HOUSEHOLD SPENDING AND INCOME INEQUALITY: EXAMINING THE EFFECTS OF A CONSUMPTION–BASED TAX IN GHANA

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MPHIL ECONOMICS DEGREE

DEPARTMENT OF ECONOMICS

FEBRUARY, 2023

DECLARATION

This is to certify that this thesis is wholly the result of research undertaken by Kobena Foh Ocran in partial fulfilment of requirements for the award of Master of Philosophy in Economics at the Department of Economics, University of Ghana, Legon. I also declare that I have not submitted this essay to any other institution for assessment or any other purposes and that all references have been duly acknowledged.

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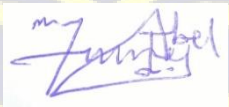

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DR. ABEL FUMEY

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DEDICATION

This thesis is dedicated to God Almighty, to my parents, Dr. Ebenezer Kojo Ocran and Mrs. Emma Ekuwa Ocran, all of whose efforts, hopes, believe, and prayers have always been my inspiration and growth in every step of my life; and to my sister, Mrs. Abena Fowaa Oppong for all the never-ending love, care, and motivation throughout the study.

ACKNOWLEDGEMENT

My utmost praise goes to the Almighty God for granting me the knowledge, courage, strength, and resilience needed to complete this thesis. I extend a profound appreciation to the academic staff of the Department of Economics, University of Ghana, Legon for the opportunity to pursue a master's degree in Economics and expand my knowledge in this field.

Special thanks and gratitude goes to my supervisors, Prof. Imhotep Paul Alagidede and Dr. Abel Fumey whose guidance, thorough feedback, and consistent encouragement enriched the quality of this project. I truly appreciate the unlimited support, dedicated interest, careful and reasoned criticism, and time spent supervising my thesis. Without their input, this project could not have seen the daylight. To Prof. Michael Jamel Osei, I cannot thank you enough for your timely response during the hard times of writing this thesis, I am grateful. I am indebted to Mr. Edward Abrokwah and Mr. Wonder Adetor of the Ministry of Finance, Tax Policy Unit, and the Financial Sector Division respectively, for providing most of the needed data for this project.

Finally, a heartfelt appreciation and thanks go to all my siblings for the love and support they have shown throughout my education and my friends, colleagues, and relatives who encouraged and assisted me in diverse forms.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ADF	Augmented Dickey–Fuller Test
AIC	Akaike Information Criterion
AIH	Absolute Income Hypothesis
APC	Average Propensity to Consume
ARCH	Autoregressive Conditional Heteroskedasticity Model
ARDL	Autoregressive Distributed Lag Model
ARMA	Autoregressive Moving Averages Model
BARDL	Bootstrap Autoregressive Distributed Lag Model
CHPS	Community Based Health Planning Services
CLRM	Classical Linear Regression Model
CPI	Consumer Price Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares Recursive Residuals
ECM	Error Correction Model
ECT	Error Correction Term
FP	Final Prediction Error
GCE	Government Consumption Expenditure
GDP	Gross Domestic Product
GMM	Generalized Method of Moment
GNS	Gross National Savings
GRA	Ghana Revenue Authority
GSS	Ghana Statistical Service
HCE	Household Consumption Expenditure

HIPC	Heavily Indebted Poor Countries
HQ	Hannan – Quinn Information Criterion
HHS	Household Spending
INEQ	Income Inequality
JB	Jarque–Bera Test
LCH	Life Cycle Hypothesis
LEAP	Livelihood Empowerment against Poverty
LM	Lagrange Multiplier
MDRI	Multilateral Debt Relief Initiative
MoF	Ministry of Finance
MPC	Marginal Propensity to Consume
MWALD	Modified Wald Test
OECD	Organisation for Economic Co–operation and Development
OLS	Ordinary Least Squares
PERM	Personal Remittance Received
*p*GDP	*per Capita* Income
$pGDP^2$	*per Capita* Income Squared
PIH	Permanent Income Hypothesis
POPG	Population Growth
PP	Phillips and Perron Test
REER	Real Effective Exchange Rate
RESET	Regression Specification Error Test
RIH	Relative Income Hypothesis
SBC	Schwarz Bayesian Criterion

SIC	Schwarz Information Criterion
sSA	sub–Saharan Africa
SWIID	Standardized World Income Inequality Database
SVAR	Structural Vector Autoregressive Model
VARs	Vector Autoregressions
VAT	Value–Added Tax
VEC	Vector Error Correction Model
WAEMU	West African Economic and Monetary Countries
WPI	Wholesale Price Index
WDI	World Development Indicator
ZA	Zivot and Andrews Unit Root Test

ABSTRACT

Over recent years, consumption taxes have increased government revenue and served as a fiscal stimulus tool in both developed and developing countries. Nevertheless, economic theory suggests that a broad-based consumption tax, such as value-added tax (VAT) is generally considered to be a regressive tax, implicitly affecting the economic welfare and standard of living of households, particularly in developing countries. Therefore, the objective of this study is to analyze the impact of VAT on household spending and income inequality in Ghana by incorporating Zivot–Andrews structural break unit root test in the series based on annual data that span the period 2000–2019. Importantly, the study employed the bootstrap autoregressive distributed lag modelling technique to examine the long-run and short-run relationship between the variables as well as the Toda–Yamamoto causality test is applied to ascertain the causal dynamics in the model. The empirical findings revealed that VAT can reduce household spending in the long-run but leaves no effect in the short-run. The elasticity of consumer spending with respect to VAT rate is inelastic in the long-run. Similarly, the VAT rate tends to be insignificant in the long-run while at the same time VAT rate exhibits a highly significant level and a negative effect on income inequality in the short-run. These results suggest that the impact of a change in VAT rate varies on household spending and income inequality. Based on these observations, the study recommends that fiscal authorities should focus on expanding the VAT base, as VAT tends to be less distortionary on consumer spending (inelastic) in the long-term, to maintain aggregate consumption and strengthen domestic resource mobilisation; on this account, better-targeted cash transfer programs should be financed using VAT revenue accrued.

CHAPTER ONE

INTRODUCTION

1.1 Background

Development, defined as the outgrowth of economic and social conditions, generates sustainable development inevitably shared by all citizens. The dynamics of the economic system of Africa entailed a trend that seemingly changed for the better in the early 2000s. The continent growth performance on average was 5 percent in 2001 and increased to about 5.5 percent from 2010 to 2015 compared with the Asia and Middle East average rate of 5 percent and less than 5 percent between the same periods respectively (Olayungbo & Quadri, 2019). In particular, median countries in sub-Sahara Africa recorded an increasing *per capita* growth rate from 0.2 percent on average annually in the 1980s and 1990s to 1.6 percent between 2000 and 2019, a clear indication of an improvement in economic growth over the periods (Archibong *et al.*, 2021).

The West African sub-region is ordinarily noted as the world's fast-moving region where its urban spread presently contains approximately 472 million people and is expected to expand from 11.3 percent in 2010 to 20.2 percent by 2050 (Saghir & Santoro, 2018). 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 (Paim, 1995; Liu *et al.*, 2018; Keho, 2019).

The economic performance of Ghana has been resilient to shocks over the past three decades, with private sector-led economic policies and programmes initiated during the period (Alagidede *et al.*, 2013). The share of the service sector has been increasing in major economic

activities of economic growth in Ghana. On average, the pattern of structural change between 2006 and 2020 was led by contributions of the services sector with 50.5 percent. Agriculture and industry accounted for 24 percent and 25.5 percent respectively in the same period (Bank of Ghana, 2021). This observation corroborates Kuznets's (1955) and Milanovic's (2016) argument on expected economic development as the population shifts from agriculture to manufacturing and from manufacturing to services (urban growth). The massive economic performances are accompanied by rapid growth rates and expansion in domestic demand due to increased private consumption and industrial sector growth (African Development Bank, 2020).

