Is Value-added Tax a Moneymaking-Machine for Developing Economies? Evidence from Ghana

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Abstract
Value-added tax (VAT) became a tax of choice recommended by the Breton Wood Institutions to boost tax revenue shares in developing countries. However, after several decades of VAT implementation globally, empirical evidence on its revenue effects is still inconclusive. The key question in this paper is: has the adoption of value-added tax (VAT) really made Ghana's tax revenue mobilisation better off? This paper employs both the Fully Modified OLS and Autoregressive Distributed Lag (ARDL) approaches to test the moneymaking hypothesis for Ghana's VAT. On the whole, the study fails to uphold the view that the VAT is a money-machine for Ghana. This implies that its adoption has not really brought about any dramatic improvement in aggregate tax shares. The study therefore recommends a reduction in the over concentration on VAT. An appropriate balance of tax-mix is therefore recommended.

JEL classification: H25, E62, O23,
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1.0 Introduction

Mobilising adequate revenue to finance national budgets and other development needs continues to remain a major challenge in most developing countries, especially in sub-Saharan Africa (SSA) countries. This situation is mostly attributed to low domestic revenue generation due particularly to poorly structured tax systems and weak tax administration among others (Stotsky et al. 1997). This situation, coupled with the high public expenditure demands has placed most SSA economies in fiscal distress.

In the early 1980s, most countries in SSA embraced the structural adjustment programme (SAP) spearheaded by the International Monetary Fund (IMF) and the World Bank. An overarching goal of the SAP in SSA was to strengthen the tax system through the introduction of a broad based consumption tax (World Bank 1991). To the Bretton Woods development finance institutions, Value Added Tax (VAT) was the tax of choice to address the inefficiencies in the tax systems in order to boost government domestic revenue. It therefore became the common "fiscal pill" prescribed for almost all developing countries that approached the IMF and the World Bank for fiscal advice and assistance. Currently, all the 54 African countries (except only six) have introduced VAT (Crowe Horwarth International 2016). VAT is also implemented in more than 70 percent of developing countries (Ebeke & Ehrhart 2012).

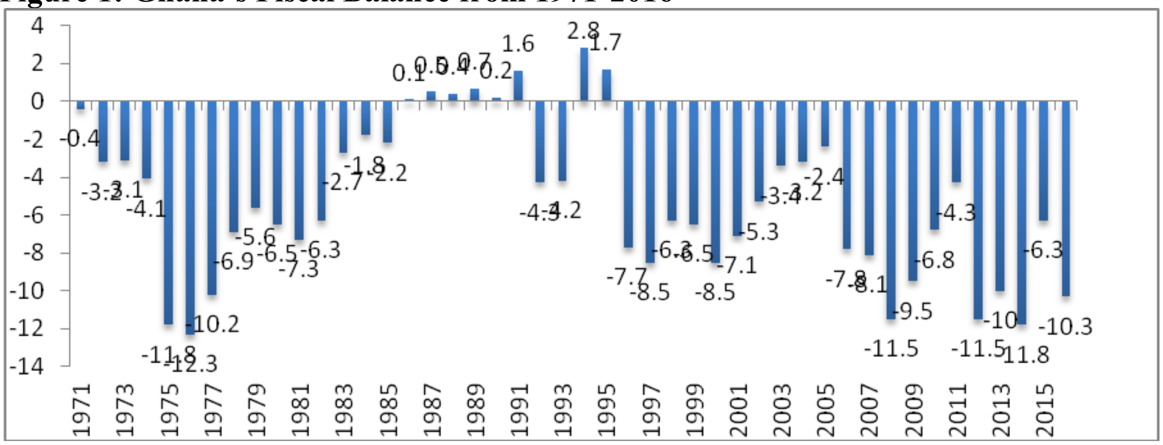
Bird & Gendron (2007) opine that VATs differ immensely amongst countries in terms of the extent of exemptions, zero-rating, threshold levels, number of differentiated rates, ease of accessing refunds, and nature and availability of simplified schemes. Indeed, after several decades of VAT implementation globally, empirical evidence on its revenue effects is still inconclusive. Some studies document positive revenue effects (thus, confirming that VAT is a money-making machine)(see for example Aaron (1981) for Europe ; Keen & Lockwood (2006; 2010) for OECD countries; Martinez-Vazquez & Bird (2010), Ebeke & Ehrhart (2012) and Buettner, Hertz, & Nam (2006) for developing countries. However, others document no or even negative effects. Riswold (2004), for example, rejects the claim of positive VAT revenue effects for both developed and developed countries, Bird & Gendron (2006) find negative effect of VAT for Ukraine, Gemmell (1985) for Europe and Stockfisch (1985) for OECD countries. Gemmell (1985) specifically, notes that the rise in tax ratio tends to be more sluggish when VAT receipts (as proportion of total tax receipts) are relatively larger than the share of income tax receipts. It is further argued that VAT may interact negatively with other forms of tax instruments and as a result reduce overall tax revenue (Le, 2003). The situation is likely to be very severe in developing countries because of the general lack of the critical administrative capacity and structures to deal with the high demands of VAT administration. This empirical divergence re-echoes the long held notion that the revenue effect of VAT is an empirical issue.

The Government of Ghana (GoG), upon the advice of the IMF, first adopted the VAT in 1995[4]. VAT was introduced to replace the existing sale tax and the services tax, bringing them under one tax with a single positive rate instead of the multiple rates regime (which ranged between 10% and 15 %). The VAT was to widen the scope of the tax net and broaden the tax base by roping in other economic activities that hitherto escaped the tax coverage. The move was to deepen the efficiency of the tax system to boost aggregate tax revenue shares and to address the

[4] VAT was first introduced in 1995 but was withdrawn within three months and re-introduced in 1998.

persistent fiscal deficits bedeviling the economy (See Figure 1 for the trends in Ghana's fiscal balance from 1971 – 2015)

