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Growth Dynamics of Value-Added Tax Revenue in Ghana

Francis Kwaw Andoh¹, Nehemiah E. Osoro², Eliab Luvanda²

ABSTRACT

The introduction of the value-added tax (VAT) to replace the sales tax in 1995 was one of the key policy steps undertaken by the government of Ghana (GoG) to further deepen and sustain the efficiency of Ghana's tax system to boost tax revenue. This study uses quarterly data from 2000 to 2014 and employs dynamic ordinary least squares (DOLS) and Divisia Index approaches to examine the growth of Ghana's VAT revenues and how this growth is affected by discretionary tax measures. On the whole, the study finds that all of the measures of VAT revenue (total VAT, domestic VAT, and import VAT) have experienced some growth. Growth in total VAT and import VAT is driven strongly by growth in the base, while that of the domestic VAT is driven by both discretionary tax measures and the tax base. Discretionary tax measures are found to have a depressive effect on both total VAT and import VAT revenue growth.

KEY WORDS:

value-added tax, consumption tax, tax collection and fiscal policy

JEL Classification: H25, H26, E62

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1. Background

Value-added tax (VAT) has emerged as the most significant fiscal tool in both developed and developing economies. It has been described as a "breath-taking tax development" (Ebrill, Keen, & Summers, 2001) and the most significant event in the evolution of tax structures in the last half of the 20th century (Cnossen, 1991). Currently, more than 164 countries worldwide have adopted VAT. Approximately two-thirds of least-developed countries have a VAT (Annacondia & van der Corput, 2012), and all of the 54 countries in Africa, except for six, levy a VAT (Crowe Horwarth International, 2016). As key strengths, VAT is believed to be broad based, avoiding cascading taxes (tax on another

tax), thereby checking distortions and over taxation. It is also considered to have an inherent self-checking mechanism, hence the tendency to improve tax compliance and minimize the occurrence of tax avoidance, evasion and fraud. In view of the above qualities, VAT is said to have greater potential to raise a substantial amount of revenue even at moderately low rates and for countries that are even in their early stages of development (World Bank, 1991). It has also been argued that VAT revenue tends to be more stable over the economic cycle (Auerbach, 2010; Ebeke & Ehrhart, 2012).

However, critics argue that gains from VAT are questionable, especially in sub-Saharan Africa (SSA) due partly to the existence of a large informal sector. Moreover, it is argued that in developing countries, there exists weak tax administrative capacity; hence, it is difficult to address gross abuse associated with exemptions, zero-rated goods and tax credit refunds,

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which have always been inherent in the structure and operation of VAT (Emran & Stiglitz, 2005). Furthermore, since the prices of some VAT goods can react more strongly to macroeconomic fluctuations, VAT revenue might be less stable (Fricke, Süßmuth, & Süßmuth, 2014).

Studies on tax revenue growth abound. Recent ones include Sobel and Holcombe (1996) Bruce, Fox, and Tuttle (2006) for the US; Cotton (2012) for Trinidad and Tobago; Koester and Priesmeier (2012) for Germany; Kargbo and Egwaikhide (2012) for Sierra Leone; Wolswijk (2009) for the Netherlands; Belinga, Benedek, de Mooij and Norregaard (2014) for OECD countries; Fricke et al. (2014) for Latin American countries; Wawire (2003) for Kenya; Choudhry (1979) for the United States, United Kingdom, Malaysia and Kenya; and Kusi (1998) for Ghana. However, none of the studies paid detailed attention to VAT revenue growth. Twerefou, Fumey, Assibey and Asmah (2010), which is the study closest to ours, estimated the buoyancy and elasticity of a number of tax handles, including VAT for Ghana for the period of 1970-2007. The VAT was reintroduced in 1998; hence, at the time of the study, VAT had been in operation for only seven years. In light of this data limitation, the study merged sales tax and VAT into one variable. Obviously, the results could be more reflective of sales tax than VAT. Moreover, the focus of the study was to compare the tax buoyancy of the pre-economic reform era (before 1984) and the postreform era (i.e. after 1984).

In view of the centrality of the VAT to Ghana's fiscal consolidation efforts, examining its growth dynamics is imperative. Our key contribution is that we use exclusive and extended data on VAT revenues and apply the recently developed two-step (2S) regression approach of error correction model to estimate the long- and short-term VAT buoyancy. We also employ the superior Divisia Index technique to isolate the elasticity coefficients from the buoyancy coefficients. The study also goes further to estimate the buoyancy and elasticity of the disaggregated VAT components (domestic VAT and import VAT) while at the same time, examining the asymmetric responses for each component. These dimensions are very useful for monitoring tax revenue performance and government fiscal planning.

1.1. VAT in Ghana

The VAT was first introduced in Ghana in January 1995 (actual collection started in March 1995). However, after three and half months (June 1995), the VAT was suspended due to public protests resulting in several deaths. It was reintroduced in January 1998. The introduction of the VAT was in line with the recommendations of the then ongoing IMF's Enhanced Structural Adjustment Facility (ESAF), which specifically emphasized a tax reform centered on a "broad-based consumption tax, notably a VAT". This step was undertaken to encourage developing economies to move away from income taxation and its associated distortions and toward consumption taxation. Prior to the introduction of the VAT, Ghana's indirect tax regime was principally based on sales tax, which was administered by the Customs, Excise and Preventive Service (CEPS), and a services tax, administered by the Internal Revenue Service (IRS).

By design, the sales tax was levied only on goods and collected as a single-stage tax at the factory gate or at the point of importation, whereas the services tax was charged on hotels and restaurants (Hotels and Restaurants Customers Tax), advertisements (Advertisement Tax), sports betting (Betting Tax) and some entertainment (Entertainment Tax). As limitations, the sales tax excluded the retail and service sectors from the base of indirect taxation. This system undermined the buoyancy of the revenue system (Terkper, 1994a). In addition, sales tax provided exemptions for large numbers of supplies and end users, thereby distorting and eroding the revenue base of the tax system. Together, both the sales and services taxes were limited in scope and very complex because of the differentiated and multiple rates regime (which ranged between 10 percent and 15 percent), as well as the gamut of exemptions provided under the regime. Eventually, it became clear that the administration of these differentiated sales taxes encouraged tax misapplication, evasion and avoidance since these taxes could not meet the revenue targets (Terkper, 1994a; Osei & Quartey, 2005). The above issues implicitly defined the principal goal of Ghana's VAT, particularly to address the fundamental problems of a distorted indirect tax regime, specifically the sales and services tax regimes and the bottlenecks exhibited by an ineffective administrative machinery (Terkper, 1994a). It

was also to widen the scope of the net tax and broaden the tax base by roping in other economic activities that hitherto escaped the tax coverage. Thus, the VAT was meant to further deepen and sustain the efficiency of Ghana's tax system to boost tax revenue generation (Osei & Quartey, 2005).

Ghana operates a uniform (single) standard VAT rate regime with exports classified as zero rated. The uniform VAT rate has, however, undergone a number of changes. In 1995, when the VAT was first introduced, the rate was 17.5 percent. The rate was reduced to 10 percent in 1998 when the original VAT Act which established the VAT, was repealed and replaced by a new VAT Act 486 (Terkper, 1994b; VAT Act 546, 1998a). In 1999, i.e., a year after the reintroduction, the VAT rate was further increased from 10 percent to 12.5 percent (but took effect in May 2000). The additional 2.5 percent was earmarked for the Ghana Education Trust Fund (GETFund). GETFund is devoted primarily to tertiary education infrastructural development and scholarships for building the capacity of faculty for tertiary schooling (Prichard, 2009). In September 2004, the rate was again increased to 15 percent. The additional 2.5 percent was, however, branded as the National Health Insurance Levy (NHIL) because the proceeds were earmarked for the funding of the newly introduced National Health Insurance Scheme (NHIS). The NHIS had just been introduced nationwide to replace the cash and carry system of accessing healthcare (Prichard, 2009). Furthermore, in 2007, a VAT Amendment Act, VAT Act 734 was enacted to introduce a VAT flat rate scheme (VFRS) (Ghana News Agency, 2007). This scheme is a collection mechanism that applies a marginal tax percentage rate as net VAT payable on the value of taxable supplies (Prichard, 2009). Under the VFRS, retailers and traders with annual sales ranging between GH¢10,000 (\$2,272 using the current exchange rate of \$1=GH¢4.4) and GH¢120,000 (\$27,272) were made to charge a VAT flat rate of 3 percent as net VAT payable on their taxable goods. This scheme was intended to facilitate VAT collection in the informal retail distributive trade sector. The threshold for the payment of the VFRS was, however, increased to GH¢200,000 (\$45,450) in 2017.

In 2013, a new VAT Act not only increased the rate to 17.5 percent but also outlined a number of new discretionary measures (VAT Act 870, 2013). The key re-

forms in the Act 870 included an imposition of VAT on fee-based financial services and removal of telephone handsets from the list of VAT supplies exempted under the VAT Act 546. This implied that the supply and import of telephone sets, including mobile or cellular phones and satellite phones, attracted VAT (PricewaterhouseCoopers, 2013). However, in 2017, with the opposition party now in power, a new VAT (Amendment) Act, VAT Act 948 (2017), was enacted to amend the VAT Act 870 (Mensah, 2017). This amendment gave legal backing to the VFRS. Regarding the supply of goods, and it extended coverage to include wholesalers and retailers. The new act also reclassified the supply of financial services, domestic air transportation and sale of immovable property by real estate developers as exempt supplies. These services attracted VAT under the VAT Act 870 (The Parliament of the Republic of Ghana, 2017).