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). Consumption expenditure in Africa has grown at an annual compound rate of 3.9 percent since 2010 reaching US$1.4 trillion in 2015 and expected to reach US$2.1 trillion by 2025 (Signé, 2018). 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 private household consumption expenditure *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). Figure 1.2 depicts Household consumption expenditure characterized by volatility with relative fluctuations in Ghana. The vertical axis represents household consumption expenditure (% of GDP) whereas the horizontal axis indicates the year (2000-2019). Household consumption expenditure (% of GDP) took a

[1]Other countries include South Africa, Egypt, Nigeria, Morocco, Algeria, Sudan, Angola, Kenya, Ethiopia and Tunisia.

rather sharp decline from 85.824 in 2011 to 72.323 in 2014 (a reduction of 18.670 percent of the 2011 figure) before rising steadily around an average of 3.380 percent in 2015. This trend, however, decreased by 8.437 percent from 2015 to 2019. However, the overall value of household consumption expenditure (current US$) increased from US$ 4,199,378,969.0 to US$ 46,240,579,542.0 between the period 2000 to 2019, representing a change of 90.918 percent (World Development Indicators, 2020).

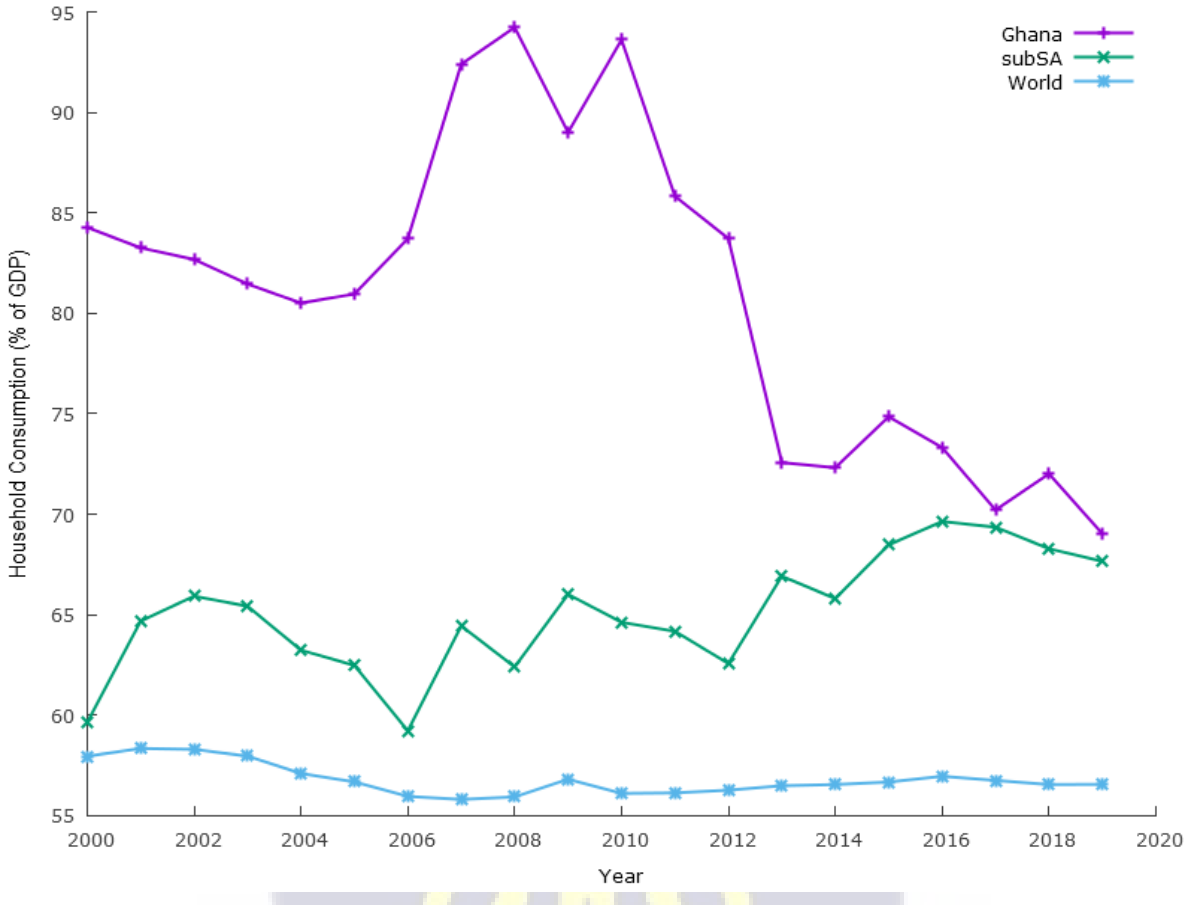

Figure 1.1: Trends in household consumption in Ghana (% of GDP)
Source: Author's illustration based on data from WDI (2020)

In spite of the progressive growth, resource distribution in Ghana, and in particular, income inequality has remained below expectations leaving many questions unanswered. Admittedly, income inequality is an inevitable by-product of economic development as the classic work by Simon Kuznets in 1955 validates that in the primary stages of growth, income disparity worsens, but as the economy expands fiscal authorities engage in redistributive policies such as progressive taxation and welfare spending to decrease inequality (Baymul & Sen, 2019). Income inequality is an utmost variation of income distributions where its income concentration highly falls among some households than others in a population (Hindriks & Myles, 2013).

Inequality is heavily influenced by many institutional and political elements with a trickle-down effect on institutional relations, labour market institutions, welfare, and tax systems which affects productivity and economic performance (Dabla-Norris *et al.,* 2015). The state of inequality of income has been snowballing in Ghana and poverty remains widespread in many areas. Reports indicate that inequality as measured by Gini Coefficient for instance continued to increase from 41.9 percent in 2005 and 2006 to 42.3 percent in 2012 and 2013 and 43.0 percent in 2016 and 2017 (Ghana Statistical Service, 2017) (see Figure 1.2). The COVID-19 pandemic has even more worsened income inequality. To this end, Ghana's development task is to guarantee that resilient economic growth is attained through domestic resource mobilisation in an efficient process while ensuring equitable distribution of income. Figure 1.2 below illustrates an upward trend in income inequality in Ghana for the period 2000 to 2019. The vertical axis represents income inequality (Gini coefficient) whereas the horizontal axis indicates the year (2000 – 2019).