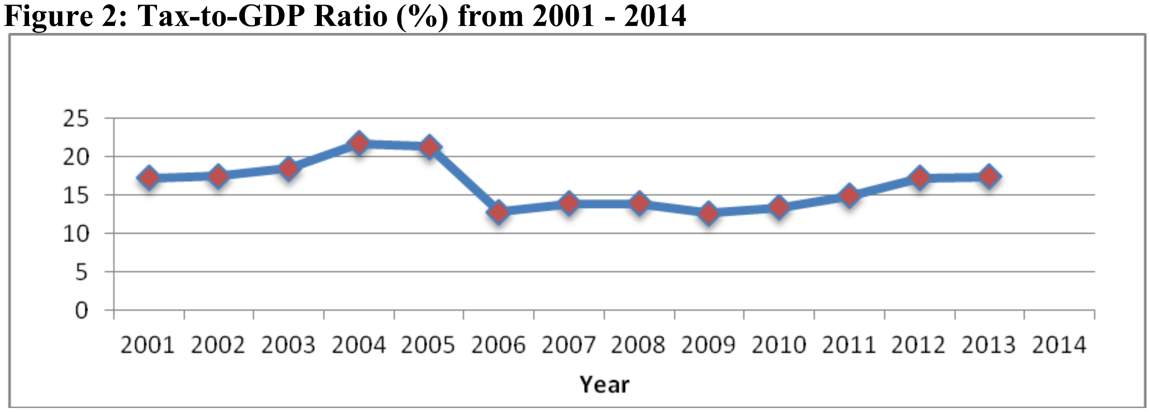
Figure 1: Ghana's Fiscal Balance from 1971-2016



Source: Constructed by Author based on data compiled from various Bank of Ghana(BoG) annual reports and Kusi(1998)

However, after almost two decades of VAT implementation in Ghana, its contribution to total tax revenue has consistently remained below 30 percent from the period 2001-2014 (Andoh, 2017). Moreover, tax-GDP ratio has persistently remained below 17 percent. This is lower compared with the average for the developing world, and even the average for Africa (Osei & Quartey, 2005; World Bank, 2014; Bank of Ghana, 2014). Figure 2 reports the trends in Ghana's tax share from 2001-2014.

Figure 2: Tax-to-GDP Ratio (%) from 2001 - 2014



Source: Author plotted graph with data from WDI (2015).

This paper specifically seeks to examine three key questions: (i) How much effect does the adoption of VAT have on tax ratios? (ii) Does the adoption of VAT increases the buoyancy and stability of aggregate tax share? (iii) Does VAT interact negatively with other tax categories to reduce aggregate tax share? These questions, no doubt, are critical for the discourse on public development financing options and indeed have implications for fiscal behaviour. Moreover, they remain germane to the political economy debate surrounding VAT administration in Ghana. However, to the best of knowledge, no study has specifically paid critical attention to the issues.

1.2 The moneymaking-machine hypothesis

The concept of the "money-making machine" hypothesis of VAT is due Keen and Lockwood (2006). According to the authors, the term consists of two sub-hypotheses: the "weak" and "strong" form hypotheses. The "weak" form hypothesis states that, *other things being equal*, governments or countries, which adopt a VAT, are able to raise more revenue than those without can do. The strong form of the money machine hypothesis, on the other hand, states that the use of the VAT in itself causes increased government size (government size defined as the size of tax revenue of GDP). The strong form of the hypothesis implies the weak form but the reverse does not hold.

A number of theoretical arguments underline the VAT moneymaking machine hypothesis. Nellor (1987) provides a summary of these arguments. First, it is argued that VAT reduces compliance costs as well as the risk of evasion because there is a self-enforcing mechanism inherent in VAT administration that incentivises the producer to pay VAT. At each stage of production, VAT is paid on the gross value added and credit is received for the VAT paid on inputs. It is therefore in the best interest of the producer to do proper bookkeeping on all transactions in order to receive the full credit of VAT payments. Moreover, the multi-stage payment system of VAT administration reduces the risk of tax evasion than under a single-stage sales tax. This argument is re-echoed by Auerbach (1996) ; Altig, et al. (2001). Thus, this line of arguments suggests that since VAT lowers the cost of tax collection, it has the potential of increasing the tax ratio for a given outlay on administration.

The second theoretical argument is that VAT broadens the tax base. The introduction of VAT extends the tax base not only to items hitherto untaxed but also to more buoyant service sectors. This has a number of advantages including providing a leeway for the reduction in the marginal rates of other taxes such as income tax, thereby providing positive supply effects to firms' expansion. Moreover, the incentive for tax evasion is minimised if the rates of other taxes are reduced. McLure (1983) notes that with a broad tax base, large amounts of tax revenue can be generated with relatively small increases in rates. The implication of this proposition is that the tax ratio may increase initially because of extension of the tax base. However, subsequent increases will come on account of discretionary rate adjustments.

Third, it is argued that, in principle, VAT has the characteristics that make it possible to reduce economic distortions. In other words, it is able to raise a given amount of revenue at a reduced or no welfare cost. VAT does not distort investment decisions, as producers do not face any direct burden of it when making purchasing decisions. Exemptions are granted or refund is made for VAT paid. Another argument is that, a VAT designed to have a constant standard rate over time does not distort household saving and business investment choices (IMF ,1991 quoted in Riswold , 2004). In addition, VAT is uniformly levied on final goods and services. As a result, it does not distort relative prices among consumption goods. Furthermore, as a consumption tax, VAT imposes a one-time tax on existing household wealth. Since the wealth is already accumulated, the tax on it functions like a lump-sum tax (Hubbard & Gentry, 1997). In both theory and empirics, lump-sum taxes are noted to have no distortionary effect (Gale & Harris 2010). Finally, as a consumption tax, VAT is believed to minimize the disincentive to save and invest since it does not tax profits and investment.

2.0 Methodology and Data

2.1 Time series properties

The stationarity status of the data is first examined using the both the ADF and the Zivot-Andrews unit root tests. Zivot-Andrews unit root test is employed to cater for the breaks in the series. The results of unit root test are presented in Appendix Table A1. In levels, the ADF test rejects the null of the existence of unit root in all the variables in levels. However, when the breaks in the variables are accounted for, the log of real GDP per capita and real GDP become stationary in levels (i.e. I(0)). Thus, the results from the Zivot-Andrews test shows that variables are integrated of different order. All the variables are however, found to be stationary at first difference (i.e. variables are I(1)) at 1 percent.

With the variables integrated of different order, cointegration test is performed to ascertain the existence of long-run relationships. The appropriate lag order is first selected using the lag selection information criteria. The results are presented in Appendix Table A2. The results show that almost all the information criteria suggest a maximum lag order of 1. Thus lag order 1 is used in performing the cointegration test. The Johansen cointegration approach is then used to estimate the cointegrating relationships among the variables. The results are presented in Appendix Table A3. The result suggests at least one cointegration relationship among the variables.

2.2 Model specification and empirical strategy

In all, three broad groups of estimations are made in this study. The first group of estimations examines the weak form of the moneymaking hypothesis. First, a VAT dummy is introduced into a standard tax effort model to capture the effect of presence of VAT on aggregate tax shares. Following Keen & Lockwood (2006) and Keen & Lockwood (2010), the model is specified as:

$$TR_t = \alpha_t + \delta_t' VAT_t^D + \beta' X_t + \varepsilon_t \qquad (1)$$

Where, TR_t is the total tax revenue as percentage of GDP while VAT_t^D is the VAT dummy, taking the value 1 if VAT was in existence in a particular period and zero otherwise. The term ε_t is a random disturbance term, assumed to be independently and identically distributed.

