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Household spending and income inequality: examining the effects of a consumption-based tax in Ghana

Kobena Foh Ocran, and Abel Fumey

Department of Economics, University of Ghana, Accra, Ghana,

Abstract

This paper examined the impact of VAT on household spending and income inequality in Ghana by incorporating Zivot–Andrews test. The study employed bootstrap autoregressive distributed lag model, complemented by Toda–Yamamoto causality test. The empirical findings revealed that the elasticity of consumer spending with respect to VAT is negative, inelastic, and significant in the long-run but leaves no short-run effect. The impact of a change in VAT varies on household spending and income inequality.

Keywords: *Consumption expenditure; Income inequality; Value-added tax; Kuznets curve; Bootstrap ARDL model; Ghana*

1. Introduction

Consumption is the largest component of GDP in most modern economies, accounting for more than 60% of output. The relevance of rapid economic development and urban expansion accelerates consumption opportunities that increase living standards, the general well-being of households, and the dynamic effects of economic shocks (Liu et al., 2018; Keho, 2019). In a standard view, growth provides the means for consumption in an economic system. The valuation of society's wellbeing often starts with utility derived from the consumption of goods and services (Syrovátka, 2007).

Household consumption continues to exhibit constant growth faster than GDP in recent years, with Ghana among ten other African countries contributing about 80 percent of consumer wealth and consumer spending (Signé, 2018).[1] Available statistics from the World Bank indicate that on average Ghana's household consumption expenditure (HCE) per capita from 2007 to 2019 is US\$1364.58, a figure slightly higher than sub-Saharan Africa of US\$1022.47 (Koomson et al., 2021).

Despite the progressive growth, resource distribution in Ghana, and in particular, income inequality (INEQ) has remained below expectations leaving many questions unanswered. Reports indicate that inequality as measured by Gini Coefficient for instance continued to increase from 41.9 percent in 2006 to 42.3 percent in 2013 and 43.0 percent in 2017 (Ghana Statistical Service (GSS), 2017). To reduce the growing income disparities, Ghana has implemented several social equity-enhancing policies over the past decades. Some of these policies in recent times include Livelihood Empowerment against Poverty–LEAP, School Feeding Programme, National Health Insurance Scheme–NHIS, Microfinance and Small Loan Centre–MASLOC, Free Senior High School Education–FSHS and Community Based Health Planning Services–CHPS among others. The core

***Corresponding author.** *E-mail address:: kfohocran@yahoo.com*
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[1] Other countries include South Africa, Egypt, Nigeria, Morocco, Algeria, Sudan, Angola, Kenya, Ethiopia and Tunisia.

objective of these programmes is to alleviate poverty, boost human capital and protect citizens from social and economic shocks.

The existence of fiscal deficit and the narrow tax base of Ghana's economy compel the government to borrow from the private sector which tends to crowd out private investment, and negatively affects growth performance. Therefore, focusing on taxation than any other alternative ways of financing government expenditure such as money creation, debt financing is considered as a better resource for revenue mobilization (Ofori et al., 2020). The Ghana Statistical Service estimates that about 53 percent of individuals or households spending (HHS) on goods and services are subject to VAT contributing on average 20 – 30 percent of total tax revenue, and a major source of governments revenue in advanced economies, emerging markets and developing economies (Bekoe et al., 2016).

Although, studies on the effects of indirect tax policies on consumption expenditure and income inequality have received scholarly attention, the results are in a mix pointing to inconclusive debate on the subject. Thus, while some conclude that there exists positive relationship between commodity tax, domestic savings and household consumption such as Çevik (2015), others point to a negative relationship between indirect tax, economic growth and income inequality (Sung & Park, 2011; Martinez-Vazquez et al., 2012). Other studies indicate neutrality between indirect tax policies and income disparity (Alavuotunki et al., 2019).

From methodological perspectives, the dominant approaches used to estimate the empirical models relating taxation to consumption and economic growth have been panel and cross-sectional analysis, specifically Generalized Method of Moments (GMM), fixed effects and microsimulation analysis (Alm & El-Ganainy, 2013; Kolahi, 2016; Alves & Afonso, 2019). However, few studies have also applied time series techniques including the Autoregressive Distributed Lagged (ARDL) and Vector Error Correction (VEC) models (Şen & Kaya, 2016; Bartkus, 2017; Idris & Sani, 2021). It should be noted though that panel and cross-sectional estimations are subject to potential heterogeneity and cross-sectional dependence leading to biased estimates (Pereira, 2000).

In this paper we examine whether VAT as a consumption tax is effective in reducing income inequality trends and simultaneously maintain a healthy spending pattern within Ghana's economy. The study contributes to the literature by applying the bootstrap ARDL model to examine the long-run and the short-run effects of VAT on consumption expenditure and income inequality. The bootstrap approach maintains its strong size and power properties over the conventional ARDL model even when all variables are integrated of order zero I(0) (McNown et al., 2018). The second section presents a theoretical and empirical review while section three discusses the methodology and data. The fourth section reports the empirical results and their discussions. Finally, section five provides conclusions and policy suggestions of the study.