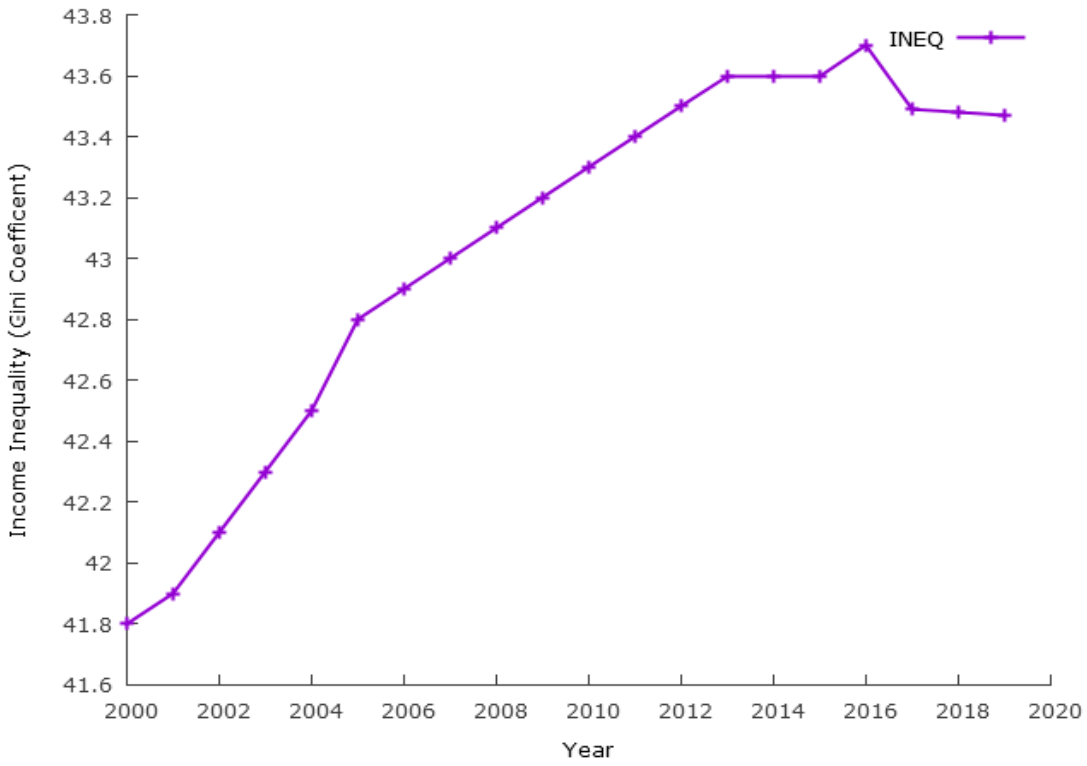

Figure 1.2: Trends in income inequality in Ghana (Gini Coefficient)
Source: Author's illustration based on data from Standardized World Income Inequality Database (SWIID version 9.0)

The existence of fiscal deficit is a major development setback and has been persistent in Ghana as is the case for other developing countries. The effect of a higher fiscal deficit forces government to rely on foreign and domestic borrowing to bridge the gap. Consequently, governments' debt as a percentage of GDP rises, thus higher debt burden poses macroeconomic instability and threats to economic performance in the long-run (Alagidede *et al.*, 2018). In real terms Ghana's total public debt stock of GDP as at the first quarter of 2021 was 70.2 percent (representing GH₵ 304.6 billion). This ratio accounts for GH₵ 15.2 billion (3.5 percent of GDP) loan facility for cleaning up the financial sector. (Bank of Ghana, 2021).

The narrow tax base of Ghana's economy compels government to borrow from the private sector which tends to reduce the quantum of loanable funds available for private investment

and household consumption and results in higher interest rates in the domestic market. The outcome of this policy will lead to higher lending rate in the long-run and a reduction in investment (Nwaeze, 2017; Mwakalila, 2020). This will increase the cost of borrowing for the private sector, thereby crowding private investment, and negatively affecting 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).

Further and most importantly, Ghana has since the 1980s engaged in tax initiatives and reforms with specific core objectives: (a) restoring the tax base; (b) strengthening production incentives; (c) enhancing tax efficiency and equity and, (d) most importantly improving revenue generation. In detail, the initiation of consumption-based tax mainly VAT has contributed on average 20 to 30 percent of total tax revenue in Ghana since 1995 to date, albeit consumption tax, is a major source of governments revenue in advanced economies, emerging market and developing economies (Bekoe *et al.*, 2016; Ofori *et al.*, 2020). Meanwhile, the Ghana Statistical Service estimates that about 53 percent of individuals or households spending on goods and services are subject to VAT (Warwick *et al.*, 2022). Figure 1.3 below shows that there is an upward trend in value-added tax in Ghana for the period 2000 to 2019. The vertical axis represents value-added tax (% of GDP) whereas the horizontal axis indicates the year (2000-2019). With this information, the study seeks to examine whether tax policies particularly value-added tax (VAT) is effective in reducing income inequality trends and simultaneously maintain a healthy spending pattern within the economy of Ghana.

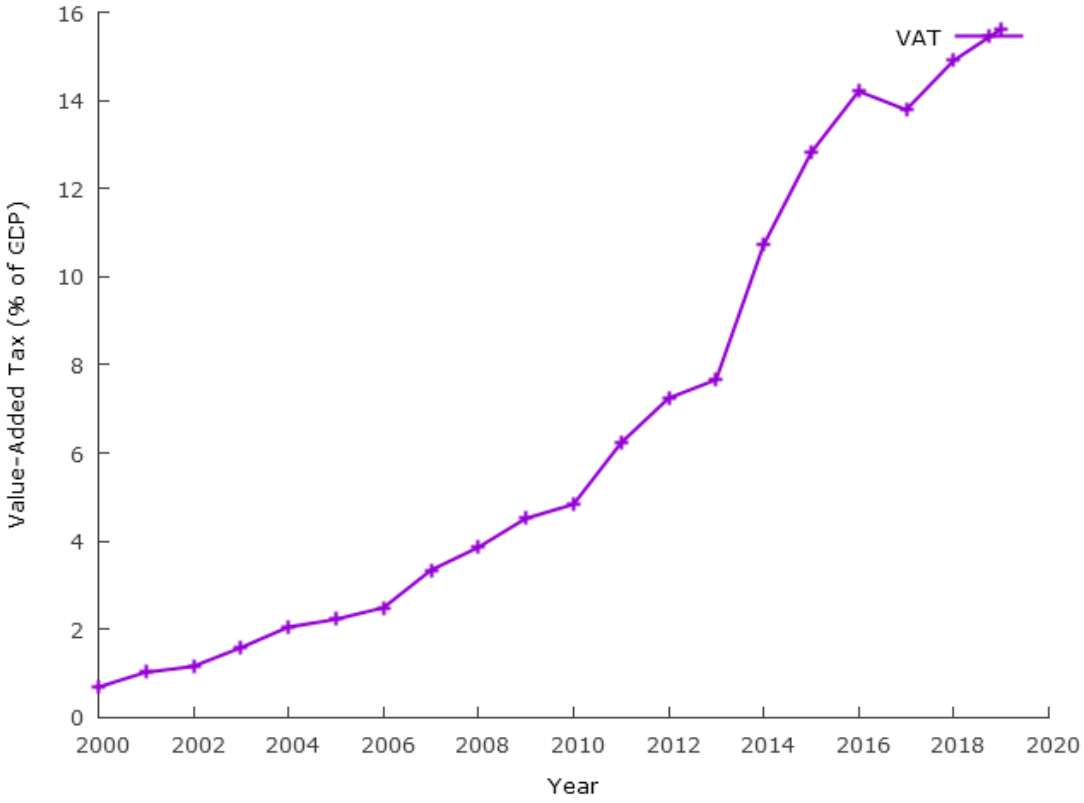

Figure 1.3: Trends in Value-added tax in Ghana (% of GDP).
Source: Author's illustration based on data from Ghana Revenue Authority (2020); Ministry of Finance (2020).

1.2 Statement of the Problem

Income equality and household consumption smoothing in the presence of a favourable tax policy contributes to poverty reduction, domestic savings, sustainable growth and development. Greater economic income equality benefits all people whether rich, poor or indifferent. In economies where income equality is widespread, its inhabitants enjoy economic prosperity. Therefore, investment growth means wealth accumulation among the population (Keeley, 2015). Similarly, household consumption is recognized to drive economic outcomes as it contributes substantially to aggregate demand, the rate of growth, employment, and poverty reduction among the poor (Iheonu & Nwachukwu, 2020).