In Ghana, the VAT is levied on both domestically produced and imported goods and services. The VAT on domestic goods and services is collected in stages on the value added to the product. The law governing VAT, the VAT Act 546 (VAT Act, 1998a) and VAT Regulations 1998 (VAT Regulations 1998, 1998b), define "value-added" as the mark-up that a producer or supplier adds to the cost price of his or her materials and supplies before selling the new or improved product or service to a customer (Ghana Revenue Authority, 2018). Registered manufacturers, wholesalers, retailers and services providers perform the collection on behalf of the Ghana Revenue Authority (GRA). Individuals and firms registered with the VAT Service can charge VAT on their supplies. VAT on taxable imports is collected at the time of importation. For VAT purposes, the time of importation is when the customs and other duties and taxes become due. Thus, import VAT is collected at the point of entry into the country. The value for charging VAT on imports is the value for customs duty plus import duties and other taxes, which might be chargeable by the CEPS.

VAT registered importers are entitled to claim this VAT as input tax unless they render supplies exempt, in which case only the VAT incurred in producing taxable supplies will be reclaimable. According to GRA, the services provided by freight forwarding, shipping and clearing agents and port authorities are liable to VAT, and providers of these services are required to

register for VAT. The VAT on imports paid by a freight forwarding or shipping or clearing agent on behalf of an importer is an input tax that can be reclaimed by the importer and not the agent. This principle also applies to the VAT paid on any other services on behalf of the importer. However, when the agent is charged directly for a service, and the tax invoice is in his or her name, he or she is entitled to recover the VAT as an input tax but must also account for VAT in full on the services that he or she invoices to the importer (Ghana Revenue Authority, 2018).

Ghana's VAT is based on the destination principle, meaning that VAT is paid on all taxable supplies at the point of consumption, regardless of the country of production. Under the destination type, exports do not attract VAT, but imports do unless the item is an exempt supply. Appendix 1 provides a list of exempt goods and the year of exemption. Notable among the exempt goods are basic foodstuffs, medicines and pharmaceutical products, newspapers and books, water, electricity, public transportation, feed, seed, fertilizer, agricultural implements, petroleum products, and handicrafts. The invoice-credit VAT system of Ghana's VAT allows registered traders to automatically offset the tax paid on inputs against the taxes on output, with the difference paid to the tax authorities. When the amount of input VAT deductible exceeds the output tax, the tax authority (in this case the GRA) pays the difference. However, the latter case rarely occurs given that the output tax is based on value added. This system applies to both import VAT and domestic VAT on the basis that the inputs were used wholly, exclusively and necessarily in the course of the business (The Parliament of of Republic of Ghana, 2017).

1.2. Dynamics of Tax Revenues in Ghana

In broad terms, there are four categories of taxes in Ghana. They are taxes on income and property, taxes on domestic goods and services, international trade taxes and value-added tax. With the exception of the VAT, the other three categories have been operational in Ghana since independence. Prior to 1998 (before the reintroduction of VAT), taxes on international trade constituted the largest contribution to tax revenue in Ghana, followed by taxes on domestic goods and services and then taxes on income and property. Specifically, taxes on international trade contributed

on average 38.8 percent to total tax revenue for the period of 1980-93 and 32.1 percent between 1996 and 1998. Taxes on domestic goods and services contributed on average 28.5 percent and 24.4 percent over the same period, respectively, and taxes on income and property contributed approximately 21.3 percent and 27.5 percent for the periods of 1980-93 and 1996-98, respectively (Osei & Quartey, 2005). However, the introduction of VAT introduced some twists into the relative contributions of the tax components. Income and property taxes became the major sources of tax revenue, contributing approximately 24.5 percent to total tax revenue in 1999, but their contribution increased steadily to 27.1 percent by 2002. VAT placed second, contributing approximately 21.9 percent of total tax revenue in 1999. This amount increased to 22.3 percent in 2002. International trade taxes, once the largest major component of tax revenue, placed third with 20.9 percent in 1999 and 19.3 percent in 2002. Taxes on goods and services contributed 14.9 percent of total tax revenue in 1999; but their contribution dropped to 10.5 percent in 2001 and subsequently increased to 14.0 percent in 2002 (Osei & Quartey, 2005).

Over the last one and half decades, VAT has emerged as the largest contributor to total tax revenue, contributing on average approximately 28 percent of the total tax revenue -- almost twice the contribution of pay as you earn (PAYE) (14.1 percent) and approximately 17 times that of self-employed tax (1.58 percent). Import duties, which are the next largest contributor after VAT, account for 17.76 percent of total tax revenue, while company and PAYE contribute approximately 16.46 percent and 14.1 percent, respectively (Andoh, 2017). Figure 1 shows the contribution of VAT from 2001 to 2014.

Generally, VAT revenue performance (based on VAT productivity and VAT collection efficiency) in African countries is, on average, lower than in other regions of the world, whether in the Middle East, the Western Hemisphere, Asia and the Pacific, or the European Union (WoldeMariam, 2010). Even then, Ghana's performance relative to other lower middle-income countries is not the best (see Table 1).

More than a decade into the VAT operation, Ghana is still ranked among the lowest performing countries in Africa in terms of tax-to-GDP ratio. Table 2 shows the trends in the tax-to-GDP ratio for Ghana from

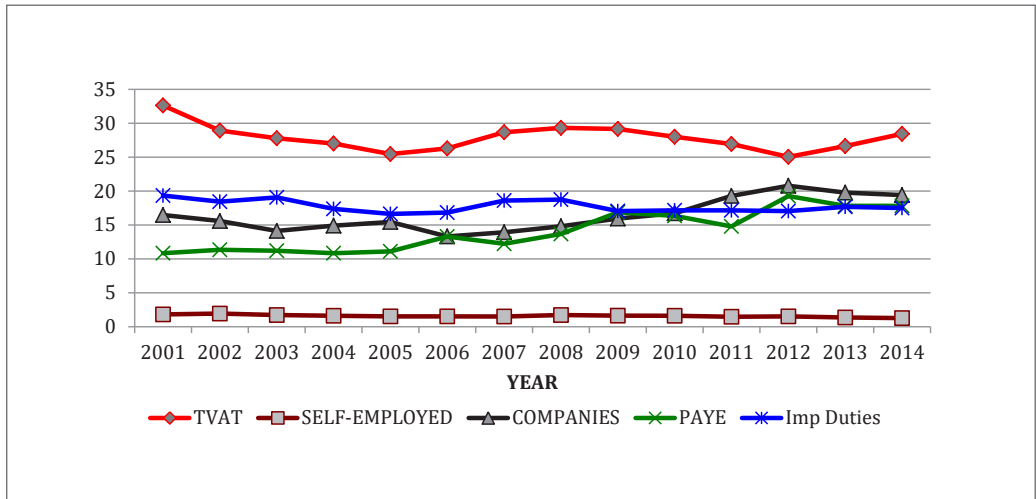


Figure 1. Contribution of VAT to Tax Revenue Compared to Other Taxes

Table 1. VAT Rates and Performance Among Selected Lower Middle Income Countries in Africa

COUNTRY	Year VAT introduced	Standard rate	VAT C-efficiency	VAT productivity	VAT (% of tax revenue)	Year of data
Cape Verde	2004	15.0	0.65	0.53	37.0	2006
Morocco	1995	14.0	0.52	0.39	31.4	2006
Tunisia	1998	18.0	0.50	0.30	24.3	2009
Ghana	1998	15**	0.39	0.27	30.1	2010
Kenya	1990	16.0	0.35	0.39	28.7	2010
Cameroon	1999	19.5	0.30	0.24	37.1	2006
Cote d'Ivoire	1960	18.0	0.11	0.09	8.4	2010

Source: Adapted from "Mobilizing VAT revenues in African countries" by Cnossen (2015). *International Tax Public Finance*, 22(6), 1077-1108. Retrieved from <http://doi.org/10.1007/s10797-015-9348-1>.

Note:

** Ghana has revised the standard rate on four occasions: 10% in 1998, 12.5 % in May 2000; 15 % in Sept 2004; and 17.5 % in January 2015.

Ranking is performed in a descending order based on VAT C efficiency

2006 to 2015, compared to other countries in the same lower middle-income bracket.

The tax-GDP ratio of Ghana has consistently remained at less than 18 percent, which is lower than the average for the developing world and even the average

for Africa (Osei & Quartey, 2005; World Bank, 2014; Bank of Ghana, 2014). These developments, therefore, cast some doubt about the revenue growth performance of the much-celebrated VAT, thereby rendering a thorough analysis very crucial.

Table 2. Total Tax as a Percentage of GDP in Selected Lower Middle Income Countries in Africa from 2006 to 2016

COUNTRY	YEAR										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006-2015
Tunisia	24.3	25.2	26.8	26.6	27.2	29.1	29.1	29.8	30.9	30.3	27.93
Morocco	25.4	29.7	30.2	26.9	27.7	28.5	29.5	28.1	27	26.1	25.1
Cape Verde	21.1	21.3	21.7	18.7	18.8	19.9	18.2	18.1	17.4	19.2	19.44
Kenya	17.2	17.9	18.7	18	17.7	18.4	17.7	17.8	19	18.4	18.08
Africa	16.6	17.2	17.7	17.1	17.2	17.8	18.1	18.5	18.8	19.1	17.81
Cote d'Ivoire	16.2	17.1	16.9	16.8	16.5	15.3	17.7	17.6	16.9	17.6	16.86
Cameroon	14	14.8	14.8	15	14	14.8	15.3	15.8	16.1	16.4	15.1
Ghana	13.1	13.2	12.7	13.1	13.2	14.5	14.8	13.6	15.0	15.0	13.82

Source: Adapted from "Revenue Statistics in Africa" by OECD (2016). Retrieved from <http://dx.doi.org/10.1787/9789264253308-en-fr>
 Note:

Countries are ranked by authors in descending order based on the observed information in the table. Income classification is based on the World Bank classification: <https://blogs.worldbank.org/opendata/new-country-classifications-2016>

2. Overview of Fiscal Development and Growth Performance

Ghana's fiscal position continues to deteriorate. Figure 2 shows Ghana's fiscal deficit from 1996 to 2016.