2. Literature review

The 'absolute income hypothesis' (AIH) considers taxation as an effective instrument of economic policy regulation. The impact of consumption tax on the poor reflects a high marginal propensity to consume (MPC) and a low marginal propensity to save (MPS) relative to the rich (Drakopoulos, 2021). In all, Keynes's theory of consumption asserts the decision of a rational economic agent on consumption or spending changes to a tax shock. The 'permanent income hypothesis' (PIH) and 'life-cycle hypothesis' (LCH) argue that aside shocks, a change in tax policy will not affect economic agents' consumption decisions unless individuals reform expectations of future incomes (Şen & Kaya, 2016). Additionally, the Kuznets hypothesis, stipulates that income inequality first increases to its maximum point and falls with economic development. Kuznets noted that inhabitants of a country initially engage in agricultural activities in the rural sector with low income, but people migrate to urban areas to work in industrial sectors with increased wage disparities that initially worsens inequality and later improves with rapid advances in development (Kuznets, 1955). The Kuznets curve hypothesis is however criticised for failing to explain data beyond 1980 but developed a new theory called the Kuznets waves (Milanovic, 2016).

On the empirical front, Çevik (2015) shows that in Turkey, share of consumption taxes has positive impact on domestic savings, whereas income taxes are negatively related to gross domestic savings in the long term. Furthermore, in Lithuania, Bartkus (2017) assesses tax effect on consumption and savings using quarterly data from 2002(Q1) to 2016(Q4). By applying the vector error correction model the study shows that taxes have a minimal effect on savings, but agents tend to maintain constant future consumptions. Similarly, Bonsu and Muzindutsi (2017) used multivariate cointegration approach to analyze the macroeconomic determinants of household consumption expenditure in Ghana using annual data from 1961 to 2013. The finding reveals that on average, 79.71 percent of private income is spent on consumption. Also, in the short-run, private spending is influenced by changes in inflation, and has contagious effect on growth performance and the real exchange rate.

Furthermore, Şen and Kaya (2016) studied the impact of tax shocks on private consumption expenditure in Turkey using quarterly time-series data over the period of 2003(Q1) to 2013(Q3). By using the structural vector autoregressive (SVAR) model, the study finds that VAT, special consumption tax, and income tax affected private consumption expenditure in the short-term. Moreover, only income tax and VAT tend to have a long-term effect on private consumption expenditure. By contrast, Zeynalova and Mammadli (2020) applied ARMA maximum likelihood model to find the determinants of household consumption in Azerbaijan from 1995 to 2017. The authors established a linear relationship between the response variable and independent variables where corporate tax, VAT, and the exchange rate had a significant positive impact on consumption. Other factors such as income tax and disposable income had an insignificant negative influence on consumption.

The tax policy of an economy should be efficient, such that it does distort labour supply decisions and reflect positively on revenue performance (Atkinson & Stiglitz, 1972). Therefore, a good tax policy should consider the most efficient solutions to reach the desired levels of redistribution. Nguyen et al., (2017) applied a structural VAR model to investigate the impact of consumption and income tax shocks on economic growth in the United Kingdom from 1973 to 2009. The results indicate that an increase in income tax has a significant and negative impact on GDP, investment, and private consumption, whereas an upward revision in consumption tax has a neutral effect. On the policy side, this requires fiscal authorities to shift toward taxing consumption than income.

Alavuotunki et al., (2019) analysed the impact of VAT on inequality and government revenue in 138 countries using panel data analysis. The panel data span through the period 1975-2010. They find that VAT adoption on average does not lead to an increase in income inequality. This is evident in low-income economies where inequality is consumption-based. Moreover, Martinez-Vazquez et al., (2012) looked at the role tax policy and public expenditure play in income distribution for a sample of 150 countries from 1970–2009. The empirical results from the panel model framework concluded that progressive personal taxes and corporate income taxes improve income equality. On the other hand, a collection of indirect taxes such as consumption taxes, excise taxes, and customs duties hurt income distribution. They added that only fiscal expansion on social welfare such as education, health, and public housing positively impact income distribution.

On studies in Africa, Mourfou and Ouedraogo (2021) sampled West African economic and monetary union countries (WAEMU) to examine the effect of tax revenue on inequality using the double least squares estimation technique for the period 1996 to 2015. The results indicate that progressive taxation is associated with an efficient and effective redistribution of income whiles indirect and commercial tax revenues are neutral to inequality. Yet, Obaretin et al., (2017) pointed out that tax variants exert an insignificant impact on income disparity in Nigeria using ordinary least squares model for the period 1981 to 2014.

3. Methodology and Data

3.1. Model 1: Impact of VAT on private consumption

Keynes's general theory (1936) asserts that consumption expenditure is associated with disposable income. In detail, consumption is a function of current income at a given period. The functional form of this statement is expressed as:

$$C_t = \gamma_0 + MPC(Y_t - T_t) \tag{1}$$

$$C_t = \gamma_0 + MPC(Y_{dt}); \quad \gamma_0 > 0; 0 < MPC < 1 \tag{2}$$

where C_t is consumption expenditure, γ_0 denotes autonomous consumption independent of income, MPC represents marginal propensity to consume (MPC is positive and range between 0 and 1), Y_{dt} is disposable income after tax, Y_t is gross national income. The average propensity to consume (APC) is the ratio of consumption expenditure to disposable income given as:

$$APC = \frac{C_t}{Y_{dt}} = \frac{\gamma_0}{Y_{dt}} + MPC \tag{3}$$

This implies that $APC > MPC$, and that the APC falls as income grows. Mathematically, the Keynes AIH can be in the form:

$$C_t = \varphi_0 + \beta_i Yd_t + u_t \tag{4}$$

where φ_0 denotes the intercept, β_i is the MPC and u_t is the disturbance term. Based on the derivation of equation (4), consumption function is reparametrized and written as:

$$HHS_t = f\left(Y_t, TAX_t, Z_t\right), \tag{5}$$

where HHS represents household spending, Y is GDP, TAX is VAT, the main variable of interest and Z represents control variables. Equation (5) can be written as:

$$HHS_t = f\left(GNS_t, VAT_t, Z_t\right), \tag{6}$$

The empirical model to analyze the impact of VAT with other related variables on household spending is stated as:

$$lnHHS_t = \alpha_0 + \beta_1 lnVAT_t + \beta_2 lnGNS_t + \beta_3 lnGCE_t + \beta_4 lnPOPG_t + \beta_5 lnREER_t + \beta_6 lnPREM_t + u_t \tag{7}$$

α_0 is the intercept; β_1 to β_6 are coefficients of household spending (HHS), Value-added tax (VAT) - main variable of interest, gross national savings (GNS), government consumption expenditure (GCE), population growth rate ($POPG$), real effective exchange rate (REER), personal remittance received (PREM), respectively; u_t acquires the disturbance term, and t is the time series. The log transformed model ensures that the disturbances are normally distributed on the logarithmic scale yielding a linear relationship (Xiao et al., 2011).

3.2. Model 2: Impact of VAT on income inequality

Referring to the standard model of Kuznets (1955), the study adopts a non-linear polynomial model specification of the form:

$$INEQ_t = \alpha_0 + \beta_t pGDP_t + \beta_t pGDP_t^2 + u_t \tag{8}$$

where $INEQ(.)$ depends on per capita income and per capita income square. It is increasing in per capita income ($pGDP$) and decreasing in per capita income squared $\left(pGDP^2\right)$ to reflect an inverted U shaped relationship between INEQ and per capita income. However, it is assumed to be strictly concave in both arguments. Equation 9 adopts the theoretical framework of Martinez-Vazquez et al., (2012) and specifies the non-linear model to examine the impact of VAT contributions to GDP on INEQ.

$$INEQ_t = \delta_0 + \beta_1 pGDP_t + \beta_2 pGDP_t^2 + \beta_3 VAT_t + \beta_4 GCE_t + \beta_5 REER_t + \beta_6 PREM_t + \beta_7 POPG_t + u_t \tag{9}$$

δ_0 is the intercept; β_1 to β_7 are coefficients of INEQ, real GDP per capita *(pGDP)*, real GDP per capita squared $\left(pGDP^2\right)$, Value-added $tax(VAT)$ - main variable of interest, all variables are as previously defined, u_t is the residual term, and t is the time series. Xiao et al., (2011) argues that in non-linear model the errors are normally distributed and addictive on the arithmetic scale.

4. Data

To implement our methodology, the study utilizes data from year 2000 to 2019, on a semi-annual basis. The choice of the period is guided by credible data availability. Table 1 provides description of the variable, data sources and expected signs from theory. All variables are expressed in real terms.

Table 1. Variable Detail

Variable	Variable representation	Description	Data Source	Expected sign
Household spending	HHS	Market value of durable and non-durable goods and services (% GDP)	WDI	Response variable
Income inequality	INEQ	Gini coefficient, ranges between zero and one	SWIID & Statista	Response variable
Value-added tax	VAT	Domestic and import VAT (% GDP)	MoF & GRA	-
Real effective exchange rate	REER	Real value of domestic currency against weighted average of several foreign currency	WDI	$-$
Government expenditure	GCE	Goods and services purchased + compensation of employees (% GDP)	WDI	$+/-$
GDP per capita	pGDP	GDP per capita, captures "Kuznets process"	WDI	$+/-$
Gross national savings	GNS	Private + public savings (% GDP)	WDI	$+/-$
Personal remittance received	PREM	Personal transfers + compensation of employees (% GDP)	WDI	$+$
Population growth	POPG	Annual population growth in percentages	WDI	$+$

Source: Compiled by author

5. Estimation techniques

5.1. Bootstrap autoregressive distributed lag (BARDL) model

The study employs the bootstrap autoregressive distributed lag (BARDL) model, which modifies the traditional ARDL bounds testing approach using the bootstrap resampling procedure to improve the test statistic properties (Goh et al., 2020; Pata & Kumar, 2021). The general ARDL model is expressed as follows:

$$\Omega(L)y_t = \varphi + \emptyset(L)x_t + u_t \tag{10}$$

where $\Omega(L)$ is an order-p polynomial that, for stability, has roots lying outside the unit circle and $\emptyset(L)$ is an order-q polynomial. Expanding the lag polynomials of equation (10) forms:

$$y_t = \varphi + \Omega_1 y_{t-1} + \cdots + \Omega_p y_{t-p} + \emptyset_0 x_t + \emptyset_1 x_{t-1} + \cdots + \emptyset_q x_{t-q} + u_t \tag{11}$$