The problem of inequality of income has been a major challenge for many governments in developing countries including Ghana. Inequality has a direct connection with social development. This causes social disorders such as crime and insecurity, lower growth performance and poor health, among others. In a 2017 report on 'Poverty Trends' by the Ghana Statistical Service shows that a significant number of Ghanaians are pro-poor, having increased from 2.2 million in 2013 to 2.4 million in 2017. In a similar vein, between 2005 and 2017, while the average consumption of the poorest 10 percent in rural areas increased by 19.0 percent, that of the wealthiest 10 percent increased by 27.0 percent (Ghana Statistical Service, 2017).

The welfare disparity between the well-off and the disadvantaged is growing as the poverty level in Ghana appears likely to continue (Burman, 2013). In an effort to reduce the growing income disparities, Ghana has implemented several social equity-enhancing policies over the past decades. Some of such policies implemented in recent times include Livelihood Empowerment against Poverty–LEAP, Capitation Grant, 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 objective of these programmes was to alleviate poverty, boost human capital and protect citizens from social and economic shocks, but unable to improve the desired level of income redistribution out of the poor population, household consumption support, and raise the welfare of the pro-poor across various sectors of the rural and urban economy (Ghana Statistical Service, 2018; Fosu & Twumasi, 2021).

The socio-economic outturn of tax policies on consumption and income inequality in emerging countries remains largely unattended in the literature partly due to the unavailability of household income and expenditure data (Schechtl, 2021). The neglect is surprising to note as consumption taxes mainly VAT contributes averagely one third of total tax revenue in Ghana and across the sub-Region, while direct tax constitute less than 10 percent (Jacob *et al.,* 2019; Ofori *et al.*, 2020).

Howbeit, there are extensive studies that have examined the relationship between indirect tax structure on household consumption and income inequality and the results from these empirical studies are quite mixed. Some of the studies found a positive relationship between commodity tax, domestic savings and household consumption. For instance, Bhattarai (2003) argues that taxing consumption boost up revenue target and public goods and services. Likewise, Çevik (2015) indicates that in the long term the share of consumption taxes has a positive impact on domestic savings. Another cluster of literature reveals a negative relationship between indirect tax, economic growth and income inequality (see Sung & Park, 2011; Martinez-Vazquez *et al.,* 2012). Additionally, other studies indicate neutral link between indirect tax policies and income disparity (see Alavuotunki *et al.,* 2019). However, the effect of consumption tax on household

consumption and income inequality has been inconclusive and a subject of debate on its findings.

In spite of the mounting evidence, most studies focus either exclusively on the effect of consumption tax on household consumption on one hand (see Bhattarai, 2003; Alm & El-Ganainy, 2013; Çevik, 2015; Şen & Kaya, 2016; Usman, 2018), and the impact of indirect tax on inequality on the other (see Sung & Park, 2011; Martinez-Vazquez *et al.*, 2012; Alavuotunki *et al.*, 2019). Nevertheless, a recent paper by Alves & Afonso (2019) exploits the impact of tax items on consumption and income inequality among OECD countries but not the interrelation among these variables at the same time in a specific country in an emerging economy.

In the main, panel data and cross-sectional analysis (see Sung & Park, 2011; Martinez-Vazquez *et al.*, 2012; Alm & El-Ganainy, 2013; Kolahi *et al.*, 2016; Iosifidi & Mylonidis, 2017; Alves & Afonso, 2019 and so on) dominates the literature in developed, emerging, and developing countries using estimation techniques such as dynamic or generalized method of moment (GMM), fixed effect least squares dummy variable, incidence method analysis, microsimulation analysis among others. Of note few studies (see Şen & Kaya, 2016; Bartkus, 2017; Idris & Sani, 2021 among others) have analyzed macro level research using time series estimation models including structural vector autoregressive model, vector autoregressive model, autoregressive distributed lag model, vector error correction model among others. Pereira (2000) argues that studies based on panel and cross-sectional estimation are subject to potential heterogeneity and cross-sectional dependence leading to biased estimates.

Furthermore, country-specific studies in sub-Saharan and Southern Africa (see Tochukwu *et al.*, 2015; Obaretin, 2017; Usman, 2018; Idris & Sani, 2021; Indongo & Robinson, 2021) used

estimation techniques including the error correction model (ECM), ordinary least squares (OLS) and, ARDL model to examine the impact of fiscal policy on household consumption and income inequality. An observation of the methodology used (see Tochukwu *et al.,* 2015; Obaretin, 2017; Usman, 2018) revealed that the authors failed to perform residual diagnostic tests comprising serial correlation test, heteroscedasticity test, and normality test. The presence of these tests illustrates robust and unbiased coefficients. Additionally, causality test was not conducted. In particular, the ordinary least squares estimates (see Tochukwu *et al.,* 2015; Obaretin, 2017) are spurious in the absence of cointegration and are likely to suffer from simultaneous bias where inferences cannot be drawn about causality if corrected (Pereira, 2000). Though Indongo and Robinson (2021) performed a diagnostic test, the Jarque-Bera normality test score showed that the residuals are not normally distributed due to data extrapolation. The cointegration test results confirmed that all the variables did not have a long-run relationship at a 5 percent significance level. In addition, the study failed to specify the short-run dynamic coefficient (error correction model). In all, stability diagnostic test examines whether the estimated model parameters are reliable, valid, and stable to shocks across different sub-sample size (Shrestha & Bhatta, 2018); however, studies including Tochukwu *et al.,* (2015), Obaretin (2017), Usman (2018), and Indongo and Robinson (2021) failed to conduct Ramsey RESET test, structural break test, and structural stability (CUSUM recursive estimate test).

The present study makes a modest contribution to the household spending and income inequality literature by examining the influence of consumption tax in an emerging economy. The focus on a specific country such as Ghana reduces any heterogeneity and bias existent in the literature made up of countries in the sub-region and other regions of the world and allows the formulation of effective targeted policies for the country, based on data analysis.

1.3 Research Questions

The study seeks to find empirical responses to the following questions:

i. how do household spending and income inequality change when there is a shock to value-added tax share of GDP?
ii. what is the effect of value-added tax share of GDP on private household consumption and income disparity dynamics?
iii. what is the causal relationship between value-added tax share of GDP, income inequality and private consumption expenditure?

1.4 Research Objectives

The general objective of this study is to examine the dynamic effect of consumption-based tax (Value-added tax) on household spending patterns and income inequality in Ghana.

The specific objectives are as follows:

i. to determine the long-run effect of value-added tax share of GDP on household spending and income inequality.
ii. to investigate the short-run effect of value-added tax share of GDP on income inequality and household consumption.
iii. to ascertain the causality between income inequality, private consumption expenditure and value-added tax share of GDP.

1.5 Significance of the Study

Tax systems play a major role in revenue mobilisation, income disparity reduction, income redistribution and economic decisions and expenditures of consumers. Household consumption constitute a significant element of national accounts and a highlight of the variable broadens the dynamic understanding of policy makers, market fluctuations and business cycles in macroeconomic theory (Ezeji & Ajudua, 2015).

The economic equality of any economy leads to fair distribution of income, poverty reduction, likewise the weight of real growth originates through consumption growth. The ability of fiscal authorities to comprehend private household consumption and variations in income requires a first-class national fiscal policy (Gahtani *et al.*, 2020). This effect, in turn has made successive governments set ambitious priorities to increase domestic resource mobilisation over the past few years. The contributions of these variables to Ghana's economic performance can be understood from their rising trends, on average respectively, as shown in Figures 1.1, 1.2 and 1.3.

Howbeit, given the positive influence of private consumption expenditures and the smooth distribution of income to the health of every economy, it is relevant to examine how tax policy affect these economic indicators. Nonetheless, it is striking to note that there seems to be no clear-cut favourite technique in estimating these variables. A good estimation technique would reduce endogeneity problems, heterogeneity and attempt to correct biased estimates.