Although the economy registered surpluses in the mid-1980s, the deficit resurfaced in 1992 and has persisted ever since, except in 1994 and 1995 when there were surpluses of 2.8 percent and 1.7 percent of GDP, respectively (Alagidede, Baah-Boateng, & Nketiah-Amposah, 2013). The deficit decreased from 8.5 percent in 2000 to 2.4 percent in 2005. It, however, worsened, particularly over the subsequent years. It increased from 7.8 percent of GDP in 2006 to 11.5 percent in 2008, 10.0 percent in 2013, 11.8 percent in 2014 and 10.3 percent in 2016. Ghana's debt was consequently considered to be unsustainable, thus compelling the country to request an Extended Credit Facility (ECF) from the IMF (IMF, 2015; World Bank, 2014; Republic of Ghana, 2017). While unrestrained public expenditure is believed to have contributed to this persistent deficit, weaker nonoil tax collection is considered to be largely responsible (Amo-Yartey, 2014).

The available statistics show that Ghana's economy has experienced some steady economic growth over the past decade. Real GDP grew from approximately 3.8 percent in 1994 to 5.8 percent in 2005 and subsequently to 6.2 percent in 2006 until it peaked at approximately 15 percent in 2011 (following the commercial production of oil), thus becoming one of the fastest growing economies in the world during this year. Between 1991 and 2013, the economy's average annual growth rate of 5.8 percent was higher relative to 3.7 percent in SSA. Per capita GDP stood at \$439 in 1991; however, it increased to \$502 in 2005, \$930 in 2006, \$1,099 in 2007 and \$1,858 in 2013 (Aryeetey & Baah-Boateng, 2015; World Bank, 2014). As a result of the impressive growth performance, poverty fell from approximately 51 percent in 1991 to 39 percent in 2001 and further to 28.5 percent in 2005 (African Development Bank [AfDB], 2012; 2014). Consumption expenditures have also increased over the years. Based on Adam Smith's ability-to-pay principle of taxation (Kendrick, 1939), therefore, these developments should be reflected in increased tax revenues.

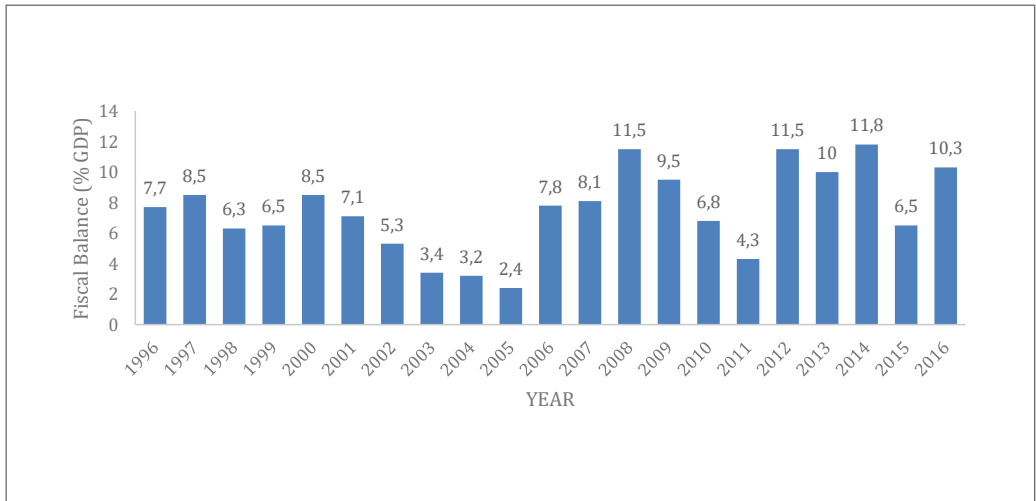


Figure 2. Ghana's Fiscal Deficit from 1996 to 2016

Source: Adapted from "Tax reform and revenue productivity in Ghana" by Kusi (1998), Available at <https://opendocs.ids.ac.uk/opendocs/handle/123456789/2210>

"Annual reports" by Bank of Ghana (several series) Available at <https://www.bog.gov.gh/statistics/publication/annual-report>

2.1. The Concepts of Buoyancy and Elasticity

Tax revenue growth performance is measured by two concepts: tax elasticity and tax buoyancy. Tax buoyancy is a measure of the total degree of responsiveness of tax revenue to both changes in the national income (national tax base) and discretionary changes in tax rates, tax rules, and tax administration. Tax elasticity, in contrast, measures the automatic response of tax revenue to changes in national income (or tax base) when the revenue effects of discretionary tax measures are removed (Bilquees, 2004; Osoro, 1993). Desirably, a good tax regime is expected to be both buoyant and elastic, i.e., yield coefficient greater than unity, indicating that the tax can potentially improve the fiscal balance through the revenue side of the budget. If changes in discretionary tax policy were revenue enhancing, the buoyancy coefficient would be greater than the elasticity coefficient. However, more preferably, the elasticity coefficient should be greater than the buoyancy coefficient to imply that the VAT regime will generate revenue automatically in response to growth in the tax base. In such a situation, tax authorities will not have to resort to frequent changes in tax policies and

VAT rates to increase the revenue yield. Such practices have often led to fierce protests in Ghana.

Tax buoyancy and elasticity can vary between the short and long term. Whereas the long-term responses measure the effect of economic growth on long-term fiscal sustainability, the short term captures the volatility (or the stability) of tax revenues and provides an indication of the extent to which the tax regime can be used as an automatic stabilizer. If the long-term coefficient is greater than unity, it indicates that more rapid growth of the economy (or tax base) will reduce the fiscal deficit ratio through improved revenue. Conversely, if the short-term coefficient exceeds one, it means that the tax system is highly variable, but at the same time, it could function as a good automatic stabilizer and vice versa (Belinga et al., 2014).

3. Methodology

In the tax literature, the standard econometric model for the empirical estimation of tax buoyancy is obtained by regressing the log of tax revenues on the log of the relevant tax base without controls (Beling et al.,

2014; Dudine & Jalles, 2017; Kargbo & Egwaikhide, 2012; Kusi, 1998; Mansfield, 1972; Osoro, 1993; Sobel & Holcombe, 1996; Twerefou, et al., 2010; Wawire, 2000; Wolswijk 2009). Thus, the baseline empirical model is specified in equation (1)¹.

$$\ln R_t = \alpha + \beta \ln Y_t + \mu_t \tag{1}$$

where $\ln R_t$ is log of the tax revenue at time t , and $\ln Y_t$ is the log of tax base at time t . The parameter β is the tax buoyancy coefficient, while μ_t is the stochastic error term. Since the variables are in logs, β is interpreted as elasticity or buoyancy, depending on whether tax revenue data are adjusted for changes in discretionary policy or not.

However, equation (1) might suffer from specification bias because important variables that affect VAT revenues are omitted from the model. It has been argued that VAT is more likely to perform better with improved tax administration capacity. Therefore, in line with the literature, GDP per capita (a measure of economic development) is used as a proxy for tax administration capacity and efficiency (Adam, Bevan, & Chambas, 2001; Khattry & Rao, 2002; Keen & Lockwood, 2010). GDP per capita is therefore expected to be correlated positively with VAT buoyancy. The economic structure of the economy has also been implicated in many tax performance studies. As argued by Piggott and Whalley (2001) and Emran and Stiglitz (2005), VAT becomes inferior to tariffs in the presence of a large informal sector. The rationale is that the informal sector is extremely difficult to tax because almost all of the economic activities in the informal sector are in the underground economy. Therefore, an economy with a significantly large informal sector is more likely to experience poor tax performance. As in the empirical literature, the share of agriculture in GDP is used as a proxy for the size of the informal economy.

Equation (1) is, therefore, modified to capture the control variables:

$$\ln R_t = \alpha + \beta \ln Y_t + \varpi N_t + \mu_t \tag{2}$$

where N_t is a vector of control variables (in this case, log of GDP per capita and agriculture share of GDP). The variables $\ln R_t$, $\ln Y_t$, and β were defined earlier.

3.1. Empirical Strategy

The two-step (2S) regression approach proposed by Sobel and Holcombe (1996) and used by Bruce et al. (2006), Wolswijk (2009) and Koester and Priesmeier (2012) is adapted to estimate equation (2). The first step involves estimating a long-term model, which requires cointegrated relationships. The second step is to obtain the short-term dynamics of tax revenue responses through an error correction model (ECM). The first-step regression is estimated using the dynamic ordinary least squares (DOLS), an estimator developed by Saikkonen (1991) and Stock and Watson (1993) and appropriate for modeling long-term and cointegrated relationships. The advantage of DOLS over ordinary least squares (OLS) is that it addresses any potential endogeneity among regressors by augmenting the model with leads and lags of the first differences of the regressor (Bruce et al., 2006; Masih & Masih, 2001). Moreover, Monte Carlo evidence on DOLS proved that the estimator is superior, especially with small samples (Stock & Watson, 1993), compared to alternative long-term estimators, such as Engle and Granger (1987) and Phillips and Hansen (1990). In terms of policy, the lags and leads of the regressor are not of interest to this study.