The ARDL bounds testing framework of Pesaran et al., (2001) has many advantages over the classical cointegration tests. The conventional ARDL model identifies the presence of longrun relationship between two or more variables in levels irrespective of whether the series are I(0) or I(1). Pesaran et al., (2001) proposed a pair of tests (F-test and t-dependent test) to identify cointegration in the ARDL methodology. The presence of cointegration could be determined if the overall F-test and the t-dependent test compared with the critical bounds values (lower bound I(0) and upper bound I(1)) individually reject their null hypothesis (Pesaran et al., 2001). The ARDL approach presents some challenges. For instance, the bounds test assumes no reaction at the levels from the response variable to the regressors, thus creating endogeneity problem in the ARDL test (Goh et al., 2017). The bounds testing process to cointegration lacks endogeneity as the traditional unit root test suffer from low power and size properties (Pata & Kumar, 2021).

To overcome the above challenges, McNown et al., (2018) developed the BARDL model. McNown et al., (2018) proposed additional test statistics on the lagged-levels of the independent variables to examine the long-run relationship between variables. The BARDL has several advantages. The additional test-statistics reclines the assumption of the order of integration among variables and minimizes the prospect of applying low power and size properties of existing unit root tests. Unlike the asymptotic distribution of critical values by Pesaran et al., (2001), the BARDL uses bootstrap simulation method to produce critical values capable of eliminating insecure cases based on fixed properties of integration (Nawaz et al., 2019; Goh et al., 2020). This feature eliminates inconclusive inferences with the conventional ARDL cointegration test and degenerate cases. Additionally, the lagged-level independent test statistic of McNown et al., (2018) has the power to ease the assumption of an I(1) dependent variable than imposing Pesaran's asymptotic unit root test which has a low size and power properties (Goh et al., 2020). The BARDL accommodates endogeneity problems and feedback that may exist among the variables leading to accurate and robust inferences (Goh et al., 2017). The BARDL bounds testing approach expressed in a bivariate ARDL (p, q) model as follows:

$$y_t = \breve{c} + \sum_{m=1}^{p} \breve{\delta}'_j y_{t-j} + \sum_{n=1}^{q} \breve{\alpha}'_k x_{t-k} + \sum_{h=1}^{e} \breve{\gamma}'_k x_{t-k} + \sum_{o=1}^{w} \breve{\eta}'_v Dummy_{t,v} + \breve{u}_t \tag{12}$$

where m, n, h, o are indices of lags: $m = 0, 1, 2, \cdots, p; n = 0, 1, 2, \cdots, q; h = 1, 2, \cdots, e; o = 1, 2, \cdots, w. t$ denotes time periods $t = 1, 2, \cdots, T; y_t$ is the response variable; ω_t and β_t are the independent variables; Dummy $_{t,v}$ is used to detect structural breaks through the process by Zivot and Andrews (ZA) (2002). β'_k is the coefficient on the lag of explanatory variables and ω'_j is the coefficient on the lag of the dependent variable. η'_v is the coefficient of the v_{th} dummy variable; u_t is independent and identically distributed (i.i.d) disturbance term with zero mean and a finite variance $u_t \sim \left(0, \sigma_u^2\right)$. The error correction model (ECM) version of the current model (12) can be reparametrized and expressed as:

$$\Delta y_t = \breve{c} + \breve{\omega} y_{t-1} + \breve{\beta} x_{t-1} + \phi_{t-1} + \sum_{m=1}^{\rho-1} \breve{\delta}'_j \Delta y_{t-j} + \sum_{n=1}^{q-1} \breve{\pi}'_k \Delta x_{t-k} + \sum_{h=1}^{e-1} \breve{\Omega}'_k \Delta x_{t-k} + \sum_{o=1}^{w} \breve{\Pi}'_v Dummy_{t,v} + \breve{u}_t \tag{13}$$

where is Δ the differential term:

$$\breve{\omega} = \left(1 - \sum_{m=1}^{p} \delta_i\right); \breve{\beta} = \sum_{n=1}^{q} \breve{\alpha}_i; \phi = \sum_{h=1}^{e} \breve{\gamma};$$

other parameters are the function values of the original parameters in equation 12 . Furthermore to differentiate the short-run dynamics and the long-run equilibrium of the impact of VAT share of GDP on personal consumption, equation (7) and the effect of VAT share of GDP on income inequality, equation (9), the study applies the BARDL framework proposed by McNown et al., (2018) and specifies the unrestricted ECM as:

$$\begin{aligned} \Delta \ln HHS_t = {} & \alpha_0 + \tau_i \sum_{i=1}^{p} \Delta \ln HHS_{t-i} + \psi_i \sum_{i=1}^{q} \Delta \ln VAT_{t-i} + \delta_i \sum_{i=1}^{q} \Delta \ln GNS_{t-i} + \vartheta_i \sum_{i=1}^{q} \Delta \ln GCE_{t-i} \\ & + \varphi_i \textstyle\sum_{i=1}^{q} \Delta \ln POPG_{t-i} + \omega_i \sum_{i=1}^{q} \Delta \ln REER_{t-i} + \lambda_i \sum_{i=1}^{q} \Delta \ln PREM_{t-i} + \phi_1 \ln HHS_{t-1} \\ & + \phi_2 \ln VAT_{t-1} + \phi_3 \ln GNS_{t-1} + \phi_4 \ln GCE_{t-1} + \phi_5 \ln POPG_{t-1} + \phi_6 \ln REER_{t-1} \\ & + \phi_7 \ln PREM_{t-1} + \partial_i Dummy_t + u_t \end{aligned} \tag{14}$$