In particular, this study considers the bootstrap autoregressive distributed lag (BARDL) estimation technique of McNown *et al.*, (2018) to examine the long-run and short-run impact of consumption tax – the value-added tax (VAT) on private consumption expenditure and

income inequality. The bootstrap ARDL has several advantages. First, it uses bootstrap simulation method to produce critical values for the additional test on the independent variables (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). Furthermore, the bootstrap approach maintains its strong size and power properties even when all variables are I(0) (McNown *et al.,* 2018).

This study, therefore, seeks to contribute to bridging the gap in the literature by conducting a country-specific study to determine household spending pattern and income inequality dynamics to consumption-based tax (VAT) and other control variables. Moreover, the findings from this study would enable policy makers and academics appreciate the importance of tax policies together with other macroeconomic variables necessary to maximise private consumption and minimize income inequality.

1.6 Organisation of Study

The study is organized into five (5) main chapters. Chapter one discusses the general introduction of the study, which consists of a background of the study, statement of the problem, research questions, research objectives, and the significance of the study. Chapter two highlights related literature; the theoretical review, the conceptual review, and the empirical review. Chapter three discusses the methodology employed, the empirical model and sources of data used to carry out the research. Chapter four presents findings and discussions, and finally chapter five contains the summary of findings, conclusions and, recommendations of the research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the existing knowledge of relevant literature on consumption, income inequality and tax policy that are related to the study. The first part focuses on the theoretical literature; the second part deals with conceptual literature and framework on household spending, income inequality, measures of income inequality and taxation that underpin and set foundations of the current study while the third part discuses empirical evidences on private consumption, income inequality and tax policy nexus.

2.2 Theoretical Review of Consumption Hypotheses

This subsection reviews theoretical literature of consumption hypotheses namely the Absolute Income Hypothesis, the Relative Income Hypothesis, the Life Cycle Hypothesis, and the Permanent Income Hypothesis. Additionally, the subsection provides policy implications, advantages, and empirical evidences of each hypothesis and further discusses its limitations and criticisms.

2.2.1 The Absolute Income Hypothesis

The theory of aggregate consumption was set in motion out of a revolution in macroeconomic thought after the 1930s Great Depression with Keynes great work "The General Theory of Employment, Interest and Money" published in 1936. This notwithstanding, prior to Keynes general theory, outstanding works by Ramsey (1928) and Fisher's two period model (1930) are among the founding theoretical approaches to consumption function. The modern theory of consumption as described by Keynes is based on the functional relationship existing between consumption expenditures and national income. Consumption function forms an integral part

of Keynes theory of economic fluctuations and has ever since performed key roles in theoretical and empirical investigations (Mankiw, 2010). Keynes general theory posits subjective and objective factors that influence consumption pattern of household out of a given income. The objective factors are exogenous and includes, the rate of interest, fiscal policy, price expectations, wind fall gains or losses while enjoyment, short sightedness, generosity, miscalculation, and extravagance forms subjective factors labelled endogenous (Keynes, 1936).

In the general theory, Keynes postulates that planned consumer spending is a positive function of disposable income. Disposable income is the income earned after deducting tax payments from national income plus transfer payments (Keynes, 1936). Keynes hypothesis to consumption is also known as absolute income hypothesis (AIH) because current disposal income is the main determinant of consumption. In an attempt to provide rationale for the arguments above, Keynes formulates a simple linear consumption function:

$$C_t = \gamma_0 + \beta Yd_t \qquad (2.1)$$

where C_t and Yd_t denotes consumption expenditures at time t and disposable income at time t. β, represents the marginal propensity to consume (MPC). γ_0 is autonomous consumption assumed not to depend on income but positive.

The important properties of the AIH includes: (a) that consumption expenditure increase or decrease with a rise or fall income but unequal. This unequal change indicates that in the short-run average propensity to consume (APC) yields a greater value than MPC. In the short-run, autonomous consumption is invariable with income but changes in the long term, that is consumption function shifts upwards as wealth increases; the MPC gets closer to APC in the long-run (Alimi, 2013), (b) when wealth rises, the proportion of it spent drops: $\frac{\delta APC}{\delta Y} < 0$, so

the income elasticity of consumption defined as $\frac{\text{MPC}}{\text{APC}}$ would be less than one (Alimi, 2013), (c) the consumption function is solely determined by income but not interest rate which plays a marginal role (Mankiw, 2010).

The criticisms of Keynes consumption theory are well known. The first is based on some economists' details during World War II. Keynes assumed that the APC falls as income rises. In this framework, households would consume smaller fractions of their income and increase saving over time. The transmission mechanism of the general theory would result to low consumption and a fall in aggregate demand which eventually leads to an infinite depression after the war. However, Keynes assumption of APC falls as income shifts upwards turned not to hold after the war since higher incomes did not change the saving ratio after the war (Mankiw, 2010). The second objection by Kuznets (1946) used data on USA to empirically examine the interrelation between income and aggregate consumption from 1869 to 1938. The study opposes Keynes assertion of APC falls as income up turns but argues that the share of income consumed remains stable in the long-run (Mankiw, 2010; Drakopoulos, 2021).

2.2.2 The Relative Income Hypothesis

The variability to reconcile/justify Keynes conjecture/General theory on a rising APC as income increases with earlier studies using short-run time series and cross-sectional budget survey from 1935-1936 and 1941-1942 and Kuznets (1942) data on aggregate savings and income from 1869-1928 led to the formation of relative income hypothesis (RIH) by James Duesenberry in 1949 during his seminal work "Income Savings And The Theory Of Consumer Behaviour" (Duesenberry, 1949; Alvarez-Cuadrado & Long, 2011).

Duesenberry (1949) argues that an individuals' private consumption and savings ratio depends on his own income relative to the current income of other households. This alludes that the share of income consumed by a person is conditioned on his percentile position within the income distribution. The shared savings and aggregate saving ratio are independent of absolute real income. In general, the RIH manifest that individuals depend on habit formation and social elements to make a choice on spending and savings. The theory states that the psychological and social dimensions such as interdependence of society influence the spending patterns of consumers (Zeynalova & Mammadli, 2020; Drakopoulos, 2021).

Duesenberry (1949) emphasized on relative income and relative consumption and argued that present consumption is achieved by prior consumption pattern and not necessarily on current levels of relative and absolute income. The RIH further expounds his arguments on two (2) "fundamental assumptions" of aggregate demand theory that are null and void. These assumptions include: (a) in the context of consumption theory, households' consumption pattern is informed by the behaviour of other consumers with whom the household associates social contacts; referred to as the demonstration effect (Drakopoulos, 2021); (b) the relation between aggregate consumption and aggregate income is not completely reversible. Present consumption is attained by the level of previous peak income that is any household enjoying higher wealth standards than present levels would maintain higher consumption level as the past periods.

The main significant role of relative income depends on absolute income not exceeding poverty levels of human basic needs (Beath & FitzRoy, 2007). Consequently, consumption do not change in proportion to a dive in income levels; clarifying a fair change in spending patterns during economic downturns. The outcome of this behaviour is known as the ratchet effect

(Frank, 2005; Drakopoulos, 2021). Theoretically, Duesenberry hypothesis was able to resolve the inconsistencies between a variety of cross-sectional studies and the long-run consumption pattern, with a claim of the RIH accounting for time series data (Alimi, 2013; Drakopoulos, 2021).