The long-run buoyancy model for VAT is specified as:

$$\ln R_t = \alpha_t + \sum_{n=1}^N \beta_{t,n} \ln X_{n,t} + \sum_{g=-j}^j \lambda_{t,n} \Delta X_{n,t+g} + \varpi \Delta N_t + \mu_t \tag{3}$$

where $\ln R_t$ is the log is the observed tax revenue, $\ln X_{n,t}$ is the log of the tax base, and $\Delta X_{n,t}$ is the first difference of the tax base; hence, $\sum_{g=-j}^j \lambda_{t,n} \Delta X_{n,t+g}$ shows the j

lags and leads of the first difference of the tax base. Due to the smaller sample, we limit the number of lags to one and the leads to one. The term μ_t is the stochastic error term, while the parameters $\lambda_{t,n}$ and $\beta_{t,n}$ are the coefficients of the leads and lags of the first difference of the tax base and the log of the tax base, respectively. We further modify equation (3) into an error correction model (ECM) as

$$\begin{aligned} \ln R_t = & \delta_t + \sum_{n=1}^N \sum_{j=0}^q \eta_{n,j} \Delta X_{t-j} + \sum_{k=1}^p \varphi_{t,n} \Delta R_{t-k} + \varpi \Delta N_t + \\ & + \psi_t \mu_{t-1} + e_t \end{aligned} \tag{4}$$

where ΔR_t refers to the first difference of the log of tax revenues in period t , and δ_t is the intercept. The second term on the right-hand side captures the impacts of changes in N contemporaneous log tax bases, ΔX_{t-j} , including up to q lags of them, while the third argument captures the dynamic properties of the tax revenue growth persistence ΔR_{t-k} and by its p lags. The parameter μ_{t-1} is lagged long-term equilibrium errors, while e_t is the *i.i.d.* residuals.

As observed from equation (4), there are three key variables. The first variable is the immediate direct short-term VAT revenue buoyancy, which measures the cyclical variability of tax revenues. This variable is represented by the coefficient $\eta_{i,j}$. The second variable measures the degree of responses to persistence of tax revenue growth. Its coefficient is $\phi_{i,n}$. For example, a dip or rise in the growth of tax revenues could serve to encourage or cause complacency, on the part not only of tax collectors but also of payers as well (Koesster & Priesmeier, 2012). The third variable, the lagged long-term residuals μ_{t-1} , is the adjustment parameter, and it captures the *indirect short-run* channel of the tax base changes.

Anytime there is a difference between the direct short-term coefficient and the identified long-term relationship, a temporary deviation, which can be higher or lower than the equilibrium relationship is created (i.e., revenue overshooting or undershooting). However, these deviations are transitory and therefore corrected over time. The corresponding coefficient, ψ , therefore measures the adjustment to revenue overshooting and undershooting. It indicates the percentage of equilibrium deviation corrected in every period. This parameter is expected to be negative and significant to show that, indeed, the system will return to the long-term equilibrium when it deviates.

3.2. Allowing for Short-term Asymmetric Responses

The short-term buoyancy and elasticity coefficients obtained in equation (4) do not provide any information about the variability in tax revenue in different states of the economy. As indicated earlier, in the short term, the deviation of tax revenue in the current period, t (measured by the long-term error term), can be either less than (i.e., error term less than zero) or greater than (residual term is greater than zero) its long-term

equilibrium value. This asymmetric response can emanate from a number of factors, including differences in household and government consumption behaviors (Bruce et al., 2006).

Following the idea pioneered by Granger and Lee (1989) and adopted by Bruce et al. (2006) and Wolswijk (2009), a dummy variable is used to capture the asymmetric short-term responses. The dummy is assigned if the deviation is greater than its long-term equilibrium value (i.e., the error term was greater than zero), while zero is assigned if it is less than the long-term equilibrium (i.e., the residual was negative). Error terms equal to zero are not included since the focus is on asymmetric responses. The dummy variable is then interacted with the tax base and the generated error correction terms. The rationale is to obtain separate measures for asymmetric short-term buoyancy and the adjustment parameter. The modified form of the ECM in equation (2) that captures the presence of asymmetric revenue responses is thus specified as:

$$\ln R_t = \delta_t + \sum \eta_{i,j} \ln \Delta X_t + \sum_{n=1}^N \rho_i (D^* \Delta X_t) + \psi_i \mu_{t-1} + \sigma_i (D^* \mu_{t-1}) + \nu_t \quad (5)$$

where D represents the dummy variable, taking the value of zero when μ_t is less than zero and one when it is greater than zero. The parameters ρ_i and σ_i measure the asymmetric responses of the tax regime and the speed of adjustment, respectively.

Equations (3), (4) and (5) are estimated for each of the three measures of VAT: total VAT revenue, domestic VAT revenue, and import VAT revenue. Estimating tax buoyancy, therefore, requires the tax base or proxy base, as well as the tax revenues. In the first model, the log of total VAT revenue is used as the dependent variable and the log of the sum of total consumption and imports as the base. In the second model, the log of domestic VAT is used as a dependent variable, while total consumption and household final consumption are used as bases (separate regressions are performed for each base). In the third model, the log of import VAT revenue is used as a dependent variable with the log of total import as a proxy base. This distinction between private consumption and import is premised on the components of total VAT, i.e., domestic VAT and import VAT, being levied on different bases. Whereas

domestic VAT is assessed on domestic private consumption, import VAT is assessed on imports.

3.3. Estimation of VAT Elasticity Coefficients:

The Divisia Method

Equations (3), (4) and (5) yield buoyancy coefficients but not elasticity coefficients. The literature identifies four techniques for obtaining elasticity coefficients. These are the proportional adjustment (PA) method pioneered by Mansfield, (1972) and Prest (1962); the constant rate structure (CRS) method by Chelliah and Sheetal (1974) and Andersen (1973); the dummy variable (DV) approach by Singer (1968), Wawire (2011) and Twerefou et al. (2010); and finally, the Divisia index approach used by Choudhry (1979).

We employ the Divisia method. Its key strength is that it does not require any adjustment of the historical series to discretionary tax changes because the index itself offers the automatic growth of revenue. Moreover, a number of changes in VAT rate have been made. In addition, there have been a number of amendments to the VAT laws regarding exemptions. Finally, in 2010, the three autonomous revenue agencies in Ghana were integrated into one institution: the GRA. Using the dummy variable techniques will require including a dummy for each of these several reforms. Obviously, this would lead to a dummy variable trap. With the Divisia Index approach, therefore, no dummies are needed. Importantly, since the index considers the integrals of all discretionary changes along the tax yield curve, it provides an exact index of discretionary measures of the underlying equation. The key limitation of the Divisia Index method is that it is unable to estimate the revenue effect of specific tax measures. For details of the derivation and theoretical basis of the Divisia Index, refer to Solow (1957); Star and Hall (1976), Bilquees (2004) and Choudhry (1979) also provide the detailed derivations and their application. The key equations of the model are outlined as follows:

$$\ln \Gamma(n) = \log \frac{R(n)}{R(0)} - \sum_1^k \Omega^* \log \frac{Y_i(n)}{Y_i(0)} \quad (6)$$

where $\Gamma(n)$ is the index of discretionary VAT measures, $R(n)$ is the tax revenue in period n, $R(0)$ is the tax revenue in period 0, $Y_i(n)$ is the tax base in period n, $Y_i(0)$ is the tax base in period 0, and Ω^* is the weight for the growth rate of automatic tax revenue

– a weighted sum of growth rates of the tax bases. Equation (6) shows that the growth rate of the discretionary tax revenues is the difference between the growth rate of total revenues and growth rate of automatic tax revenues, where the latter is a weighted sum of the growth rate of the (proxy) bases, Ω^* . The elasticity coefficient is then obtained by applying the formula:

$$\delta^* = \beta - \frac{\log \Gamma(n)}{\log(Y_{i(n)} / Y_i(0))} \quad (7)$$

where δ^* is VAT elasticity coefficient, while β is the VAT buoyancy coefficient (regression estimates obtained from equations (3), (4) and (5)).

3.4. Robustness

We test for both serial correlation and heteroskedasticity in each model. We employ the Newey-West estimator for models with both heteroskedasticity and autocorrelation (Newey & West, 1994;1987), while the Prais-Winsten estimator is used in cases in which only autocorrelation is detected (Wooldridge, 2003). The Linktest is performed to ascertain the correctness of the model specification. The stationary test is also performed on residuals of the regression results to check the robustness of the results. If the residuals are stationary, it indicates that the regression results are robust. The results of the Linktest and augmented Dickey-Fuller (ADF) tests are reported under the estimation.

3.5. Unit Root Test

Common issues in time series data analysis are non-stationarity and cointegration. If the variables are nonstationary, estimation of equations (3), (4) and (5) with OLS can provide spurious results (unless the variables are cointegrated). We first test for unit root with the augmented ADF test. All of the variables are tested with a linear trend and/or intercept because they were found to be significant at 1 percent (see Table 3).

The ADF test statistics are found to be greater than the critical values at the 5 percent significance level, indicating that all of the relevant variables are found to be stationary in [log] levels (i.e., I(0)) at 5% (see Table 3). The only exception is real GDP, which is stationary at first difference (i.e., I(1)).