The variable X_t is a vector of control explanatory variables. These controls include, GDP per capita, trade openness, and size of informal economy. It is well documented that the higher the level of development of a country, the better the quality and effectiveness of the existing institutions, including tax revenue collection institutions. In the literature, GDP per capita which is found to correlate with the level of economic development is used as a proxy for tax administration capacity (Adam, Bevan, & Chambas, 2001; Khattry & Rao, 2002) (Keen & Lockwood 2010). The coefficient is therefore expected to have a positive sign. The structural composition of an economy is also critical in determining the performance of its tax system. An economy that is dominated by informal activities or agricultural led growth is less likely to yeild low tax revenue shares due to the difficulty in taxing those sectors. Piggott & Whalley (2001) and Emran & Stiglitz (2005) show that VAT is undermined in the presence of large informal sector. Share of agriculture in GDP is used to capture for size of the informal economy. Furthermore, Agbeyegbe et al. (2004) show that greater proportion of taxes collected on goods and services in sub-Saharan Africa come from imports. Therefore, trade liberalization policy in the form of tariffs reduction has the tendency to reduce the tax base because tariffs constitute an element of the tax base of taxes on goods and services. In view of the fact that VAT is levied on the base inclusive of tariffs, the tax revenue is likely to be reduced with the adoption of VAT. In this study, trade openness is used to capture the effect of trade liberalization.

Several variants of the baseline equation (1) are estimated by including controls as well as VAT interaction terms. Interactions of VAT dummy with the various controls are included one after the other to explore how they interact with VAT to affect tax ratios. Similar estimations are carried out for models that include interactions between VAT and other tax components. The importance of the inclusion of these interactions is to offer deeper insight into the channels through which VAT affects tax ratios.

Keen & Lockwood (2006) and Keen & Lockwood (2010) (henceforth denoted as K&L) estimate equation (1) severally using OLS and GMM after successive addition of controls. This line of action [of adding controls] is pursued in this chapter. However, given that variables used in this paper are integrated of different order but have cointegrated relationships, in this study, equation (1) is estimated using in a cointegrating regression framework that allows for different estimators. Following Dudine & Jalles (2017), the Fully Modified Ordinary Least Squares (FMOLS) technique (by Phillips & Hansen, 1990) is employed to estimate the long-run parameters of equation (1) while allowing for linear trend.

FMOLS is preferred over OLS because, in the presence of cross-correlation between the cointegration equation error and the regressor innovations, the asymptotic distribution of the OLS estimators is generally non-Gaussian, asymptotically biased, asymmetric, and contains non-scalar nuisance parameters (Wang & Wu, 2012). This renders the conventional testing procedures invalid. The FMOLS therefore employs a semi-parametric correction to eliminate the problems stated above. Moreover, its estimators are asymptotically unbiased, possess fully efficient normal asymptotic properties, and allows for standard Wald tests making use of asymptotic chi-squared statistical inference.

The second estimation under the first group tests the effect of the adoption of VAT on the buoyancy and stability of the tax system. Two approaches are used. The first approach introduces a VAT dummy into a standard tax buoyancy function. In the second approach, the same question is asked differently: what is the growth (buoyancy) of aggregate tax revenue in the absence of VAT compared with that in the presence of VAT? Thus, instead of putting dummy like the first approach, the tax buoyancy is estimated after subtracting VAT revenues from aggregate tax revenues. The buoyancy is also calculated after each of the major tax revenues are subtracted from the aggregate tax revenues. This is intended to control for the possible impact of all major taxes other than the VAT [5]. The results are then compared to see how buoyancy and stability of aggregate tax changes without each of the major tax categories.

The specification and testing of both aspects of this proposition begins with the general econometric approach of estimating tax buoyancy, where Buoyancy is obtained by regressing the

[5] Similar technique is employed by Alm & El-Ganainy (2013) in analyzing the effect of VAT on consumption

log of dependent variable (aggregate tax revenue in this case) on the log of the tax base (Mansfield,1972; Osoro, 1993; Sobel & Holcombe, 1996; Wolswijk, 2009; Belinga et al., 2014 and Dudine & Jalles, 2017). The model is specified as:

$$\ln TR_{it} = \alpha_{it} + \beta_{it} \ln Y_{it} + \varepsilon_{it} \tag{2}$$

Where, $\ln TR_{it}$ is the log of tax revenue or tax share of tax type i at time t, $\ln Y$ is the log of appropriate tax base at time t (GDP in this study). The parameters α and ε are the constant and error term respectively while β is the buoyancy coefficient.

The estimation of (2) takes a slightly different approach. Autoregressive distributed lag (ARDL) approach developed by Pesaran et al. (2001) is employed. The ARDL model not only allows for a flexible dynamic relationship between tax revenue and GDP but also unlike other approaches, it has proven to provide consistent estimates even when the variables are integrated of different order, e.g. I(1) or I(0) (Pesaran and Shin 1998). The ARDL representation of equation (2) is specified as:

$$\ln TR_t = \alpha_t + \sum_{j=0}^{q} \beta_j \ln Y + \sum_{j=1}^{p} \theta_j \ln TR_{t-j} + \varepsilon_t \tag{3}$$

Equation (3) shows that the growth in tax revenue share can be explained by the distributed lag of order q of log of its base (GDP) and the distributed lag of order p of the log of the dependent variable itself (aggregate tax revenue share). The Akaike information criteria (AIC) is used to determine the appropriate lag length in each case. The inclusion of appropriate lag length adequately addresses any possible autocorrelation and endogeneity problems. Since the focus of the study is to examine whether the buoyancy changes in the presence of VAT, equation (3) is modified to capture the presence of VAT. The modified model is thus specified as:

$$\ln TR_t = \alpha_t + \sum_{j=0}^{q} \beta_j \ln Y_{t-j} + \sum_{j=1}^{p} \theta_j \ln TR_{t-j} + \delta_t VAT_{it}^{D} + \gamma_t (VAT^{D} * \ln Y_{it}) + \varepsilon_t \tag{4}$$

Where, VAT^D is the VAT dummy, taking the value 1 if VAT was in existence and zero otherwise. Subtracting the lagged dependent variable from both sides of equation (4) gives the Error Correction Model (ECM) as:

$$\Delta \ln TR_t = \phi_t (\ln TR_{t-1} - \lambda \ln Y_{t-j}) + \beta_{t-1} \Delta \ln Y_t + \delta_t VAT^{D} + \gamma_t (VAT^{D} * \ln Y_{it}) + \varepsilon_t \tag{5}$$

Where the first expression on the right-hand side of equation (5) shows the long-run relationship between tax revenue shares and the tax base. The parameter $\lambda_t = -\frac{\beta_{t-1} + \beta_t}{\phi_t}$ denotes the long-run buoyancy coefficient, β_t is the short-run buoyancy denoting the immediate effect of GDP on tax shares while ϕ_t is the speed of adjustment, which measures how fast the buoyancy, converges to its long-run equilibrium.

