	1	1	2	0	0
Max-Eig	0	0	0	0	0
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
0	–832.3300	–832.3300	–831.5174	–831.5174	–825.7585
1	–821.1938	–820.7292	–820.2621	–816.4408	–811.0349
2	–813.5309	–812.0646	–811.6940	–807.5799	–803.5737
3	–811.4792	–806.5666	–806.2139	–801.7476	–800.5098
4	–811.4602	–804.5473	–804.5473	–799.7142	–799.7142
Log likelihood by rank (rows) and model (columns)					
0	–832.3300	–832.3300	–831.5174	–831.5174	–825.7585
1	–821.1938	–820.7292	–820.2621	–816.4408	–811.0349
2	–813.5309	–812.0646	–811.6940	–807.5799	–803.5737
3	–811.4792	–806.5666	–806.2139	–801.7476	–800.5098
4	–811.4602	–804.5473	–804.5473	–799.7142	–799.7142
Akaike information criteria by rank (rows) and model (columns)					
0	26.83323	26.83323	26.92698	26.92698	26.87525
1	26.74099	26.75674	26.83124	26.74826	26.67750*
2	26.75091	26.76661	26.81453	26.75235	26.69335
3	26.92586	26.86961	26.88864	26.84552	26.83852
4	27.16059	27.07492	27.07492	27.05042	27.05042
Schwarz criteria by rank (rows) and model (columns)					
0	29.44442*	29.44442*	29.66873	29.66873	29.74755
1	29.61330	29.66169	29.83410	29.78376	29.81092
2	29.88433	29.96531	30.07851	30.08161	30.08789
3	30.32040	30.36207	30.41374	30.46854	30.49418
4	30.81625	30.86114	30.86114	30.96720	30.96720

* Critical values based on Mackinnon et al. (1999).

Table A5

Vector autoregression estimates.

	DTAXGDP	DOPEN	DAIDGDP	DGDPPC
DTAXGDP(–1)	0.492566 (0.14803) [3.32748]	–0.156681 (1.55386) [–0.10083]	–0.030716 (0.26747) [–0.11484]	–123.6835 (3598.55) [–0.03437]
DTAXGDP(–2)	0.138631 (0.13926) [0.99550]	–0.285123 (1.46177) [–0.19505]	0.052546 (0.25162) [0.20883]	9081.369 (3385.29) [2.68260]
DTAXGDP(–3)	0.049901 (0.15281) [0.32657]	–0.879268 (1.60399) [–0.54817]	–0.296957 (0.27610) [–1.07553]	–7945.448 (3714.65) [–2.13895]
DTAXGDP(–4)	–0.428645 (0.15230) [–2.81457]	1.548779 (1.59863) [0.96881]	–0.568501 (0.27518) [–2.06592]	–1033.766 (3702.24) [–0.27923]
DTAXGDP(–5)	0.101723 (0.15807) [0.64355]	–1.220891 (1.65921) [–0.73583]	0.585144 (0.28561) [2.04876]	90.57675 (3842.53) [0.02357]
DOPEN(–1)	0.004804 (0.01457) [0.32964]	–0.284145 (0.15299) [–1.85730]	–0.051907 (0.02633) [–1.97104]	–152.1326 (354.303) [–0.42939]
DOPEN(–2)	–0.004889 (0.01499) [–0.32616]	–0.022259 (0.15734) [–0.14147]	0.024488 (0.02708) [0.90416]	432.9901 (364.387) [1.18827]
DOPEN(–3)	–0.001293 (0.01312) [–0.09851]	–0.368804 (0.13774) [–2.67760]	–0.026153 (0.02371) [–1.10306]	232.8032 (318.982) [0.72983]
DOPEN(–4)	3.00E-06 (0.01431) [0.00021]	0.025689 (0.15016) [0.17107]	–0.056620 (0.02585) [–2.19046]	–308.0089 (347.762) [–0.88569]
DOPEN(–5)	–0.004753 (0.01593) [–0.29834]	0.099412 (0.16724) [0.59443]	0.058433 (0.02879) [2.02978]	533.4257 (387.307) [1.37727]
DAIDGDP(–1)	–0.052506 (0.07060)	–1.059603 (0.74113)	0.675024 (0.12757)	907.6643 (1716.36)

Table A5 (continued)