Table 3. Unit Root Test Results

Variables	ADF Test	
	Test stats	1 st diff
GDP (Total Value Added)	-3.246	-9.101***
Household Final Consumption	-3.538**	
Total Consumption	-7.391***	
Imports	-4.582***	
Domestic VAT	-9.673***	
Import VAT	-5.132**	
Total VAT Revenue	-4.357***	

Note:

ADF Test: Critical values (levels) : 1% (-4.130), 5% (-3.491)

Critical values (first difference): 1% (-4.135), 5% (-3.493)

***, **, and * denote 1%, 5% and 10% significance levels, respectively.

4. Data Sources and Description

The study uses quarterly data covering 2000-quarter one (2000 q1) to 2014-quarter four (2014 q4). The tax data are compiled from the GRS, Bank of Ghana (BoG), annual and quarterly reports and various budget statements from the Ministry of Finance (MoF). Quarterly data on GDP from 2006 to 2014 are readily available on the Ghana Statistical Service (GSS) website. The GDP series from 2000 to 2005 and that of the value of imports are however compiled from various annual, quarterly and monthly reports by the GSS, the BoG, the Ministry of Trade and Industry and the MoF. The use of nominal values is said to bias the coefficient toward unity, thereby underestimating the magnitude of the estimates (Haughton, 1998). All of the data used are in real values. Effective 1 July 2007, the current currency of the country, the cedi (¢), was redenominated to the Ghana cedi (GH¢). Per this change, ten thousand cedis were equivalent to one Ghana cedi (i.e., four zeros were removed). The redenomination did not affect the intrinsic value of the currency (the value was the same). Since data recorded before the redenomination were expressed in the old unit, a plot of most data from July 2007 showed a sharp break since data before July 2007 had four more zeros (in ten thousand). For

consistency, the data before July 2007 were converted to the new unit by dividing by 10,000. This conversion removes the breaks from the data.

5. Results and Discussions

5.1 Trends in Key Variables

For the sake of brevity, only the trends in the contributions of import and domestic VAT to total VAT revenue are discussed (see Figure 3). The trends in private consumption, import value, total VAT, import VAT and domestic VAT revenues are presented in Appendix 2.

On average, the contribution of import VAT to total VAT revenue (64.46 percent) is almost twice that of domestic VAT (35.52 percent). This development underscores the dominance and importance of import VAT in the generation of Ghana's tax revenue; however, this dominance is gradually eroding. The contribution of import VAT decreased gradually from approximately 71 percent in 2001 to 60 percent in 2014 as that of domestic VAT increased steadily from 29.32 percent in 2001 to approximately 40 percent in 2014. The dominance of the import VAT reflects two things. The first is that Ghana's economy is not only a net

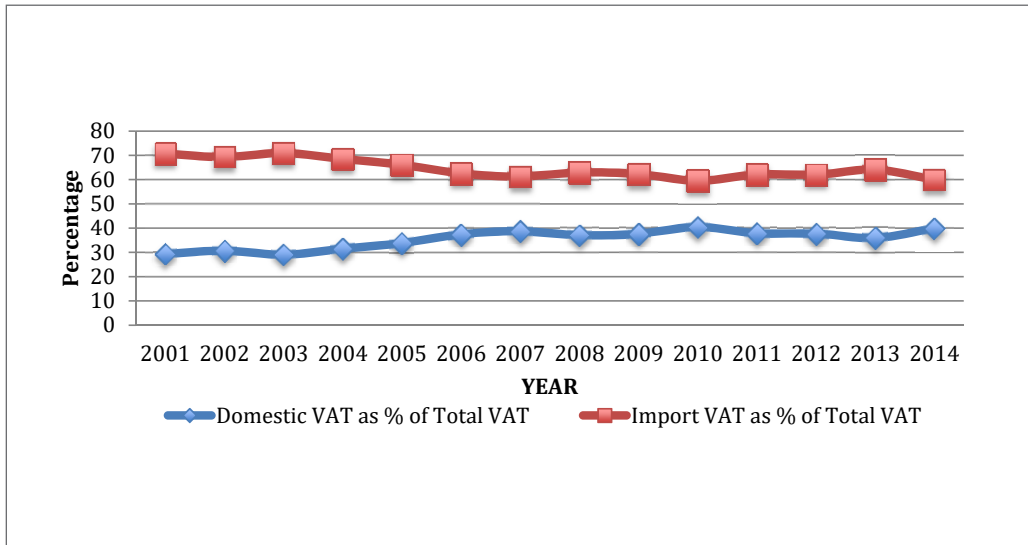


Figure 3. Contribution of Domestic and Import VAT to Total VAT Revenue

importer but is also known for its high dependence on imports for domestic consumption. The country was ranked 78th in terms of imports worldwide in 2013 and 2014. Merchandise imports are dominated by manufactured goods, which accounted for an annual average of 65 percent over the reported period, followed by fuel (17 percent) and all food items (6%) (Vacu & Odhiambo, 2017). Under such circumstances, the VAT on imported goods has the tendency to be higher. Second, the efficiency of import VAT revenue collection could be higher than that of domestic VAT because import VAT is collected at the port/border. Therefore, voluntary compliance is likely to be high, especially with the existence of clearing automation at the ports and harbors. Unlike the import VAT, the domestic VAT revenue is more likely to be addressed with evasion and fraud because it largely depends on the sincerity of taxpayers and revenue officials since most of the activities fall within the informal sector, in which bookkeeping is generally low.

In particular, it is observed that import VAT assumed a downward trend from 2004. This period corresponds to the period when many generous import duties and import VAT exemptions were provided. For example, in 2004 the following packages were

announced. (i) Payment of VAT on imported industrial raw materials was to be suspended and eventually zero rated, in pursuance of the government's vision of a Golden Age of Business. This policy was implemented to leverage manufacturers against the upfront cash flow problems associated with the VAT component of large imports of industrial raw materials (Republic of Ghana, 2004). (ii) In line with the government's priority of modernizing agriculture and increasing international market share, particularly for nontraditional crops and rice, import VAT on irrigation pumps was also removed (Republic of Ghana, 2004). (iii) Finally, import duty and import VAT on inputs for the production of fishing nets and fishing ropes were removed (Republic of Ghana, 2004), to render the fishing industry competitive through a reduction in operation costs. The offering of such packages was not without abuses. It was stated categorically in the 2006 budget that, for a 7-month period (January to July 2005), import duties and import VAT that were given away in exemptions amounted to a total of ₵895.07 billion (Republic of Ghana, 2006).

With regard to domestic VAT, the trends show that its contribution to total VAT revenues not only decreased from almost 31 percent in 2002 to 29 per-

cent in 2003 but was also the lowest contribution for the study period. In 2002, it was realized that more than 90 percent of VAT turnover was contributed by a small number of (large) taxpayers. The growth in domestic economic activity recorded at the time failed to be reflected in domestic VAT revenues for obvious reasons. The growth was driven by the agriculture sector in general and the cocoa subsector in particular. Such a source of growth could not trickle into VAT revenues because the majority of income earners in these sectors generally are in rural areas, the consumption of which usually occurs in the informal sector. Moreover, most of the goods and services consumed by these income earners tend to fall outside the value added taxable supplies.

Consequently, a number of initiatives that aimed at increasing domestic VAT were implemented: these measures included the Tax on Professional Services. The then VAT Service was supposed to focus attention on taxable services provided within the finance and banking sectors, including management and consultancy services, equipment leasing, research and professional advice, such as accountancy, investments and legal services (Republic of Ghana, 2002). Additionally, as part of the reform program under the Public Financial Management Reform Programme (PUFMARP), the Financial Administration Decree (FAD) SMCD 221, 1979 and the Financial Administration Regulations (FAR) LI 1234 were to be revised to ensure that procurement of goods and services by municipalities, districts and agencies (MDAs) were made from only VAT registered companies.

Moreover, in 2003, the VAT Service began to address some of the key inherent implementation bottlenecks bedeviling the domestic VAT. These factors included identifying businesses that had not registered but were supposed to do so by law. In contravention of the VAT Act, some VAT registered businesses, especially in the hotel and restaurant industry and the retail sector, were selective in charging the tax. A number of them even failed to issue official VAT invoices. Consequently, the VAT Service embarked on nationwide public education to sensitize the buying public to insist on their VAT invoices (Republic of Ghana, 2003). Furthermore, in 2003, the Government of Ghana (GoG), as a way of motivating the revenue agencies to collect more revenues, decided to pay 2.5 percent of its col-

lections to cover personal emoluments, administration, services and investment expenditures (Republic of Ghana, 2006). All of these reforms contributed to the upturn in domestic VAT revenues. Therefore, by 2004, all of these initiatives and reforms had reversed the 2002/2003 trends and yielded positive outcomes. The outcome was that the contribution of domestic VAT to total VAT revenues increased from 29 percent in 2003 to 31 percent in 2004. This increase continued through to 2014.

5.2. Discretionary, Automatic and Total Growth of VAT Revenues

Equation (6) allows for computing and accounting for the growth in tax revenue emanating from discretionary policies and automatic growth in the tax base separately. Table 4 presents the results based on equation (6), showing that, during the period under review, all discretionary VAT measures cumulatively reduced total VAT revenue by 1.63 percent, while growth in tax bases increased total VAT revenues by 3.65 percent, leaving a net growth in total VAT revenues of 2.02 percent.

The above results suggest that growth in total VAT revenues is mainly driven by the growth in the tax base. This finding corroborates Choudhry (1979) for the United States, the United Kingdom, Malaysia and Kenya; Bilquees (2004) for Pakistan; and Milwood (2011) for Jamaica. All of these studies attributed a greater proportion of growth in tax revenues to growth in the tax bases.