$$\begin{aligned} \Delta INEQ_t = {} & \delta_0 + \alpha_i \sum_{i=1}^{p} \Delta INEQ_{t-i} + \beta_i \sum_{i=1}^{q} \Delta VAT_{t-i} + v_i \sum_{i=1}^{q} \Delta pGDP_{t-i} + \pi_i \sum_{i=1}^{q} \Delta pGDP^2_{t-i} \\ & + \varpi_i \textstyle\sum_{i=1}^{q} \Delta GCE_{t-i} + \theta_i \sum_{i=1}^{q} \Delta REER_{t-i} + \vartheta_i \sum_{i=1}^{q} \Delta PREM_{t-i} + \lambda_i \sum_{i=1}^{q} \Delta POPG_{t-i} \\ & + \Omega_1 INEQ_{t-1} + \Omega_2 VAT_{t-i} + \Omega_3 pGDP_{t-1} + \Omega_4 pGDP^2_{t-1} + \Omega_5 GCE_{t-1} + \Omega_6 REER_{t-1} \\ & + \Omega_7 PREM_{t-1} + \Omega_8 POPG_{t-1} + \lambda_i Dummy_t + u_t, \end{aligned} \tag{15}$$

where all variables are as previously defined in section 3, Δ is the first difference operator whiles p signifies the lag length, Dummy denotes structural breakpoint based on ZA test and u_t is error term assumed to be i.i.d. The optimal lag structure of the first difference regression in Model 1 and 2 is selected by Akaike information criteria (AIC). The AIC is appropriate for small sample data and generates reliable and accurate results for maximum lags of variables (Lütkepohl, 2006). The first part of summation sign indicates error correction dynamics with coefficients $\psi_i, \delta_i, \vartheta_i, \varphi_i, \omega_i, \lambda_i$ and $\beta_i, \upsilon_i, \pi_i, \varpi_i, \theta_i, \vartheta_i$ showing short run elasticities, respectively. The coefficient, ϕ_i, represent long-run elasticities.

The decision about cointegration among series in the BARDL model relies on the following hypotheses.

- The overall F-statistics ($F_{OVERALL}$) on coefficient on all lagged values variables. The $F_{OVERALL}$ null hypothesis is $H_0 : \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 = 0$ against the alternative: $H_1 : \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 \neq 0$.
- The t-test (t_{DV}) on coefficient on the lagged level dependent variable. The t_{DV} null hypothesis: $H_0 : \Psi_1 = 0$ is tested against the alternative: $H_1 : \Psi_1 \neq 0$.
- The F-test (F_{IDV}) on coefficient on all lagged independent variables. The (F_{IDV}) null hypothesis: $H_0 : \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 = 0$ against the alternative hypothesis of cointegration: $H_1 : \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 \neq 0$.

However, by applying the two tests: ($F_{OVERALL}$) and (t_{DV}) of Pesaran et al., (2001) and the third test (F_{IDV}) by McNown et al., (2018) simultaneously yields a clear picture of cointegration, if the three tests exceed the respective critical values at 5% significance level. To check the robustness of the BARDL model, the study uses the following diagnostic tests, the Jarque-Bera test for normality, the Breusch-Godfrey LM test for autocorrelation, the Breusch-Pagan test for heteroscedasticity, the recursive coefficient tests for stability, and the Ramsey RESET test for specification error. Finally, the Toda-Yamamoto causality test is used to determine the direction of causality between among the variables.

6. Results and discussions

6.1. Unit root test results

Table 2 reports the stationarity test results based on the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The results indicate a combination I(0) and I(1) which means the variables

Table 2. Unit root test results

Variable	Level	First difference	Level	First difference
	ADF test		PP test	
Model 1				
lnHHS	-1.946	-4.190**	-1.314	-3.271***
lnVAT	-0.985	-4.617***	-0.971	-3.917**
lnGNS	-4.162	-4.529***	-1.002	-3.444*
lnREER	-2.327	-4.128**	-1.721	-3.127**
lnGCE	-3.154	-5.112***	-2.367	-3.667**
lnPREM	-2.594	-4.299***	-2.079	-4.155**
lnPOPG	-6.262***	-3.525*	-1.095	-4.220***
Model 2				
INEQ	-0.276	-5.380***	0.432	-6.621***
VAT	-2.145	-3.485*	-1.714	-3.218*
pGDP	-2.785	-3.128	-2.287	-3.500*
$pGDP^2$	-3.194	-5.041***	-2.425	-4.613***
REER	-2.497	-4.056**	-1.581	-3.217*
GCE	-3.235*	-4.100**	-2.422	-3.920**
POPG	-4.474***	-3.570*	-1.304	-4.312***

Note: ***, ** and * significant at 1%, 5% and 10% respectively.
Source: Author's formation.