Long-run tax buoyancy coefficient may differ from that of short-run. While the short-run buoyancy measures the stabilization function of fiscal policy, long-run buoyancy is important for the impact of economic growth on long-term fiscal sustainability. If short-run buoyancy exceeds one (i.e. $\beta_t > 1$), it suggests that the tax system is a good automatic stabilizer. If it is less than one ($\beta_t < 1$), it means that tax revenue is more stable than GDP and therefore fails to be a good automatic stabilizer. On the other hand, if the long-run buoyancy is greater than one (i.e. $\lambda > 1$), it implies that higher economic growth will improve the fiscal balance through the revenue side of the budget and vice versa (Belinga et al., 2014). If δ_{it} is positive and significant, it means that VAT has positive effect on tax shares and vice versa. Four variants of equations (4) and (5) are first estimated. In order to examine the stability of tax revenue, equation (4) is modified to have the standard deviation of the tax share as the dependent variable. Using standard deviation as a measure of instability is well documented and supported in the literature. However, given that the aggregate tax share is not stationary in levels, the standard deviation is computed after the first difference is taken (Ebeke and Ehrhart 2012; Bleaney, Gemmel, and Greenaway 1995).

The third set of estimations focuses on the strong form of the moneymaking machine hypothesis has an element of causality. The key statistical question here is: Does VAT revenue Granger–cause total/aggregate tax revenue? To answer this question, the Granger-causality test, a well-known approach to test for causality between two economic variables, is adopted. Following Keen & Lockwood (2006), a two-variable unrestricted vector autoregression (VAR) involving total tax revenue and VAT revenue is run. The pre-estimation lag selection-order criteria test (see appendix Table A4) shows that the HQIC and the SBIC criteria prescribe appropriate lag order to be one (1). However, the LR, FPE and the AIC prescribe lag order of four (4). Since estimations may be influenced the lag order, the VAR estimations and the Granger-causality tests are carried out for both lag orders (i.e. lags 1 and 4). The unrestricted VAR equations are specified in equations (6) and (7).

$$TR_t = \alpha_0 + \sigma_1 TR_{t-j} + \beta_1 VR_{t-j} + \mu_t \quad (6)$$
$$VR_t = \delta_0 + \gamma_1 VR_{t-j} + \theta_1 TR_{t-j} + \varpi_t \quad (7)$$

where, TR_t and VR_t are the aggregate tax revenue and VAT revenues at time t respectively(both relative to GDP); TR_{t-j} and VR_{t-j} are the lagged values of aggregate tax revenue share and VAT share respectively , with $j = 1, 4$.

2.3 Data

Both annual and quarterly series are used for different parts of the analysis. The annual series covering the period 1960 to 2015 are on aggregate tax ratios, trade openness, GDP per capita and agriculture share of GDP (Agric-GDP share). This set of data is used to estimate the revenue effects of VAT, the VAR and Granger-causality test. The data is readily obtainable from the World Bank Development Indicators (WDI) from World Bank database but is complemented and validated with data provided by the national budget statements, Central Bank annual reports and Ghana Statistical Service bulletins and annual reports. The second set of data is a quarterly series on real GDP, real total consumption, household consumption and revenues from aggregate tax, VAT and other tax components. This set of data is used to estimate the effect of the absence of VAT and other tax categories on the buoyancy of aggregate tax and it is obtained from databases of Ghana Statistical Service (GSS) and Ministry of Finance (MoF) and the Central Bank's reports.

3.0 Results and Discussions

3.1 Weak form of moneymaking machine hypothesis: effect of VAT on tax ratios

As explained earlier, the weak form of the money machine hypothesis implies that the adoption of VAT increases aggregate tax shares. The results from the FMOLS are presented in Table 1.

TABLE 1
Effect of VAT Adoption on Tax Ratios

VARIABLES	(1) Static Model	(2) Dynamic Model	(3) Model 3 (FMOLS)	(4) Model 4 (FMOLS)	(5) Model 5 (FMOLS)
Trade openness	0.138***	0.0881***	0.0655***	0.0985***	0.0686***
	(0.0107)	(0.0110)	(0.00898)	(0.00984)	(0.0101)
Log per capita GDP	1.933***	1.350**	2.721***	0.489	1.604***
	(0.569)	(0.548)	(0.461)	(0.556)	(0.508)
Agric-GDP share	-0.0906***	-0.0581***	-0.102***	-0.0258	-0.0582**
	(0.0207)	(0.0201)	(0.0163)	(0.0209)	(0.0245)
VAT Dummy	-3.155***	-2.442***	-10.94***	2.252	-16.14***
	(0.499)	(0.481)	(1.511)	(1.788)	(5.407)
VAT*Openness			0.0993***		
			(0.0171)		
Lag Tax Ratio		0.513***	0.553***	0.499***	0.527***
		(0.0321)	(0.0244)	(0.0275)	(0.0337)
Linear Trend	-0.137***	-0.0849***	-0.109***	-0.0748***	
	(0.0186)	(0.0191)	(0.0143)	(0.0168)	
VAT*Agric				-0.127***	
				(0.0467)	
VAT*GDP					1.552**
					(0.606)
Constant	4.882	0.212	-4.681	3.178	16.20***
	(4.139)	(3.970)	(2.996)	(3.508)	(3.336)
Observations	55	54	54	54	53
R-squared	0.440	0.522	0.575	0.514	0.507

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Column 1 reports the results of the baseline model. It has VAT dummy but no lagged value of the dependent variable. The results show that trade openness and GDP per capita increase tax ratios. Specifically, one percentage point increase in trade openness relative to GDP increases tax ratio by 0.138 percentage point. The coefficient is significant at 1 percent. Similarly, 1 percent increase in GDP per capita is found to increase tax ratio by 1.933 percentage points. The coefficient of agriculture share of GDP, however, is significant but negatively signed. It suggests that tax a ratio is reduced by 0.0906 percentage point with a one-percentage increase in agriculture-GDP ratio. This reflects the fact that most agricultural activities are excluded from

VAT. These findings collaborate Keen & Lockwood (2006) and Keen & Lockwood (2010) and International Tax Dialogue (ITD), 2005).