Regardless of the milestone attained by the relative income theory, Duesenberry failed to account for the redistributive impact of a given change in aggregate income (Kosicki, 1990). The captivating details of Duesenberry approach went aground not on empirical findings (Frank, 2005); but on the account of many economists, human nature (psychological and social interdependence) from a major spotlight on Duesenberry hypothesis than applied macroeconomic theory hence its rejection (Frank, 2005; Palley, 2010). The relative income theory was criticized for its failure to verify the stability of aggregate APC in the long-run and the flat slope of interrelation between short-run and long-run consumption function with regards to income (Palley, 2010). Duesenberry theory was discarded for the inability to originate a justifiable framework fit for academic objectives and policy implementation (Palley, 2010).

2.2.3 The Life Cycle Hypothesis

The life cycle hypothesis (LCH) of consumption expenditure was pioneered by Franco Modigliani with Richard Brumberg and Alberto Ando in the early 1950's. The structure of the hypothesis was modelled on the foundations of Fisher's two period intertemporal choice theory (1930) and the justification of the consumption puzzle on Keynes General theory using Kuznets (1942) data (Mankiw, 2010).

The foremost tenet of the model permits the use of utility functions where consumers are assumed to maximise utility of consumption over the life cycle pattern. The utility function can be written in the form;

$$U_H = U_H(C_t, C_{t+1}, C_{t+2} \dots \dots C_L) \quad (2.2)$$

where U_H is the utility of individual $'H'$, C_t is current consumption, C_{t+1} is consumption in the future periods and C_L is the life time consumption, subject to a budget constraint of total resources (current and future) which accumulates over the entire working period of the individual including retirement (Modigliani & Brumberg, 1954; Drakopoulos, 2021). The value of the individuals' budget constraint includes income earned from asset or wealth and present value of labour income until retirement (Modigliani, 1986).

The utility maximization outcome of the individual consumption function entails factors such as present income, returns on capital, current age of individual and expected life time resources and wealth that justifies the consumption pattern of households (Modigliani & Brumberg, 1954). The standard version of the life cycle theory originates from the following prepositions; (a) constant income until retirement, zero thereafter; (b) interest rate at zero; (c) tastes: steady consumption over the life cycle; (d) no inheritance (Modigliani, 1986 & 2001; Baranzini, 2005).

Specifically, the LCH highlights the consumption behaviour of households by factoring present income, savings and life time resources. The LCH enhances the ability to make intertemporal transfer of resources and asserts the consumption decisions for households (Modigliani & Cao, 2004). The LCH implies that saving is an increasing function of the number of years in active service and a decrease for retirees with a hump-shaped pattern of wealth (Jappelli & Modigliani, 1998).

Modigliani and Brumberg (1954 and 1986) emphasized that with variations in wealth and needs among individuals, constant savings help maintain the level of consumption after retirement (Mankiw, 2010). The objective of savings is to rack up resources and maintain smooth consumption expenditure over the phases of continuous existence including retirement (Modigliani & Ando, 1963; Deaton, 2005). Howbeit the youth have the tendency to borrow in times of low income (debt accumulation), savings rate increases for the middle age as income rises (smooth consumption) and income falls again during retirement (dissaving).

In fact, the LCH has been subjected to several empirical test (micro and macro data) whose outcomes provide a unified support to the hypothesis (for instance see Modigliani & Ando, 1957; 1963; Modigliani & Cao, 2004; Deaton, 2005). Meanwhile, the LCH has been under massive criticism. Foremost, numerous studies have proven the merits of intergenerational bequests in the total capital stock (Baranzini, 2005). In addition, Baranzini (2005) rejects the core elements of the model by indicating that retired persons are rational and forward planners, thus save a weighty portion of their current income likewise the propensity to save increases among the youth as income shoots up, a complete contrast to the mainstream model.

2.2.4 The Permanent Income Hypothesis

Perhaps, the disparate evidence of Keynes' general theory of consumption function was mainly straightened out and extended by Milton Friedman (father of monetarism) in 1957 with his permanent income hypothesis (PIH). The model was developed from the perspective of seeming inconsistent empirical results of savings and consumption including the discrepancy between long-run and short-run spending pattern (Meghir, 2004).

The theoretical foundations of the PIH are consistent with the classic intertemporal choice of forward-looking consumers (Ramsey, 1928; Fisher, 1930), where consumers maximise expected lifetime utility, subject to a life time budget constraint (Meghir, 2004; Drakopoulos, 2021). The fundamental assumptions of the theory include; (a) rational economic agents and; (b) no liquidity constraints (agents can borrow and lend at a constant interest rate).

Friedman (1957) argues that current income has two components, permanent component and transitory component. This implies;

$$Y_t = Y^p + Y^T \tag{2.3}$$

where Y_t is current (measured) income at time t, Y^p is permanent income (present value of expected flow of long-term income) at time t and Y^T is transitory income (deviations from average income). The hypothesis emphasized that agents spending decisions are based on current income in addition to the notion of a long term expected income and wealth, termed permanent income. Therefore, relating consumption to measured income alone will account mere statistics but not spending pattern of households (Dornbusch *et al.,* 2011). Freidman's treatment of income is broadly comparable with household spending, where present consumption C_t at time t is the sum of permanent consumption C^P and transitory consumption C^T. Thus;

$$C_t = C^p + C^T \tag{2.4}$$

In equation (2.4) permanent consumption constitute planned spending out of permanent income and can vary from current consumption by any unplanned shift in spending (Chao, 2003). With planned spending, consumers are receptive to changes in permanent income than changes in transitory income since consumers are able to use savings and borrowing to smooth consumption in response to unexpected changes in income (Chao, 2003; Meghir, 2004). In fact,

Friedman (1957) notes that consumers plan their spending on the basis of expected average income over a long period.

The observations of equation (2.3) and (2.4) leads to a consumption function:

$$C^p = j(r,s)Y^p \tag{2.5}$$

where, $j(r,s)$ is the average or MPC out of permanent income which depends on the rate of interest and on the taste shifter variable s. Empirically, Friedman argues that households consume a proportion of permanent income in each period hence a constant APC signals equality to MPC (APC=MPC). In addition, permanent income remains constant in the long term while transitory income changes in the short term.

Nevertheless, other studies (see Hall, 1978; Campbell, 1986 among others) strongly supports the standard PIH. Yet (see Lucas, 1976; Roche, 1995; Dejuan *et al.*, 2004 among others) rejected the PIH. Hayashi (1982) rejected the theory on the motion of measurement errors of permanent consumption and permanent income. Likewise, Khan and Nishat (2011) criticised the theory on the absence of liquidity constraints on household spending.

2.3 Income Inequality

This subsection aims to highlight the Kuznets hypothesis and the Kuznets waves/cycles with the account of empirical evidence, policy implications, and lastly limitations (criticisms) of each theory.

2.3.1 Kuznets Hypothesis

The eagerness to observe and analyze inequality, economic performance and development of economies as well as determining the welfare-enhancing pattern of economic agents started by

some economists in the early twentieth-century. In the process of fuelling the existing arguments, Simon Kuznets (1901-1985) stood out with his seminal works titled "Economic Growth and Income Inequality" in 1955. Moving forward, Robinson (1976) revised the early works of Kuznets (1955) on the presence of within sector inequality as well as Anand and Kanbur (1993) reformulated the theory with functional analysis and termed it the "Kuznets Process".

Kuznets (1955) used objective data to explore the relationship between *per capita* income and income inequality in three developed countries; the United States, United Kingdom and two states from Germany. Simon Kuznets postulated an inverted 'U' – hypothesis, where income inequality first increases to its maximum point and falls with economic development. In detail, Kuznets noted that inhabitants of a country initially engage in deprived agricultural activities in the rural sector. This sector is characterized with rational and evenly distributed low wages, poor *per capita* output and an insignificant level of inequality, hurting the have-nots more than the rich (Deininger & Squire, 1998).