	DTAXGDP	DOPEN	DAIDGDP	DGDPPC
DAIDGDP(–2)	[–0.74367] 0.020800 (0.05746) [0.36201]	[–1.42972] 0.854009 (0.60312) [1.41598]	[5.29122] 0.039064 (0.10382) [0.37627]	[0.52883] –667.7548 (1396.76) [–0.47807]
DAIDGDP(–3)	–0.002213 (0.05799) [–0.03816]	–0.963643 (0.60876) [–1.58295]	0.092115 (0.10479) [0.87905]	594.6042 (1409.82) [0.42176]
DAIDGDP(–4)	0.168632 (0.05827) [2.89403]	0.283200 (0.61164) [0.46301]	–0.925437 (0.10529) [–8.78979]	–792.5921 (1416.49) [–0.55954]
DAIDGDP(–5)	–0.130821 (0.07215) [–1.81306]	–0.326015 (0.75740) [–0.43044]	0.617616 (0.13038) [4.73720]	1036.390 (1754.06) [0.59085]
DGDPPC(–1)	–1.37E-06 (6.0E-06) [–0.22793]	8.31E-05 (6.3E-05) [1.31945]	1.55E-05 (1.1E-05) [1.43176]	0.859075 (0.14584) [5.89067]
DGDPPC(–2)	–5.34E-06 (7.2E-06) [–0.74034]	–4.16E-05 (7.6E-05) [–0.55011]	–2.02E-05 (1.3E-05) [–1.55284]	0.139439 (0.17534) [0.79526]
DGDPPC(–3)	3.68E-06 (7.0E-06) [0.52282]	–2.40E-05 (7.4E-05) [–0.32445]	6.40E-06 (1.3E-05) [0.50380]	0.053626 (0.17101) [0.31358]
DGDPPC(–4)	3.14E-06 (6.3E-06) [0.50159]	2.31E-05 (6.6E-05) [0.35097]	–1.28E-06 (1.1E-05) [–0.11337]	–0.308287 (0.15227) [–2.02466]
DGDPPC(–5)	–4.72E-07 (5.4E-06) [–0.08799]	–3.31E-05 (5.6E-05) [–0.58814]	2.97E-06 (9.7E-06) [0.30657]	0.261551 (0.13045) [2.00492]
C	0.029749 (0.05259) [0.56571]	0.094522 (0.05201) [0.17123]	–0.082253 (0.09502) [–0.86563]	764.3266 (1278.39) [0.59788]
R-squared	0.570370	0.344374	0.733964	0.881405
Adj. R-squared	0.387548	0.065384	0.620757	0.830938
Sum sq. resids	2.782584	306.6010	9.084758	1.64E+09
S.E. equation	0.243319	2.554100	0.439651	5914.991
F-statistic	3.119818	1.234360	6.483391	17.46526
Log likelihood	12.18052	–147.6932	–28.04889	–674.5263
Akaike AIC	0.259396	4.961564	1.442614	20.45665
Schwarz SC	0.944833	5.647000	2.128051	21.14209
Mean dependent	0.025903	0.243763	–0.114571	17.588.27
S.D. dependent	0.310913	2.641930	0.713919	14,385.72
Determinant resid covariance (dof adj.)		2,152,902.		
Determinant resid covariance		491,337.7		
Log likelihood		–831.5174		
Akaike information criterion		26.92698		
Schwarz criterion		29.66873		

Standard errors in () and t-statistics in [].

Table A6

VAR Granger causality tests.

	Chi-squared statistic	Degrees of freedom	Probability value
<i>Dependent variable: DTAXGDP</i>			
DOPEN	0.267851	5	0.9982
DAIDGDP	10.15411	5	0.0710
DGDPPC	1.375946	5	0.9269
All	11.93315	15	0.6841
<i>Dependent variable: DOPEN</i>			
DTAXGDP	1.405686	5	0.9237
DAIDGDP	5.522675	5	0.3555
DGDPPC	2.563516	5	0.7669
All	10.19495	15	0.8073
<i>Dependent variable: DAIDGDP</i>			
DTAXGDP	10.80763	5	0.0553
DOPEN	13.53705	5	0.0188
DGDPPC	3.320743	5	0.6507
All	33.86465	15	0.0036
<i>Dependent variable: DGDPPC</i>			
DTAXGDP	10.90354	5	0.0533
DOPEN	5.121163	5	0.4013
DAIDGDP	0.714282	5	0.9822
All	17.48325	15	0.2908

Table A7
Over parameterized model results.

Dependent variable: DTAX				
Method: least squares				
Sample (adjusted): 1994Q2 2011Q4				
Included observations: 71 after adjustments				
Variable	Coefficient	Std. error	t-Statistic	Prob.
DOPEN	−0.008	0.013	−0.634	0.530
DOPEN(−1)	−0.003	0.014	−0.213	0.832
DOPEN(−2)	0.004	0.013	0.317	0.753
DGDPPC	5E-06	5E-06	1.020	0.312
DGDPPC(−1)	4E-06	6E-06	0.664	0.509
DGDPPC(−2)	−1E-05	5E-06	−2.52	0.01
DAIDGDP	−0.163	0.048	−3.363	0.001
DAIDGDP(−1)	0.062	0.055	1.132	0.263
DAIDGDP(−2)	0.047	0.048	0.962	0.340
ECT(−1)	−0.169	0.048	−3.518	0.001
SDUM1	0.017	0.089	0.194	0.847
SDUM3	0.016	0.088	0.184	0.855
SDUM4	−0.003	0.088	−0.032	0.974
C	0.062	0.072	0.866	0.390
DTAX(−1)	0.504	0.107	4.728	0.000
R-squared	0.49	Mean dependent variable		0.04
Adjusted R-squared	0.36	S.D. dependent variable		0.31
S.E. of regression	0.25	Akaike info criterion		0.23
Sum of squared residuals	3.43	Schwarz criterion		0.71
Log likelihood	6.86	F-statistic		3.77
Durbin-Watson stat	2.06	Prob. (F-statistic)		0.00

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