The coefficient of the VAT dummy variable (the variable of interest) is found to be significant at 1 percent. However, contrary to expectation, it is negative. The coefficient of - 3.155 suggests that the adoption of VAT reduces tax ratios by about 3.2 percentage points relative to periods without VAT. The negative sign of the coefficient of the VAT dummy is found in all the various specifications except in model 4 where it is interacted with the agriculture share of GDP. In this specification, the VAT dummy is positive but insignificant. The negative sign of the VAT dummy seems to suggest that the weak form of money machine hypothesis does not hold in Ghana. The results is contrary to what is found by Keen & Lockwood (2006); Keen & Lockwood (2010) and Martinez-Vazquez & Bird (2010)

However, it supports Wawire (2000) for Kenya, Desai & Hines Jr (2005) for a panel of countries and Bird & Gendron (2006) for Ukraine. Bird & Gendron (2006), for instance, explain that when the structure of VAT becomes plagued with privileges, reduced rates, and exemptions and zero-rating, they lead to erosion in the base, thereby depressing its revenue impact. Gale & Harris (2010) give further credence to this explanation by arguing that the exemptions and zero-rating is ineffective since middle-income and wealthy taxpayers consume these exempted and zero-rated products more than low-income households do. Moreover, the practice generates complexity thereby providing incentives for tax avoidance as consumers substitute between zero-rated/exempt goods and fully taxable goods. Thus, the practice has the tendency to depress total tax revenues. There is some reason to believe that this can be the situation for Ghana as there is an existence of generous exemptions and zero-rating in the VAT structure.

In model 3, trade openness is interacted with the VAT dummy. The sign of the coefficient is positive and significant at 1 percent. Specifically, the coefficient is 0.0993, suggesting that VAT interacts with trade openness to increase tax ratio. This positive sign plausibly reflects the fact that in Ghana import VAT contributes about twice as that of domestic VAT. Conventional wisdom holds that VAT has the tendency to work more effectively, the more open is the economy because more open economies ensures large import base on which VAT can easily be imposed.

Model 4, includes an interaction of VAT dummy with agriculture-GDP ratio. In line with expectation, the coefficient is negative and significant, suggesting that VAT interact with agriculture sector to reduce tax ratio. It is observed that, the inclusion of this interacted term renders the coefficient of the VAT dummy insignificant. Furthermore, in model 5, an interaction of VAT and GDP is included. The coefficient of the interacted term is positive (1.552) and significant at 5 percent suggesting 1.55 percent points increase in tax ratios. This finding is in line with the general consensus in the literature. This observation may be rationalized on the basis of the fact that as the economy grows, there is an improved capacity in terms of technology, human capacity and logistics to implement the VAT.

A striking observation is that, while the coefficients of the VAT-openness interaction and VAT-GDP interaction are themselves positive, their inclusion in the model worsens the VAT dummy coefficient to -10.94 and -16.14 respectively. While this indeed presents a complicated situation, intuitively, it makes some economic sense. The presence of trade openness and increased GDP offers greater opportunity for greater VAT yield (i.e. positive coefficients of interaction terms) but at the same time offers greater incentive for greater VAT evasion and avoidance (negative VAT dummy). This may be the case when the growth of the economy is driven by agriculture and export. Exports do not attract VAT and it is difficult to tax agriculture sector. However, since they boost economic activity index, they have the tendency of boosting tax revenues through VAT.

3.2 How does VAT interact with other tax components?

The key question here is: Could there be an offsetting effect from other taxes? A common view is that in situation where the implementation of VAT also provides reinforcing information useful for the enforcement of other tax categories, VAT could interact positively with other tax to offset, to some extent, the depressive effect of VAT. This issue is explored by introducing VAT interaction with other tax categories in the tax effort model. The Fully Modified OLS (FMOLS) results are presented in Table 2.

TABLE 2
Interaction of VAT with Other Taxes

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Trade openness	0.114***	0.111***	0.0954***	0.119***	0.104***
	(0.00921)	(0.00903)	(0.00813)	(0.00936)	(0.00889)
per cap GDP (log)	0.611	0.770*	1.138**	1.064**	-0.206
	(0.450)	(0.442)	(0.483)	(0.443)	(0.471)
Agric-GDP ratio	0.0101	0.00252	-0.144***	0.0126	0.000743
	(0.0178)	(0.0173)	(0.0204)	(0.0179)	(0.0172)
VAT Dummy	-4.316***	-4.402***	-2.805***	-5.732***	-7.483***
	(0.436)	(0.440)	(0.967)	(0.525)	(0.652)
Lag tax ratio	0.458***	0.465***	0.451***	0.449***	0.463***
	(0.0264)	(0.0260)	(0.0243)	(0.0266)	(0.0261)
VAT*PAYE	0.753***				
	(0.0827)				
Linear trend	-0.0930***	-0.0931***	-0.160***	-0.104***	-0.0738***
	(0.0154)	(0.0152)	(0.0204)	(0.0155)	(0.0154)
VAT*comp tax		0.657***			
		(0.0741)			
VAT*Excise tax			0.592		
			(1.229)		
VAT*trade tax				0.893***	
				(0.0979)	
VAT*sales tax					1.007***
					(0.106)
Constant	1.055	0.550	6.950**	-1.518	6.183*
	(3.200)	(3.162)	(3.490)	(3.200)	(3.247)
Observations	54	54	46	54	54
R-squared	0.553	0.555	0.537	0.555	0.560

Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Column (1) includes an interaction of VAT dummy with PAYE, column (2) includes VAT interaction with company tax, and in column (3), VAT interaction with excise tax is included. Columns (4) and (5) include VAT interaction with trade tax and sales tax respectively. In all the models, trade openness, agriculture-GDP ratio, GDP per capita, and VAT dummy have the signs explained in the previous section.

Contrary to the claim by the VAT critics, the results generally show that VAT interacts positively with all the major tax components. With the exception of excise taxes, the coefficients of all the interacted terms are significant at 1 percent. Specifically, the coefficient of VAT-PAYE interaction is 0.753 and is significant at 1 percent. This suggests an increase in tax ratio by 0.75 points. The coefficient for VAT-company tax interaction is 0.657 and is significant at 1 percent. It is observed that the interaction with trade tax gives the highest coefficient (i.e. 0.893) and it is significant at 1 percent, while the company tax interaction gives the lowest coefficient (0.657).