However, with urbanization and economic development, a qualified hand full of agricultural workers are absorbed into the industrial sectors through migration with increased wage disparities that initially worsens inequality (as more and more workers join high production) and later the disparity equally improves with rapid advances in development (Kuznets, 1955). A market dominated by high productivity sector entails targeted investment policies that induce high growth, narrow disparity gap and wage inequality reduction (Deininger & Squire, 1998; Thornton, 2001). This theory explains the inverted "U" shaped or the bell curve relationship between *per capita* income and economic development.

The "Kuznets Process" can be categorized into two phases: (a) a transition to a sector characterized by high productive mean income due to equal but low shared wages; (b) a phase of inclusive development or growth denoting higher income and equal share of resources. Figure 2.1 below describes the general idea of the Kuznets hypothesis.

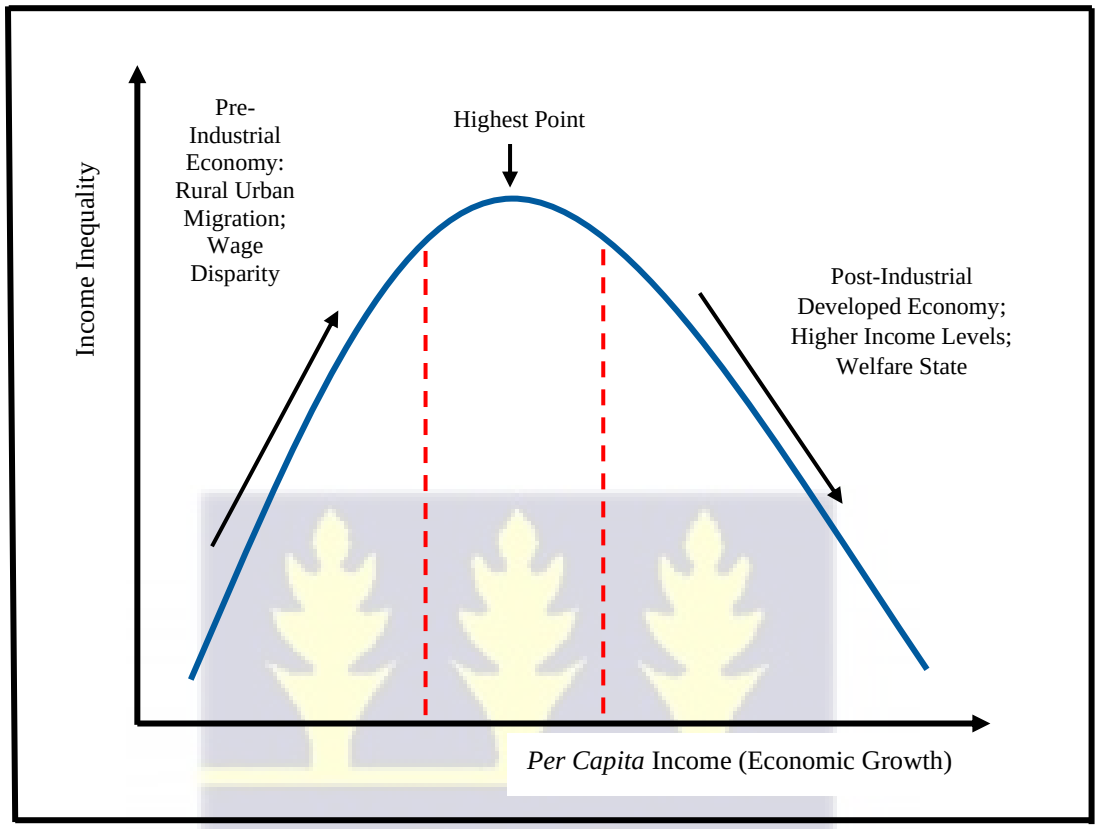

Figure 2.1: The Kuznets Curve
Source: Kuznets (1955)

On the empirical side, a hefty number of studies have tested Simon Kuznets' inverted "U" shaped hypothesis in developed, developing and emerging economies using cross-sectional data. Studies such as Ahluwalia (1976); Galor and Tsiddon (1996); Lloyd-Ellis and Bernhardt (2000); Huang (2004) among others provided support for Kuznets classic two sector model. Others (see Lee, Kim & Cin, 2013; Anand & Kanbur, 1993 among others) countered the above studies with Anti – Kuznets conclusions.

In fact, Kuznets himself asserted that there was no empirical analysis in support of his hypothesis but concludes the study based on 5 percent empirical information and 95 percent speculation with some possibility of wishful thinking. Finally, Lyubimov (2017) draws his critics on the following: (a) high level of equality during the preindustrial era; (b) no data indicating growth of inequality during industrialization; and (c) data depends on small sample size (only three countries) without covering other relevant countries.

2.3.2 Kuznets Waves Hypothesis

Piketty and Saez (2006); Piketty (2014) illustrated how data on top income share and the capital-output ratio within the United States; and other countries of continental Europe contradicts the core features of the inverted "U" shaped hypothesis with a long-term "U" shaped curve from the early twentieth century (fall in inequality) through to the millennium (upsurge in inequality) (Wardhana, 2020). It is with this fact that some economists believed that further analysis into Kuznets hypothesis will significantly advance the understanding of income inequality.

The effort to put forward a theoretical justification with a modern data for the discrepancy of Kuznets Process was made by Branko Milanovic's (2016) "Global Inequality: A New Approach for the Age of Globalization". The pre-modern period through to 1979 data on mean income and income inequality are coherent to Kuznets thesis but not beyond 1980. Put differently, the Kuznets hypothesis failed to explain data further than 1980 (Milanovic, 2016).

2.3.2.1 Pre-Industrial Era

The pre-industrial era is characterized by frequent events of wars, plagues, revolutions and epidemics from the period 1326 – 1859. The occurrence of these benign forces is linked to

increased transfer payments to the displaced in society by government. The government financed the increased war expenditure through progressive taxation creating excess demand for labour, increased returns to labour and a fall in income inequality. On the other hand, income inequality increases in pre-modern period through temporary upshot in mean income levels, where rate of return to capital outweighs returns to labour. In all income inequality wigwags/oscillates in pre modern era with a makeshift increase mean income level in tragic events (Milanovic, 2016). Figure 2.2 below depicts the Kuznets waves hypothesis.