However, there exist variations when VAT is disaggregated into its components. For domestic VAT, both discretionary measures and growth in the base contribute positively to the growth in revenue. However, growth due to discretionary measures is greater (i.e., 1.28 percent using private consumption as a base and 1.17 for total consumption as a base) than that induced by the base (i.e., 0.78 percent and 0.89 percent, respectively). The automatic growth coefficients for domestic VAT are less than unity, suggesting a weak ability of the economy to raise domestic VAT revenue as consumption increases. Consequently, tax authorities have had to make up the revenue shortfalls through discretionary tax policies, such as increasing tax rates. Indeed, this has been the practice over the years. The VAT rates have been revised upward on three occasions. The strong growth in taxes on domestic goods in 2014 over

Table 4. Discretionary, Automatic and Total Growth of VAT Revenues (Growth in Percentages)

	Total VAT	Domestic VAT ⁺	Domestic VAT ⁺⁺	Import VAT
Discretionary growth	-1.63	1.28	1.17	-1.81
Automatic growth	3.65	0.78	0.89	3.26
Total growth	2.02	2.06	2.06	1.45

Note:

+ = Base household final consumption

++ = Base total consumption = Household final consumption + Government on goods and services

that in 2013 was attributed mainly to the increase in VAT rate from 12.5 percent to 15.0 percent (Bank of Ghana, 2014).

In contrast, growth in import VAT is found to be driven exclusively by growth in its base, i.e., imports. Whereas discretionary tax measures cumulatively reduce revenue growth by 1.81 percent, the increase in imports raises import VAT by 3.26 percent. The observed negative effect of discretionary tax measures on import VAT revenues can largely be attributed to shrinking of the tax base due to large import exemptions which have been granted under the VAT regime. For example, goods and services imported on behalf of and for the president of Ghana, the blind, deaf and dumb, and churches and religious bodies are exempted from import VAT. In addition, items imported by non-governmental organizations (NGOs), as well as materials imported for use in the production of nets, twines and goods produced for fishing, infants' foods, machinery, apparatus and spare parts for agricultural purposes, and chemicals for agricultural purposes, are exempted. Moreover, exemptions are granted to specific goods for specific uses, such as Volta Aluminum Company Ltd. (VALCO) and Volta River Authority (VRA). These provisions have been abused seriously due to the inconsistencies in Ghana's tariff regime.

Moreover, Ghana's statutes contain widespread tariffs and other import duty exemptions schemes, which effectively allow many operators not to pay customs duties, VAT and other taxes. As a result, approximately 25 percent of the otherwise payable import duties are forgone annually in exemptions of various sorts (World Trade Organisation [WTO], 2014). It is estimated that,

in 2012 alone, direct tax and VAT exemptions amounted to US\$876 million, representing approximately 67 percent of all exemptions (Republic of Ghana, 2012). The revenue loss from exemptions granted in duties and taxes is said to have undermined the tax revenue performance (Republic of Ghana, 2014).

5.3. Long-term VAT Buoyancy and Elasticity Estimations

The previous subsection reports the cumulative effects of all discretionary tax measures (DTMs) on VAT revenue. This subsection provides the buoyancy and elasticity coefficients obtained from the long-term regression results from equation (3). The buoyancy coefficients are obtained by the DOLS estimations, while the elasticity coefficients are obtained using the Divisia index to adjust the estimated buoyancy coefficients. The results are reported in Table 5.

Column 1 reports long-run (LR) total VAT revenue buoyancy and elasticity. Columns 2, 3 and 4 report the case for the disaggregated VAT revenues. Specifically, columns 2 and 3 report the results for domestic VAT when private consumption and total consumption are used as tax bases, respectively, while column 4 reports the results for import VAT. The models pass all of the diagnostic tests. The Linktests show that, in each of the models, the coefficient of *hat* is significant, but that of *hat square* has no explanatory power. This outcome suggests that an inclusion of additional variables will not necessarily further improve the model, implying that the model is well specified. Moreover, the ADF test shows that coefficient of the regression residual is stationary at 1 percent, indicating that the results are robust.

Table 5. Long-run Buoyancy and Elasticity

	(1)	(2)	(3)	(4)
	TVAT	DVAT ⁺	DVAT ⁺⁺	IVAT
LR Buoyancy	1.018***	1.454***	1.482***	0.965***
LR Elasticity	1.88***	0.824***	0.852***	2.94***
Divisia Index	-0.87	0.63	0.57	-1.98
GDP Per Capita	0.922*** (0.0721)	1.5199*** (0.2304)	3.4785** (0.5602)	0.288*** (0.0904)
Agric Share of GDP	-0.0598*** (0.00168)	-1.8381** (0.5602)	-0.5260 (0.1673)**	
Linktest hat (p-value)	0.96(0.13)***	1.92(0.75)***	1.98(0.69)***	1.22(0.15)***
Linktest hat-sq (p-val)	-0.010(0.01)	-0.08(0.075)	-0.08(0.069)	-0.02(0.015)
ADF Residual (p-val)	3.100***	2.374**	2.373**	3.798***
Observations	57	57	57	57
R-squared	0.99	0.851	0.854	0.99

Note:

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

ADF critical values: 1% (-2.616); 5% (-1.950)

+ =tax base is household final consumption

++ =tax base is total consumption (Household final consumption + Government consumption of goods and services)

From column 1, the coefficient of total VAT revenue (1.018) is statistically significant at one percent and not significantly different from unity. This finding indicates that one-percent growth in both VAT base and discretionary changes cumulatively increases total VAT revenues by 1.018 percent in the long term. This coefficient is relatively smaller than that of Twerefou et al. (2010), who obtained long-term VAT/sales tax buoyancy of 1.41 for Ghana. As explained earlier, Twerefou et al. (2010) merged sales tax and VAT data, with the latter constituting only 7 of the 37 annual data series. Consequently, the results could possibly reflect more sales tax than VAT. However, the findings are in line with Dudine and Jalles (2017), who obtained a LR buoyancy coefficient of 1.075 for a goods and service tax for low income countries.

Desirably, tax buoyancy is expected to be greater than unity to imply that the tax revenue is able to im-

prove the fiscal stance of the economy through the revenue side of the budget. However, in contrast, Ghana's total VAT does not seem to exhibit strong long-term buoyancy. A number of factors might explain this low coefficient. First, the results point to composition effects. Total VAT is made up of both domestic VAT and import VAT. As already seen in Figure 3, the latter's contribution to total VAT revenue (64.46 percent) is, on average, almost twice that of domestic VAT (35.52 percent). Over the years, there has been an increase in the amount of imports not subject to VAT because of exemptions and zero rating. This expansion of imports not subject to VAT could be responsible for the low buoyancy coefficient. Furthermore, it has been argued that tax evasion and tax fraud are common features of tax administration in developing countries (Keen & Smith, 2007). Further, the situation could be worse for Ghana's VAT administration, especially in the face of

a large informal sector and the frequent hikes in VAT rates. Ghana's VAT rate has increased three times since its adoption in 1998. Given that these upward adjustments have always faced public agitation, there is every reason to believe that they have provided an incentive for VAT evasion and fraud.

Total VAT revenue is also found to be elastic (1.88), meaning that a one-percent increase in the VAT base automatically increases VAT revenue by 1.88 percent. This outcome is desirable because it is an indication that revenue generation is able to automatically keep pace with the growth in the tax base, which could prevent frequent changes in tax rates that can be politically and economically costly (Osoro, 1993). Furthermore, the elasticity coefficient of total VAT is found to be greater than the buoyancy coefficient, which is the case when the overall effect of discretionary tax changes is negative, indicating that growth in VAT revenue is strongly driven by growth in the tax base and that, on the whole, discretionary measures have not been very effective in driving revenue growth. The difference between the buoyancy and elasticity coefficients is -0.87, which implies that doubling the discretionary tax measures reduces total VAT revenue by approximately 0.87 percent, which supports the results obtained under the Divisia Index that discretionary tax measures cumulatively reduce total VAT revenue by 1.85 percent over the sample period.

Disaggregating total VAT into domestic and import VAT (columns 2 and 3) shows that domestic VAT revenue is found to be buoyant with a coefficient of 1.45 (or 1.48 when total consumption is used as a base) but import VAT revenue is not buoyant. Its buoyancy coefficient is less than unity (i.e., 0.966). The results thus suggest that domestic VAT has higher long-term growth potential than import VAT, although the latter's contribution to total VAT revenue (64.46 percent) is on average almost twice that of domestic VAT (35.52 percent) (as shown in Figure 3). In terms of elasticity, domestic VAT revenue is found to be positive but less than unity (i.e., 0.82). The magnitude of the coefficient suggests that, when the revenue effects of discretionary measures are removed, a one-percent increase in private consumption (or total consumption) increases domestic VAT revenue by approximately 0.8 percent. The positive sign, conversely, suggests that domestic VAT revenue growth is driven by both growth in its

tax base (automatic growth) and changes in discretionary tax measures. However, the automatic growth is stronger (0.82) relative to discretionary policies (0.63). From column (4), the elasticity coefficient of import VAT revenue is not only greater than unity (i.e., 2.94) but also considerably greater than the buoyancy coefficient (0.94). Thus, when the effects of discretionary tax measures are removed, a one-percent increase in import value is able to increase import VAT revenues by 2.9 percent.

Although the elasticity coefficient of import VAT appears to be relatively higher than that of the total VAT, it is desirable because it indicates that import VAT is automatically able to keep pace with import growth. The higher elasticity coefficient could be attributed to the use of full automation procedures of clearance at Ghana's major ports and harbors. In 2003, in a bid to improve revenue collection efficiency at the ports and harbors, the Ghana Revenue Authority installed full automation systems comprised of two components, namely, the Ghana Community Network (GCNet) and the Ghana Customs Management Systems (GCMS). The GCMS provides a fully integrated computerized system for the management of customs declarations and related activities. The GCNET, conversely, is the platform that enables the GCMS to share data with all of the parties engaged in the processing of customs clearances (Andoh, 2017). Studies have shown that automating the tax administration not only reduces the compliance and administration costs but also leads to increased effectiveness in revenue collection (Vasudevan, 2007).