While this suggests that the reduction in aggregate tax following the adoption of VAT is offset by these taxes, with PAYE giving the largest offset, it may also indicate that VAT in Ghana is more compatible with other taxes. This findings support Martinez-Vazquez & Bird (2010) that countries that have adopt VAT generally tend to have higher income tax yields and general sales collection.

3.3 Does the adoption of VAT affect tax buoyancy and stability?

Using equation (4) and (5), the long-run, short-run buoyancy and volatility for aggregate tax share are estimated. The ARDL results are presented in Table 3. The dependent variable for columns 1-3 is log of aggregate tax shares (defined as the total tax revenue divided by real GDP, expressed as a percentage). While the dependent variable in column 4 is tax volatility.

TABLE 3
ARDL Results for Total Tax Shares Buoyancy and Volatility

	Buoyancy			Tax volatility
	1	2	3	4
Long-run				
LR Buoyancy	0.324***	0.321***	0.313***	-0.102**
	(0.019)	(0.061)	(0.018)	(0.034)
VAT Dummy		-0.090	3.7	-0.731**
		(0.404)	(2.2)	(0.256)
GDP-VAT Interact			-0.391	-0.086**
			(0.233)	(0.031)
ECM				
Short-run buoyancy				
SR buoyancy	0.396**	0.401**	0.481**	-0.068**
	(0.159)	(0.141)	(0.13)	(0.024)
Speed of Adjust.	-0.171**	-0.134**	-0.187**	-0.724***
	(0.068)	(0.063)	(0.07)	(0.094)
Dependent Variable				
(lagged)	-0.201	0.453**	-0.342***	0.389***
	(0.134)	(0.145)	(0.103)	(0.102)
VAT dummy				-0.529**
				(0.175)
GDP-VAT interact				0.062**
				(0.021)
Constant				-2.17**
				(0.684)
Obs	50	45	47	49
R-squared	0.221	0.367	0.453	0.761
Root mean square	0.171	0.145	0.137	0.0116
Log likelihood	19.57	26.22	31.69	153.17
Diagnostics				
PSS Bounds Test	3.531*	5.647**	6.217**	17.163***
Breusch-Godfrey	0.3857	0.889	0.7352	0.6508
d-watson	1.879	1.92	1.965	2.08
ARCH LM	0.908	0.557	0.6241	0.1563
Breusch-Pagan				0.1712
Ramsey RESET	-	-	-	0.1919

Standard errors in parentheses,
*** p<0.01, ** p<0.05, * p<0.1

Post-estimation diagnostic tests are also presented at the bottom of Table 5. These include the Pesaran/Shin/Smith (2001) (PSS) ARDL Bounds Test for long-run relationship, Breusch-Godfrey LM test for higher order autocorrelation, Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, Durbin-Watson d-statistic test for first-order autocorrelation, Ramsey RESET test for model specification, and LM test for autoregressive conditional heteroskedasticity (ARCH).

Column (1) presents the model without VAT dummy. Both long-run and short-run coefficients are significant but less than unity, i.e. 0.324 and 0.396 respectively. The short-run coefficient suggests that a 1 percent increase in real GDP instantaneously increases aggregate tax share by about 0.4 percent. This shows that aggregate tax can function well as an automatic tax stabilizer. For the long-run, it increases aggregate tax share by 0.324 indicating that higher economic growth is very weak in improving the fiscal balance through the revenue side of the budget. This is not surprising, especially in Ghana, where for so long a time, growth has been mainly driven by agriculture sector, a sector which is difficult to tax.

All the diagnostics results confirm the model is robust. The PSS bounds test rejects the null hypothesis of no long-run relationship at 10 percent, the Breusch-Godfrey p-value of 0.3857 is greater than 5 percent, thus failing to reject the null hypothesis of no serial correlation, while ARCH LM test confirms that there is no ARCH effects. Since column 1-3 are fitted without a constant (was insignificant so its omission improved the model), the Breusch-Pagan and Ramsey RESET test are not applicable.

Column (2) reports the results when the VAT dummy is included. The results show that the coefficient of the VAT dummy is not significant. Moreover, the inclusion of the VAT in the model does not have any noticeable effect on the both the long-run (LR) and short-run (SR) buoyancy coefficients, the speed of adjustment and the level of significance (LS). For example, in column 1, the coefficients of the LR, SR and speed of adjustment are 0.324 (P-value <0.01), 0.396 (P-value< 0.05) and -0.171 (P-value <0.05) respectively. In column 2, they are 0.321(P-vaue < 0.01), 0.401(P<0.05) and 0.134(p<0.05) respectively. Thus, these coefficients do not change much in both models. Similar observation is made in column 3 when VAT is interacted with GDP. In all this set of findings generally suggest that the presence of VAT does not change the buoyancy of tax system, thus lending support to the findings from the earlier estimations.

In column (4), the dependent variable is the standard deviation of the aggregate tax share. The story is somehow different. It is observed that both real GDP and the presence of VAT reduce the volatility (instability) of tax shares in both long and short-run. Particularly, while a one percent increase in real GDP reduces tax share instability by about 0.10 percent (significant at 5 percent), in the long-run, it reduces it by 0.068 percent in the short-run. Similarly, the presence of VAT reduces the instability by about 0.73 percent (significant at 5 percent) in the long-run and 0.529 percent in the short-run.

3.4 Does the absence of VAT hurt tax buoyancy that much?

The key focus here is to examine and compare how both the LR and SR tax buoyancy coefficient change in the absence of VAT compared to the absence of each of the different major tax categories. The dependent variable therefore differs depending on the tax category whose absence is being examined. For example, in order to examine the extent to which the absence of VAT affects the tax buoyancy, VAT revenue is subtracted from the aggregate tax revenues. Quarterly data from 2000 to 2015 is used for this set of estimations. The results are presented in Table 4.