6.2. Structural break test results

The structural break test is applied through the endogenous procedure of (Zivot & Andrews, 1992) (ZA). Since the conventional unit root test of ADF and PP disregards structural breaks, it is imperative to test for its existence in the model. Table 3 shows the outcome of ZA structural break tests and it indicates that none of the variables is $I(2)$ and that structural breaks at level and first difference seems to cluster mostly around the second half of 2004 to 2015. However, the structural break years resonate with critical events in Ghana. For instance, between August 2006 and September 2009 the country witnessed huge hikes in crude oil prices and energy shocks especially during the Global Financial Crises. The structural break test also captured the budget deficit and the intermittent power outages ("Dumsor")[2] around August 2012 to almost mid-2015.[3] Moreover, the period between January 2004 and December 2005 coincided with better economic performance, namely, growth in revenue, debt relief from the heavily indebted poor countries (HIPC) initiative, the multilateral debt relief initiative (MDRI) as well as tight fiscal policies (Ackah et al., 2009; Younger, 2016).

Table 3. Results of Zivot-Andrews unit root test

	Level		First difference	
Variable	T-ratio	Break years	T-ratio Break	years
HHS	-4.108*	2006s2	-3.705***	2008s2
INEQ	-1.958	2013s2	-3.596**	2010s2
VAT	-4.198**	2015s2	-6.729***	2013s2
REER	-4.154	2004s2	-6.131***	2015s2
GCE	-5.177	2010s2	-6.112**	2010s2
pGDP	-2.976***	2014s2	-2.729**	2014s1
GNS	-5.386	2012s2	-5.124**	2008s2
PREM	-9.787	2010s2	-5.133*	2010s2
POPG	-5.793	2005s2	-4.162***	2007s2

Note: ***, ** and * significant at 1%, 5% and 10% respectively.
Source: Author's formation.

6.3. Bootstrap ARDL bounds test cointegration analysis

Following Pesaran et al., (2001), Narayan (2005) and McNown et al., (2018), the BARDL bounds test is applied to check the existence of long-run relationship between the variables. In line with Narayan (2005) and McNown et al., (2018) the calculated overall F-test and t-statistics ($F_{OVERALL}, t_{DV}$, and F_{IDV}) as reported in Table 4 are significant at 1% and higher than the lower bound $I(0)$ and upper bound I(1) critical values. Overall, McNown et al., (2018) observes that, a clear picture of cointegration exist if all three null hypotheses are rejected at the same time.

Table 4. Bootstrap ARDL bounds test results

Test	Model estimated	Calculated value	Lower bound	Upper bound	Cointegration Status
Model 1					
$F_{OVERALL}$	lnHHS = f(lnVAT, lnGCE, lnGNS, lnREER,	10.74^a	3.15	4.43	
t_{DV}	lnPREM, lnPOPG),BARDL	-5.28^a	-3.43	-4.99	Cointegrated
F_{IDV}	(1, 0, 0, 2, 0, 1, 0), k(6)	11.87^a	3.37	5.74	
Model 2					
$F_{OVERALL}$	INEQ = f(VAT, pGDP, pGDP^2, GCE, REER,	37.83^b	2.96	4.26	
t_{DV}	PREM, POPG), BARDL ,	-5.34^b	-3.43	-5.19	Cointegrated
F_{IDV}	(1, 0, 0, 2, 0, 1, 0), k(6)	17.37^b	3.23	5.44	

Notes: Critical value bounds (Asymptotic distribution) for FOVERALL and tDV are sourced from Nayaran (2005) while critical value bounds (Bootstrap simulation) for FIDV are retrieved from Sam et al., (2019), a and b significant at 1%. Source: Author's calculation.

[2]"Dumsor" off and on in a local dialect of Akan language in Ghana.

[3]The West Africa Gas Pipeline from Nigeria was curtailed in August 2012 as a result of undersea pipeline accident in the Togolese waters

6.4. Bootstrap ARDL cointegration estimates

Table 5 presents a summary of the Bootstrap ARDL results. The result indicates that from Model 1 in Panel A and Panel B, the long-run elasticity coefficient for VAT, a proxy for VAT against HHS or HCE is negative and significant at 1 percent, but it was not significant in the short-run. This suggests a 1 percent increase in VAT, is expected to reduce HHS by 0.033 percent, keeping other things constant. The results indicate that consumer spending is VAT inelastic in the long run. This is consistent with Alm and El-Ganainy (2013) for 15 European countries, Şen and Kaya (2016) for Turkey and Usman (2018) for Nigeria. In addition, the coefficient of government consumption expenditure (GCE) is negative and significant at 1 percent level of significance. This implies, an expansion of government expenditure is expected to reduce household spending by 0.075 percent, holding other variables constant. The result bears the conclusion that the negative relationship between government expenditure and private spending crowds out household spending in Ghana which is like the findings of (Fosu Twumasi, 2021). In the case of gross national savings, a proxy for consumer savings is negative and significant at 1 percent level of significance suggesting a 1 percent increase in consumer savings is expected to decrease household spending by 0.105 percent and 0.074 percent in both the long-run and the short-run respectively, holding other things constant. The results are in line with the theory of savings and consumption and as espoused in the study from (Ekong Effiong, 2020).