5.4. Results from Short-run Estimations

Similar to the long term, we employ the Divisia Index to isolate the short-term elasticity from buoyancy coefficients obtained from estimating equation (2). The results are presented in Table 6.

Columns 1, 2, 3 and 4 report the short-run buoyancy and elasticity coefficients for total VAT, domestic VAT (when household final consumption is used as the base), domestic VAT (when total total consumption is used as the base) and import VAT, respectively. In line with expectations, specifically in column (1), the short-run buoyancy and elasticity coefficients for total VAT are positive at one percent, suggesting that VAT revenue moves in the same direction as its respective base.

Table 6. Short-run Buoyancy and Elasticity of VAT Revenues

	(1)	(2)	(3)	(4)
	Total VAT	Domestic VAT ⁺	Domestic VAT ⁺⁺	Import VAT
Buoyancy	0.4357** (0.1351)	1.732** (0.722)	1.796** (0.723)	0.2106** (0.1021)
Elasticity	1.31**	1.10**	1.23**	2.19**
EC Term	-0.1037** (0.3761)	-0.902*** (0.186)	-0.966*** (0.186)	-0.2877** (0.1258)
Diagnostics				
Jacque-Bera	0.7906	0.40519	0.3645	0.6646
LM Test	0.2336	0.1151	0.1158	0.2579
Observations	58	58	58	57

Note:

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

+ = tax base is household final consumption

++ = tax base is total consumption (Household final consumption + Government consumption of goods and services)

The buoyancy coefficient for total VAT is 0.435, while the elasticity coefficient is greater than unity (1.31). An elasticity coefficient greater than 1 implies that total VAT revenue exhibits greater fluctuations over changes in its base. Twerefou et al. (2010) obtained a short-term buoyancy coefficient of 0.42 and elasticity of 0.7. The difference could be attributed to data since their work was based primarily on sales tax. Similarly, domestic VAT revenue exhibits positive but greater fluctuations when total consumption is used as a base (both the buoyancy and elasticity coefficients are positive and greater than unity). However, narrowing the base to only household final consumption reduces the elasticity coefficient to almost unity, suggesting that domestic VAT becomes less volatile when household consumption is used as a base, reflecting the general stability of household consumption relative to government consumption. Individuals are more likely than governments to smooth consumption in response to fluctuations over the business cycle. As shown in column (4), the import VAT elasticity coefficient of 2.19

indicates that import VAT is highly variable over fluctuations in imports, given discretionary policies.

All of the coefficients for the speed of adjustment are statistically significant and have the expected negative signs. The speed of adjustment indicates that 29 percent of the deviations in import VAT revenue from its long-run value are corrected for in the next period. Those of domestic VAT are 90 percent with respect to household final consumption and 96 percent when total consumption is used as the base.

The difference between the long-term import VAT buoyancy coefficient (0.97) and that of the short-term coefficient (0.22) suggests that there is a significantly large divergence in the responses of import VAT between the two time periods. However, the speed of adjustment shows that approximately 29 percent of the deviations are corrected for in the next period. The negligible divergence between the long- and short-term buoyancy coefficients, coupled with the high adjustment parameter of the domestic VAT revenue, suggest that reactions of domestic revenues to changes in their

Table 7. Short-run Asymmetric Responses of Value Added Tax

	(1) TVAT	(2) Domestic VAT ⁺	(3) Import VAT
Period of Expansion	0.471** (0.149)	1.371** (0.697)	0.403*** (0.127)
Period of Contraction	0.473** (0.148)	1.26* (0.691)	0.394*** (0.125)
EC Term (Speed of Adjustment)	-0.218** (0.057)	-0.274*** (0.046)	-0.439*** (0.117)
Jacque-Bera Test	0.255	0.3646	0.579
LM Test	0.464	0.5656	0.586
Observations	58	58	57
R-squared	0.662	0.557	0.566

Note:

Standard errors are in parentheses *** p<0.01, ** p<0.05, * p<0.1
+ denotes that tax base is private consumption

base exhibit no fundamental differences between the short and long term, indicating that there is no significant overshooting or undershooting, which is an indication of a rather nondynamic pattern in domestic VAT in Ghana. Evidence of growth and stability is found for almost all of the measures of VAT. Both the long- and short-term elasticity coefficients for total VAT are greater than unity, suggesting that total VAT experiences growth but, at the same time, is highly variable. A similar observation is made for import VAT.

5.5. Asymmetric Responses

The results for the asymmetric responses are obtained by estimating equation (3). They are reported in Table 7.

Columns 1 and 3 report the results for total VAT and import VAT, respectively. The total VAT coefficients for the periods of expansion and contraction in the tax base are 0.471 and 0.473, respectively, while those for import VAT are 0.40 and 0.39 respectively. This finding suggests that total VAT revenue and import VAT revenue do not exhibit any significant variability in either period. Moreover, in statistical terms, the coefficients are significantly less than one, suggest-

ing that total VAT revenue and import VAT revenue cannot serve as good automatic stabilizers in both contractionary and expansionary periods. The case is, however, different for domestic VAT revenue. The coefficients are statistically significant and are greater than 1, suggesting greater variability and hence better revenue stability during both good and bad times.

5.6. Decomposition of Elasticities

We now decompose the elasticity into tax-to-GDP, base-to-GDP and tax-to-base, enriching our understanding of the critical source of the revenue growth. The decomposition is presented in Table 8.

Positive tax-to-GDP and tax-to-base coefficients are observed for total VAT in both the short and long term. Specifically, in the long term, one percent growth in GDP leads to 1.11 percent growth in total VAT revenues, while one percent growth in the base leads to 1.88 percent growth in total VAT revenues. The base-to-GDP is, however, inelastic, indicating weaker responsiveness of the tax base to growth in GDP (variation exists among components). The estimates for total VAT differ from those of Twerefou et

Table 8. Decomposition of Tax Elasticities

	Taxes	Tax-to-GDP	Base-to-GDP	Tax-to-Base
Long-run				
	Domestic VAT ⁺	-	0.82	0.82
	Domestic VAT ⁺⁺	0.82	0.89	0.85
	Import VAT	2.23	0.86	2.94
	Total VAT ⁺⁺⁺	1.11	0.95	1.88
Short-run				
	Domestic VAT ⁺	-	1.17	1.10
	Domestic VAT ⁺⁺	0.91	1.25	1.23
	Import VAT	2.22	0.42	2.19
	Total VAT ⁺⁺⁺	1.35	0.87	1.31

Note:

+ =tax base is household final consumption

++ =tax base is total consumption (Household final consumption plus Government consumption of goods and services)

+++ = tax base is total consumption plus total imports

- denotes coefficient is as obtained from domestic VAT⁺⁺

al. (2010), who obtained a base-to-GDP elasticity coefficient of 0.79 before tax reforms and 1.11 after tax reforms in 1983. The study further obtained tax-to-base coefficients of 0.72 and 1.31 before and after the tax reform, respectively. As already pointed out, these figures reflect more sales than VAT. All three decomposed coefficients for domestic VAT estimates are less than unity in the long term. The inelastic base-to-GDP elasticity suggests that the growth in GDP is unable to induce strong growth in the base. The coefficient of tax-to-base is also inelastic and, at the same time, smaller than that of base-to-GDP elasticity, suggesting a weaker revenue-to-base response than base-to-GDP response. This observation largely reflects the problem of tax evasion and avoidance. With the presence of large informality in Ghana, it is quite easy to evade and avoid domestic VAT. The tax-to-base elasticity coefficients for import VAT are positive and greater than unity in both the long and short term. However, the base-to-GDP coefficients for both time periods are less than unity although positive. This finding suggests that the key setback to import VAT revenue growth lies in the low responsiveness of the base to growth in GDP.

6. Conclusions and Recommendations

In terms of a summary, the study finds that, although import VAT dominates total VAT in Ghana, its dominance falls over time as domestic VAT's contribution gains momentum. Moreover, both the Divisia computation and the regression analysis showed that all three VAT measures used in the study have experienced growth. Furthermore, all of the discretionary tax measures undertaken over the period have cumulatively reduced the growth of total VAT and import VAT but rather have enhanced the growth of domestic VAT revenues. Thus, while growth in domestic VAT revenue is driven by both discretionary tax measures and growth in the tax base, growth in total VAT and import VAT revenues are driven solely by growth in the respective bases. The elasticity coefficients from the error correction model show that revenues from all of the VAT measures vary positively with their respective bases but, at the same time, exhibit high variability in the short term. On the whole, a critical observation emerging from this study is that, while the key problem of domestic VAT lies in the inability of growth in the base to induce stronger automatic growth in tax

revenues, that of import VAT revenues is the inability of the base to grow automatically in response to GDP growth. This finding suggests that there cannot be a one-size-fits-all approach to boosting VAT revenues in Ghana. The approach to improving VAT revenue should be multifaceted and specific; otherwise, the revenue potential of VAT will remain fragile.

The empirical findings have of important implications for Ghana's VAT regime and therefore the fiscal system. First, the findings suggest that, in the long term, total VAT revenue has been more elastic than the erstwhile sales tax. However, in terms of buoyancy, its coefficient has been relatively smaller. For example, compared with the two previous studies of sales tax, our study obtains long-term total VAT elasticity and buoyancy coefficients of 1.88 and 1.018, respectively. Kusi (1998) obtained 1.7 and 1.58, respectively, while Twerefou et al. (2007), obtained 1.09 and 1.41. Thus, in comparative terms, total VAT generally appears to possess a better ability (relative to the sales tax) to automatically maintain pace with the growth in the tax base. However, lower buoyancy implies that VAT (relative to sales tax) was greatly damaged by the type of discretionary policies implemented during the sample period.