TABLE 4
ARDL Results comparing absence of tax category on Tax buoyancy

	1 Total Tax	2 Without VAT	3 Without Comp Tax	4 Without PAYE	5 Without Employ Tax	6 Without trade tax
Long-run buoyancy	1.188***	1.182***	1.169***	1.175***	1.259***	1.199***
	(0.063)	(0.061)	(0.062)	(0.062)	(0.063)	(0.06)
Short-run buoyancy	0.281***	0.290***	0.297***	0.287***	0.298***	0.321***
	(0.1)	(0.123)	(0.1.3)	(0.117)	(0.112)	(0.113)
EC Term	-0.195***	-0.249***	-0.204***	-0.228***	-0.219***	-0.227***
	(0.389)	(0.042)	(0.039)	(0.043)	(0.04)	(0.042)
Dynamic term						
Lag Tax revenue	-0.455***	-0.445***	-0.342***	-0.389***	-0.459***	-0.455***
	(0.099)	(0.098)	(0.103)	(0.102)	(0.097)	(0.097)
Constant	-0.627***	-0.897***	-0.669***	-0.669***	-0.871***	-0.809***
	(0.201)	(0.243)	(0.202)	(0.202)	(0.245)	(0.229)
Obs.	60	60	60	60	60	60
R-squared	0.46	0.498	0.423	0.439	0.489	0.487
Root mean square	0.081	0.099	0.083	0.094	0.09	0.09
Log likelihood	68.58	56.16	66.5	59.26	66.53	61.71
Diagnostics						
bgodfrey	0.879	0.527	0.719	0.416	0.865	0.457
d-watson	1.916	1.786	1.839	1.795	1.935	1.781
Breusch-Pagan	0.4087	0.118	0.062	0.098	0.055	0.072
Ramsey RESET	0.122	0.229	0.057	0.125	0.058	0.061

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The dependent variable in Column (1) is the log of tax revenue. That of column (2) is total tax revenue less total VAT revenue, column (3) is total tax revenue minus company tax, column (4) is total tax revenue minus PAYE, column (5) is total tax revenue minus self employment tax and finally, column (6) is total tax revenue minus trade tax. Each model's diagnostics are presented at the bottom of each column. In column (1), the long-run buoyancy coefficient is approximately 1.2 (significant at 1 %), the short-run is approximately 0.3 (significant at 1 %) and the EC term is approximately 19.5 percent (significant at 1 %). In column 2, when total VAT revenue is subtracted from aggregate tax revenue, both the long-run (LR) and the short-run (SR) buoyancy coefficients still remain unchanged at approximately 1.2 (significant at 1 %) and 0.3 (significant at 1 %) respectively. The EC term however, increases to about 25 percent. Thus, the exclusion of VAT from the aggregate tax revenue does not have any considerable effect on the long and short-run tax buoyancy coefficients. This is in line with the observations made with the estimations involving VAT dummies.

The lowest buoyancy coefficient is obtained when tax revenue is without company tax (i.e.1.16), while the highest buoyancy is obtained when total tax revenue is less self-employment tax (1.259). The tax buoyancy coefficients when PAYE, VAT and trade taxes are subtracted total tax revenues are 1.175, 1.182 and 1.199 respectively. This suggests that the absence of company tax hurts tax buoyancy more relative to the absence of VAT and the other tax categories. Thus, in terms of tax revenue growth, Ghana is not as worse off without VAT as with company taxes. This result thus, tends to demystify the notion of superiority of VAT relative to other taxes. The long-run buoyancy coefficient of the VAT itself could possibly explain the lack of a commanding effect of VAT on buoyancy of total tax revenue. Andoh, Osoro, & Luvanda (2017) find the long-run buoyancy for Ghana's VAT to be statistically equal to unity, suggesting a weak growth in relation to growth in VAT base.

3.5 Does VAT Granger-cause tax revenue?

It should be recalled that the key question under the strong form of the VAT money machine hypothesis is: Does VAT Granger-cause tax revenue? In other words, is there any evidence that the increase in share of VAT receipt is a cause or consequence of increased government size (measured in terms of tax revenue share)? The results of the granger causality test are presented in Table 5. The abbreviations L1, L2, L3 and L4 denote the lag orders.

TABLE 5
Granger-Causality Test

VARIABLES	(1) Tax-GDP	(2) VAT-GDP	(3) Tax-GDP	(4) VAT-GDP
Tax-GDP share L1	0.716***	-0.0613	0.480	0.0605
	(0.268)	(0.0676)	(0.327)	(0.0861)
Tax-GDP share L2			-0.0514	-0.0491
			(0.342)	(0.0901)
Tax-GDP share L3			-0.366	-0.0593
			(0.338)	(0.0891)
Tax-GDP share L4			0.180	-0.0258
			(0.323)	(0.0851)
VAT-GDP share L1	0.896	0.292	0.134	0.327
	(1.068)	(0.269)	(1.297)	(0.341)
VAT-GDP share L2			-0.533	-0.0160
			(1.388)	(0.365)
VAT-GDP share L3			0.625	-0.0173
			(1.351)	(0.356)
VAT-GDP share L4			0.297	0.195
			(1.258)	(0.331)
Constant	0.358*	0.0959*	0.347	0.110*
	(0.198)	(0.0500)	(0.224)	(0.0590)
Observations	58	58	55	55
R-squared	0.272	0.271	0.4045	0.3539
Prob > F	0.0002	0.0002	0.0014	0.0063
No of lags	1	1	4	4
Post estimation diagnostics				
Granger causality test (P>F)	0.4053	0.3689	0.9363	0.9023
LM test (autocorrelation)	0.74098	0.74098	0.40929	0.40929
Jacque-Bera test (P>Chi2)	0.66716	0.51751	0.23017	0.12285

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
L1, L2, L3 and L4 denote the lag orders

All the models pass the post-estimation tests. Specifically, the Langrage Multiplier (LM) test for residual autocorrelation shows that, at all the lag orders, the p-values 0.74 (for columns 1 and 2) and 0.41 (columns 3 and 4) are greater than 0.05. This means that the null hypothesis of no autocorrelation cannot be rejected, suggesting that, there is no evidence of autocorrelation in the residuals. Similarly, the Jacque-Bera test for residual normality shows that all the p-values for columns 1 to 4: 0.667, 0.518, 0.230 and 0.123 respectively are greater than 0.05 (or 5%). This means that the null hypothesis of normally distributed residuals cannot be rejected, an indication that residuals are normally distributed. In the last two columns (where there are four lags), joint significance of the lags is tested using an F–test.

Columns (1) and (3) report the granger-causality test for government size at lag orders 1 and 4 respectively. Thus, the dependent variable is government size (measured by aggregate tax revenue shares). The p-values of the F-tests for joint granger-causality are 0.405 and 0.936 for columns (1) and (3) respectively and they both exceed 0.05 (i.e. 5 percent). Thus, the null hypothesis that lags of VAT do not granger cause tax revenue cannot be rejected suggesting that there is no evidence that VAT granger-causes tax revenue. Similarly, columns (2) and (4) report the results for VAT revenue at lag order 1 and 4 respectively. The results show that the p-values are greater than 0.05, indicating that government size does not granger-cause VAT revenue. Thus, on the whole, the results suggest that VAT is neither a cause nor a consequence of large government size (measured in terms of aggregate tax ratio) in Ghana. This finding is in line with that of Keen & Lockwood (2006). This may fundamentally be linked not only to the growth in the VAT revenue itself but also the extent to which the available VAT taxable capacity is harnessed into actual tax revenues. If tax buoyancy is high and at the same time there exists an enormous scope for further tax revenue, then it is possible for VAT to cause an increase in aggregate tax ratio. However, given the limited scope for further VAT expansion (Andoh, 2017) coupled with the weak long-run buoyancy (Andoh et al., 2017), it is not surprising that Ghana's VAT is not found to statistically cause increased aggregate tax ratio.