Moreover, relative effective exchange rate (REER) exerts a negative and significant impact on household spending at 1 percent. It suggests that a 1 percent increase in REER in a 0.187 percent reduction in consumption expenditure keeping other things constant. The negative sign implies that an appreciating exchange rate increases the share of consumer spending. This is in contrast with the findings of Bonsu and Muzindutsi (2017) for Ghana and Zeynalova and Mammadli (2020) for Azerbaijan. From Model 2 as shown in panel A and B, it indicates that the impacts of VAT on income inequality is positive and significant at 1 percent level in the short-run suggesting that VAT increases INEQ in the short-run. This is consistent with conclusions of Sung & Park (2011), Martinez-Vazquez et al., (2012) and Blasco et al., (2020).

Moreover, to examine Kuznets (1955) curve model that asserts an inverse U-shaped relationship between income inequality and economic development, the coefficient of per capita income and per capita income squared in the long-run reflects the absence of the Kuznets curve hypothesis in Ghana. The coefficient of per capita income and its lag is shown to have a positive and negative relationship on income inequality at 1 percent level of significance respectively. This implies that the lagged values of per capita income itself does not contribute a lion's share to its current value in the short run. On average, current per capita income hurts income inequality, as well as its immediate past value, improves equal share of income in the short run.

Additionally, GCE, in the short-run, demonstrates a significant and positive association with income inequality which indicates that the rise in the GCE boosts the Gini index, while this impact turns into insignificant in the long-run. Furthermore, REER, a proxy for the relative price of internationally durable goods exerts a negative shock on income inequality and highly significant at 1 percent in the long run. This relationship explains that if REER increases by 1 unit, income inequality decreases by 0.061 units, holding other independent variables constant. The findings are in line with Min et al., (2015). Likewise, the sign of REER and its lag are positive and highly significant at 1 percent in the short run.

The positive sign of personal remittance received (PREM) suggest that a 1 unit increase in PREM increase income inequality by 6.869 units at 1 percent significance level, keeping other variables constant. This implies that, the concentration of PREM is found among rich households, leading to widening of incomes in Ghana, however, the impact is reversed in the short run. Again, the results suggest that remittances lead to an appreciation in real exchange rate which worsens the wellbeing of poor households. This is consistent with the findings of Acosta et al., (2009), Acharya (2012), and Meyer (2017) but contradicts Adams et al., (2008) and Anyanwu & Erhijakpor (2010).

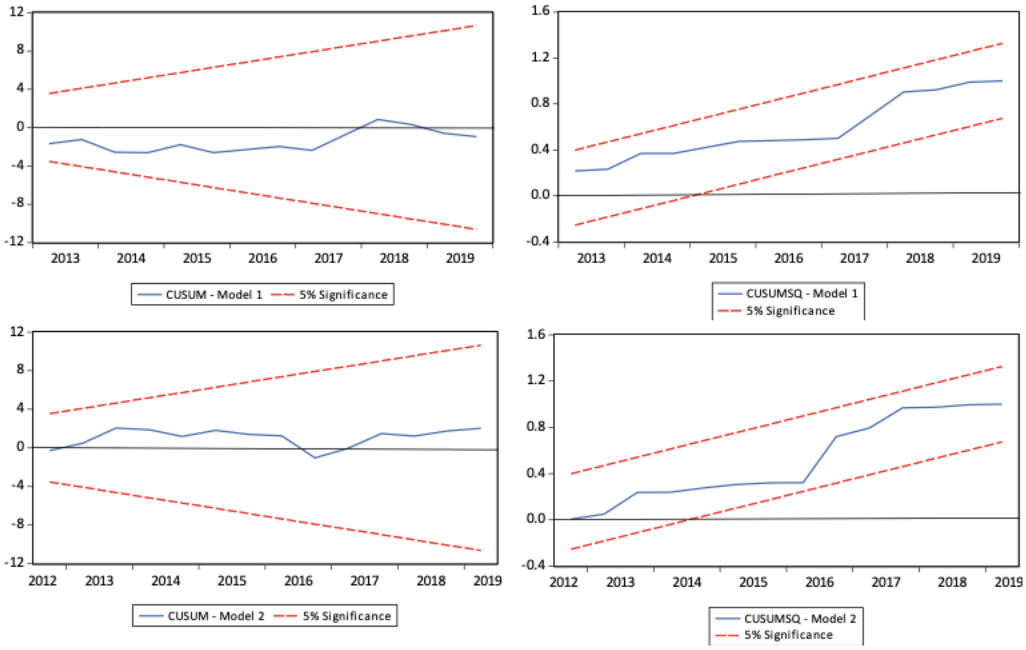
The error correction term ECT (-1) captures the speed at which the variables return to their long-run equilibrium after a shock. It is negative and statistically significant at 1 percent as expected. The high speed of adjustment value of -0.676 for Model 1 and a low speed of -0.221