Second, the positive and higher (greater than unity) elasticity coefficients suggest that, desirably, the VAT revenues grow automatically with growth in the base, *ceteris paribus*. This outcome underscores that growth in the appropriate tax base is critical for growth in VAT revenue. In this regard, this study recommends that greater emphasis must be placed on improving the respective tax bases. As shown by the findings, the informal economy (proxied by agriculture share of GDP) has a negative effect on VAT revenue. Therefore, formalizing the informal sector is believed to have a great impact in broadening the tax base. The current government has initiated a number of measures toward digitizing the entire economy. The specific measures include the provision of national biometric identification cards (Ghana card) for all citizens by the end of 2018 and a mandatory taxpayer identification number (TIN) for all residents by end of April 2018. We recommend that these policies be pursued relentlessly since they could go a long way toward reducing the size of the informal sector and the associated level of tax evasion.

Finally, the empirical results show that discretionary tax measures that were in place during the study period have cumulatively negative effects on import VAT revenue.

In light of the above findings, we recommend that tax authorities should take a critical look at import exemptions regimes. A major concern is that tax exemption provisions in Ghana are not always clear and hence can easily be abused. Although there might be justifiable reasons for providing import VAT exemptions, such exemptions should be provided sparingly and should also be monitored to eliminate abuses. Such exemptions have contributed to the erosion of the import VAT base, creating the situation where, although import VAT revenue responds strongly to in-built growth of the base, the response of the base to growth in the economy is very weak.

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Endnotes

- 1 In the textbook, the elasticity formula is the ratio of the percentage change in the tax revenue to the percentage change in the tax base. However, in econometric research, the formula is specified in a multiplicative form $R_t = e^{\alpha} Y_t^{\beta} e^{\mu}$, which is then log linearized to obtain equation (1).

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Appendix 1: List of VAT-Exempted Items in Ghana

	Item	Year of exemption
1	Agricultural food items in the raw state and selected live animals produced in Ghana and those imported for breeding purposes as well as animal products including edible meat and aquatic food products in their raw state	Since 1994
2	Selected agricultural inputs: Agricultural inputs including chemicals (fertilizers included), fishing equipment, and seeds and seedlings	Since 1994
3	Educational inputs and services: Textbooks and supplementary readers, newspapers, periodicals, magazines, trade catalogues, services supplied to students as part of the education program	Since 1994
3	Medical services and supply: Equipment and accessories for the supply of medical services; the supply of a medical, dental, nursing, midwifery or paramedical service; locally produced pharmaceuticals; mosquito nets.	Since 1994
4	Transportation: Domestic transportation of passengers by road, rail, and water but not including the supply of haulage or the rental or hiring of passenger and other vehicles; domestic transportation by air (exempted in 2017)	Since 1994
5	Utilities: Water (excluding bottled and packaged water), domestic use of electricity	Since 1994
6	Housing, land, construction services and accommodations	Since 1994
7	Financial Services: Financial services, excluding financial services rendered for a fee, commission, or a similar charge; and life insurance and reinsurance, whether or not rendered for a fee, commission or a similar charge	1994-2012; 2017 to date
8	Crude oil and petroleum products: crude oil and hydrocarbon products: (a) petrol; (b) diesel; (c) liquefied petroleum gas; (d) natural petroleum gas; and (e) kerosene	Since 1994
9	Machinery, appliances and parts: Machinery and parts of machinery specifically designed for use in the following activities: (a) agriculture, veterinary practice , fishing and horticulture; (b) mining as specified in the mining list; (c) manufacturing; (d) railway and tramway; (e) upstream petroleum operations as specified in the petroleum list; and (f) dredging	Since 1994
1	Telephone sets including mobile or cellular phones and satellite phone	2008-2013
	Institutional reliefs: All imports for the President, diplomatic missions, technical assistance schemes with agreements, and emergency relief	Since 1994

Source: Adapted from "VAT exemptions" by Ghana Revenue Authority (2015). Retrieved from <https://gra.gov.gh/index.php/charging-vat/>

Appendix 2: Trends in Key Variables

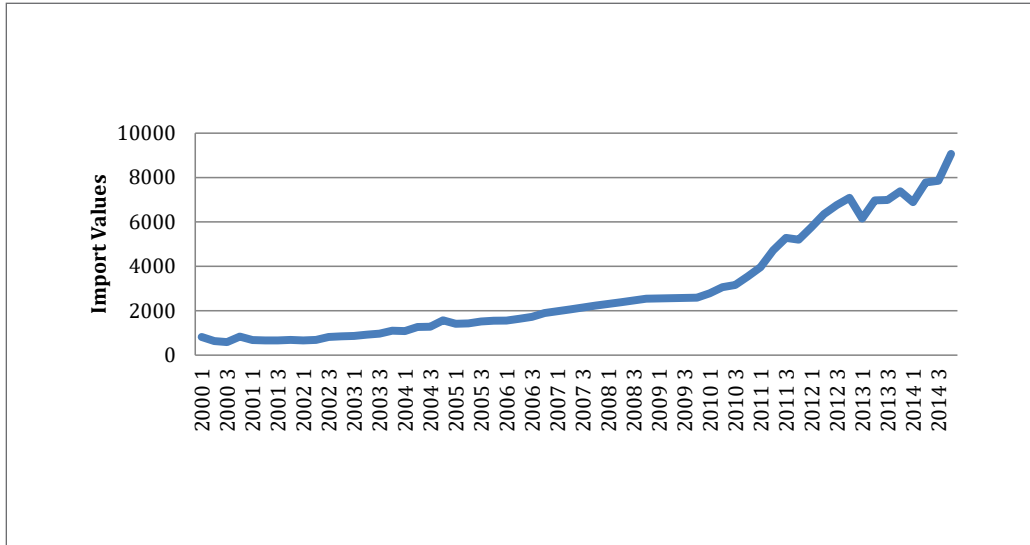


Figure A1. Trends in Imports (Millions of GhC)

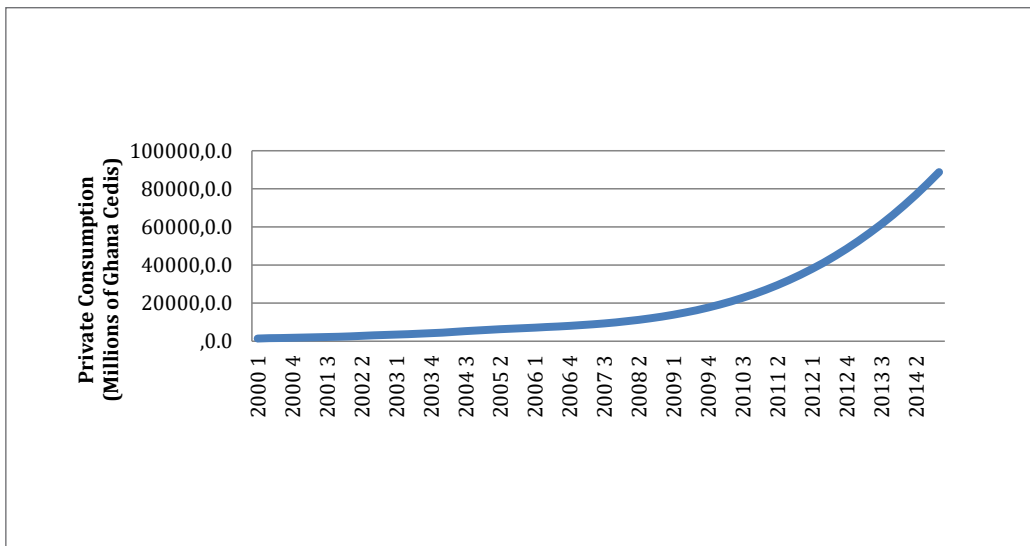


Figure A2. Private Consumption from 2000 to 2014

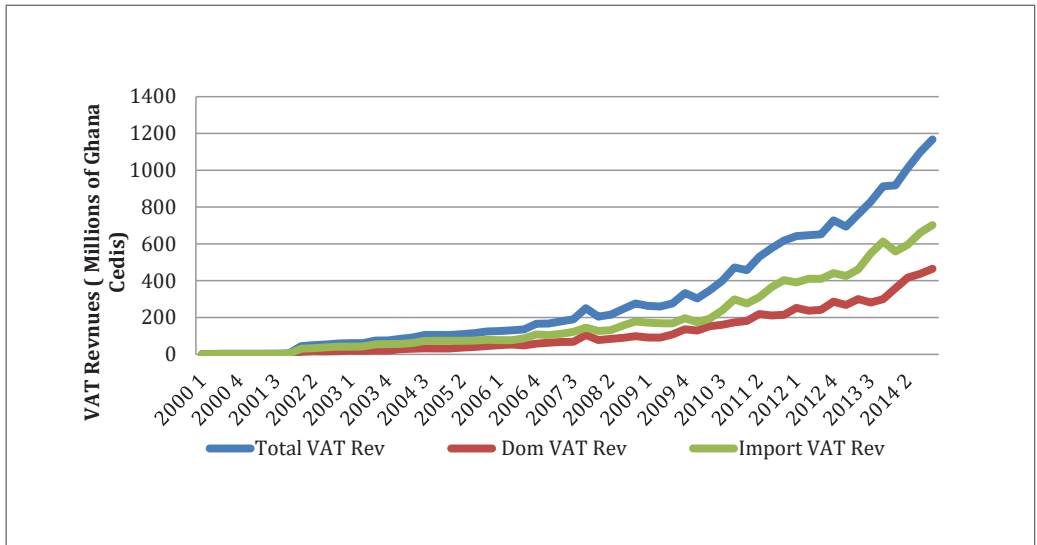


Figure A3. Trends in Total, Import and Domestic VAT Revenues from 2001 to 2014