4.0 Conclusion

This study examines question of VAT moneymaking machine for Ghana. The key empirical questions examined are: (i) does the adoption of VAT increase total tax revenue ratio? (ii) Does the VAT interact negatively with other tax components? (iii) Does the adoption of VAT improve the buoyancy (growth) and stability of the tax system? (iv) does VAT granger-cause total tax revenues? The empirical analysis suggests that the adoption of VAT is not found to have any convincing positive effect aggregate tax ratio.

Specifically, the VAT dummy is found to be negative in all the various specifications, except in the specification with agriculture share of GDP as a control variable. Moreover, the adoption of VAT model does not lead to any significant change in both the long-run and short-run buoyancy coefficients. This finding is reinforced by the buoyancy estimations where the absence of VAT does not appear to hurt tax buoyancy as much the absence of other taxes such as company tax does. Put together, the findings surprisingly fail to uphold the supposition that the VAT is a money-machine for Ghana. Furthermore the study does not find any evidence of causality between VAT revenue and total tax revenue. Finally, VAT interacts negatively with share of agriculture sector but positively with trade openness and per capita GDP. Similarly, the results show that VAT interacts positively with all the major tax components to increase tax ratios.

It is puzzling to observe that although VAT's effect on tax ratio is negative and its contribution to growth in aggregate tax ratio is weak, this is not lead to a downward trend of aggregate tax ratio. The picture that emerges is that the overall impact of VAT on aggregate tax ratios is substantially diluted, to a larger extent, by the stronger offsetting increase in aggregate revenue growth effect of other tax categories. Thus, the collective growth effect of the various tax components overweighs the depressing effect of VAT, thereby offsetting its negative revenue growth contribution.

Undoubtedly, there could be other analyses that may yield other conclusions different from those made in paper. However, the key idea that emerges from this study is, the fact that VAT is, indeed, not confirmed as a moneymaking machine for Ghana, as suggested by the empirical results, should not be a strong reason to relegate it to the background. As widely argued in the public finance literature, as long as consumption taxation is considered to be the way forward and is being encouraged to be made a key components of country's fiscal system, there is justifiable reasons to maintain VAT in Ghana. Studies that examine tax reforms argue that switching to consumption taxation significantly minimises the disincentive to save and invest since profit and investment are not taxed (Yun, 1990; Auerbach, 1996). Moreover, the efficiency of income taxation is improved (Naito, 2004). Specifically to VAT, it is argued that it reinforces the principle of productive and allocative efficiency because it does not distort investment decisions since producers do not face any direct burden of VAT when making purchasing decisions. Moreover, it does not distort relative prices among consumption goods. In addition, VAT revenues tend to be more stable over the economic (Auerbach, 2010; Ebeke & Ehrhart, 2012). Furthermore, VAT is said to be broad-based, reliable, has compliance advantages over the sales tax as it avoids the cascading problem mostly encountered in sale taxation.

Therefore, in terms of policy advice, based on the findings, this paper argues that the way forward lies within the adoption of an appropriate balance of tax mix. This has the tendency of fortifying the aggregate tax system. As observed from the analyses, all the other tax components are equally important in maintaining aggregate tax revenue growth. Indeed, Ghana's quest to finance its development mostly from funds mobilised domestically (rather than relying on foreign aid and bilateral loans) is likely to remain illusive if the over emphasis on VAT is not reduced. This is against the background that, unlike other taxes, Ghana's VAT has a very checkered history, well entrenched within a political economy landscape. Frequent boycotts of opposition political party in parliament during deliberations on VAT amendments and the frequent public demonstrations that have followed upward adjustment in rates and threshold amply exemplify the level of public prejudices about VAT. Within such a context, even if the best possible VAT regime is put in place, it is obvious that it will not be able to make the needed money to fill the fiscal gap in Ghana and developing economies as a whole.

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APPENDIX

TABLE A1

Unit Root Results

	Levels		
Variables	**ADF**	**Zivot-Andrews**	**First Difference**
Excise tax share	-2.618	-	-5.910***
Company tax share$^{+\#}$	-1.021	-2.699	-6.532***
PAYE share$^{+\#}$	0.205	-1.229	-8.369***
Import tax share^{+}	0.008	-3.259	-8.841***
Aggregate Tax share	-2.139	-	-6.387***
GDP (log)$^{+\#}$	-0.623	-8.941***	-7.438 ***
Percapita GDP(log)$^{+}$	-1.509	-5.580***	-7.026***
Trade openness$^{\#}$	-1.284	-3.093	-6.758***
Agric-GDP ratio$^{+\#}$	-1.519	-2.375	-7.672 ***

*** *(P<0.01), ** (p<0.05), * (p<0.1)*

+ Denotes test with trend; # denotes test with break

TABLE A2

Cointegration Lag Selection- Order

Sample: 1965-2015 **No. of Obs = 51**

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-557.07				42238.9	22.002	22.061	22.154
1	-377.21	359.71	16	0	68.58*	15.577*	15.867*	16.335*
2	-369.64	15.14	16	0.514	96.63	15.908	16.429	17.271
3	-357.96	23.37	16	0.104	118.06	16.077	16.829	18.047
4	-346.69	22.54	16	0.127	150.91	16.262	17.246	18.838
5	-333.05	27.27*	16	0.039	183.316	16.355	17.571	19.537

TABLE A3

Johansen Test for Cointegration

Maximum Rank	Parms	LL	Eigenvalue	Trace stats	Critical Value (5%)
0	84	-187.85	.	35.372	29.68
1	89	178.35	0.338	14.379*	15.41
2	92	-170.66	0.284	0.9914	3.76
3	93	-170.16	0.021		

Sample: 1963—2015; * indicates maximum rank

APPENDIX A4:

Granger-causality Lag Selection-Order criteria

Sample: 6-60 **No. of Obs=55**

lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-95.271				0.109	3.464	3.493	3.537
1	-75.225	36.09	4	0.000	0.066	2.953	3.038*	3.173*
2	-73.676	3.0998	4	0.541	0.072	3.043	3.183	3.408
3	-69.149	9.0531	4	0.060	0.071	3.024	3.221	3.534
4	-62.881	12.537*	4	0.014	0.065*	2.941*	3.195	3.598

Endogenous: Tax-GDP share and VAT-GDP share