Table 5. Empirical results

Model	Household spending (1)			Income inequality (2)		
Regressor	Coefficient	Std. error	T-ratio	Coefficient	Std. error	T-ratio
Panel A: long-run results						
lnVAT	-0.033***	0.009	-3.900	–	–	–
lnGCE	-0.075***	0.011	-6.678	–	–	–
lnGNS	-0.105***	0.029	-3.596	–	–	–
lnREER	-0.187***	0.065	-2.874	–	–	–
lnPREM	0.001	0.011	0.093	–	–	–
lnPOPG	1.333***	0.257	5.191	–	–	–
BREAK_{m1}	-0.028	0.020	-1.389	–	–	–
VAT	–	–	–	-0.015	0.036	-0.405
pGDP	–	–	–	0.271***	0.074	3.672
pGDP^2	–	–	–	-0.009	0.007	-1.265
GCE	–	–	–	0.005	0.024	0.191
REER	–	–	–	-0.061***	0.018	-3.371
PREM	–	–	–	6.869***	1.490	4.611
POPG	–	–	–	-0.002	0.038	-0.053
BREAK_{m2}	–	–	–	-1.161***	0.135	8.610
Constant	3.074	0.319	9.640	2.681	0.128	20.883
Panel B: short-run results						
ΔlnGNS	-0.074***	0.007	-10.852	–	–	–
ΔlnGNS(-1)	-0.013*	0.007	-1.980	–	–	–
ΔlnREER	-0.015	0.038	-0.394	–	–	–
ΔREAKm1	0.019***	0.008	2.428	–	–	–
ΔREAKm1	0.035***	0.008	4.305	–	–	–
ΔVAT	–	–	–	0.062***	0.009	7.068
ΔVAT(-1)	–	–	–	0.016*	0.008	1.973
ΔpGDP	–	–	–	0.010***	0.002	4.064
ΔpGDP(-1)	–	–	–	-0.006***	0.002	-4.084
ΔGCE	–	–	–	0.012***	0.002	6.179
ΔREER	–	–	–	0.006***	0.001	6.297
ΔREER(-1)	–	–	–	0.003***	0.001	3.438
ΔPREM	–	–	–	-0.009***	0.002	-4.723
BREAK_{m2}	–	– –		-0.107***	0.018	5.898
ECT(-1)	-0.676	0.070	-9.657	-0.221	0.004	-20.351
Panel C: diagnostic tests						
Test statistics	F-statistic	Prob.	F-statistic	Prob.		
Serial correlation	1.662	0.212	0.594	0.563		
Heteroskedasticity	1.153	0.365	0.672	0.787		
Normality	0.076	0.963	2.756	0.252		
Ramsey RESET test	3.422	0.077	0.88	0.361		

Note: ***, ** and * significant at 1%, 5% and 10% respectively. Log variables represents elasticity.
Source: Authors' compilation.

Figure 1. Plots of CUSUM and CUSUMSQ for Model 1 & 2



Source: Author's formation from data 2000–2019.

for Model 2. The results suggest that approximately about 67.6 percent and 22.1 percent of the short-run disequilibrium is restored in the long-run equilibrium steady-state position within a year.

The results of the diagnostic tests performed for the BARDL model are reported in Panel C of Table 5. The Ramsey RESET test indicates correct functional form of the models. The Breush-Godfrey-LM test shows there is no serial correlation. The Jarque-Bera normality test indicates that all residuals are normally distributed. The Breusch-Pagan-Godfrey test shows that there is no heteroscedasticity problem in the models, of which the disturbance terms are homoscedastic. To determine the robustness of the models, cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals square (CUSUMSQ) are applied. Results of these tests (figure 1) confirms the stability of the short-run and long-run estimated parameters at a 5% significance level.

Table 6. Toda-Yamamoto causality test

	Model 1			
Null hypothesis	Chi-sq	df	Prob.	Direction of causality
HHS does not granger cause VAT	2.914	2	0.238	
VAT does not granger cause HHS	25.685	2	0.033***	unidirectional
	Model 2			
Null hypothesis	Chi-sq	df	Prob.	Direction of causality
INEQ does not granger cause VAT	1.148	2	0.563	
VAT does not granger cause INEQ	39.672	2	0.005***	unidirectional

Notes:*** significant at 1%.
Source: Author's formation.

6.5. Toda–Yamamoto causality test

Table 6 reports on the results of Toda–Yamamoto causality test. This type of causality has an advantage over the typical Granger causality technique because the maximum lag length determined in the VAR system does not change, producing robust and reliable results (Adriana, 2014). The empirical results suggest that a long-run Granger causality test runs from VAT to HHS and at 5 percent significance level in Model 1 and 2. Specifically, there is a unidirectional causality from VAT to HHS as well as from VAT to INEQ. This indicates that VAT granger causes HHS and INEQ, suggesting a one-way relationship between them.

7. Conclusion and policy implications

This paper analysed the impact of consumption tax such as VAT on household spending (HHS) and income inequality (INEQ) using the Bootstrap Autoregressive Distributed Lagged (BARDL) model in Ghana. Using data from 2000 to 2019, the empirical evidence confirms that high significance level of VAT hurts HHS in the long-run and has no dynamic influence. This suggests that VAT has an inelastic, negative, and statistically significant long-run effect on consumer spending. The intuition behind this outcome is that an upward revision of VAT leads to a minor change in (or turns not to reduce) consumption levels of households in the long run. Additionally, the result indicates that VAT increases INEQ in the short-run with a high significance level but its influence in the long-run is immaterial. This implies that VAT tends to widen income gap in the short run. The paper suggests that policymakers should focus on expanding the VAT base since this tends to be less distortionary on consumer spending (inelastic) in the long-term, to maintain aggregate demand and strengthen domestic resource mobilisation. In addition, the study suggests that revenue accrued from VAT should be properly directed to providing public goods and services.

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