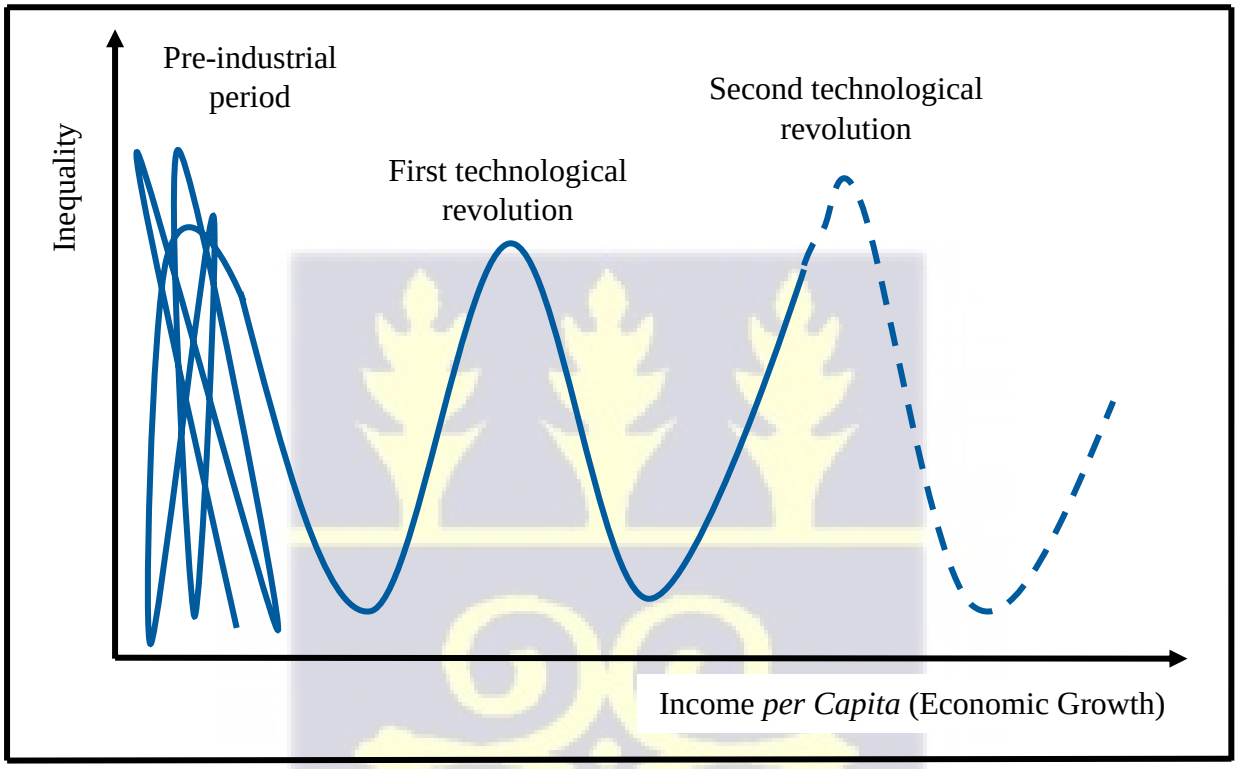

Figure 2.2: The Kuznets Waves
Source: Milanovic, 2016

2.3.2.2 First Technological Revolution

The movement and shape of the Kuznets waves is formed by economic factors including globalization, taxes, labour market and political and social forces between the period 1861 and 1979. The upswing section of the first industrial revolution just like Kuznets curve entails a

shift of labour from rural to urban yielding a drop in wages and income inequality growth. The downswing portion reflects elements such as wars, progressive taxation, reduced capital returns, formidable trade unions, increased education expenditure, high real GDP *per capita* and greater demand for social services (health insurance, social security, among others) (Milanovic, 2016).

2.3.2.3 Second Technological Revolution

Milanovic (2016) argues that data in technological advanced countries were found not to conform to Kuznets' classic hypothesis after 1980s. The upturn segment of the second technological revolution explains the transfer of labour from industry or manufacturing into the provision of skill-heterogenous services, mainly driven by strong institutions and economic policies. The second Kuznets wave has two features; (a) like the first wave, income inequality upshots in the advancement of labour from industry to services; an outcome of unequal wage distribution; (b) the physical representation of economic activities are widely disseminated in smaller units in the services sector than industrial sector (Milanovic, 2016). In all, technology, openness and policies ("TOP") are adjudged as elements of income inequality.

2.4 Conceptual Literature

This subsection aims to develop a conceptual framework for household spending and income inequality. The first part defines into greater detail the concept for household spending (private consumption), income inequality, measures of income inequality, and taxation. The second part depicts the proposed conceptual framework diagrammatically.

2.4.1 Household Spending

In economic theory, consumption plays a central role, which means the utilization of goods and services for getting the satisfaction by individuals or society (Aslam, 2017). Consumption is among the key contributing factors of household welfare in every economy. Household consumption expenditure is a vital component of aggregate demand. Household spending or household final consumption expenditure is the market value of all goods and services including frequently purchased items, less frequently purchased items, health expenditure, education expenditure, expenditure on housing, imputed rent for proportion of households who owns dwelling units, expenditure on household amenities (light, water, cooking fuel and toilet facilities), miscellaneous expenditure, asset and durable goods, and expenditure on transfer payments (World Bank, 2016; Ghana Statistical Service, 2021).

Household spending varies over time with a large collection of changes in household income, social class, age and employment status of the family head, subsidies and taxes, family size and location, and relative prices (Hronova & Hindls, 2013). In the process of their income generation and spending, households indirectly play a role in income redistribution through tax payments and social contributions (Hronova & Hindls, 2013).

Household consumption is an essential variable of macroeconomic thinking and policy (Ajmair & Akhtar, 2012). Neoclassical economists identifies the level of household consumption *per capita* a pivotal measure for an economy's productive growth (Ezeji & Ajudua, 2015). On the whole, household consumption constitutes the largest portion of GDP growth among expenditure items and comprises over 60 percent of GDP (Organisation for Economic Co-operation and Development, 2013).

2.4.2 Income Inequality

The heart of social justice theories heavily falls on the concept of inequality; defined as the state of not being equal, especially in status, rights, and opportunities (Afonso *et al.*, 2015a)**.** Admittedly, the concept of inequality is quite vast and predisposed to public deliberations and confusion as it tends to mean different things to different people. Inequality may be defined as any deviations from equality. Thus, if any person received less than his proportional share of the aggregate income, the distribution would be unequal (Schutz, 1951). Income inequality is a by-product of social and political struggles, sometimes violent ones (Milanovic, 2016)

Gruber (2016) characterized inequality into two concepts namely: relative income inequality and absolute deprivation. In particular, relative income inequality measures the share of a nation's total income that accrues to the poor relative to the rich. Absolute deprivation is the amount of income the poor have relative to some measure of a reasonable "minimally acceptable" income level. Osberg (2015) defined income inequality as the unequal distribution of income and opportunity between different groups (the rich and the poor) in a society. Neves, Afonso and Silva (2016) also defined income inequality as a state of uneven distribution of wealth and assets in a population. Income inequality is measured only at aggregate or mostly societal level.

2.4.3 Measures of Income Inequality

2.4.3.1 Lorenz Curve

Max Otto Lorenz initiated a revolution with a graphical representation of inequality measures in 1905 known as Lorenz curve. The Lorenz curve is one of the simplest and accepted tools to measure inequality. It measures the relationship between the cumulative percentages of total income measured on the vertical axis and the cumulative percentages of income recipients

ranked from the poorest to the richest individual measured along the horizontal axis (Afonso *et al.*, 2015b; Idrees & Ahmad, 2017). The Lorenz curve as displayed in Figure 2.3 shows that the curve closer to the 45-degree line of perfect equality represent a more equal distribution of income and also the further the Lorenz curve in relation to the 45-degree line, the more unequal the distribution of income (Afonso *et al.*, 2015b; Idrees & Ahmad, 2017). Figure 2.3 describes the Lorenz curve.

2.4.3.2 Gini Coefficient

The Gini coefficient or index was spearheaded by Corrado Gini in 1912. The index is the most popular and widely used/cited measure of inequality. Gini coefficient is derived from the Lorenz curve framework. It measures the extent to which the distribution within an economy deviates from a perfectly equal distribution (Afonso *et al.*, 2015b). The index is calculated as the ratio of the area below the 45-degree line. Therefore, in Figure 2.3 below;

$$Gini = \frac{Area\ between\ line\ of\ equality\ \&\ Lorenz\ curve\ (A)}{Total\ area\ under\ line\ of\ equality\ (A+B)} \qquad (2.6)$$

The Gini index always takes values between 0 and 1 or as a percentage. A higher index of (1 or 100 percent) represents a more unequal distribution, in turn all income is earned by one individual; when Gini index takes a value close to zero, income inequality falls. The main setback of Gini coefficient is that it is not easy decomposable or additive (incapable of differentiating different kinds of inequality). Additionally, the index is not sensitive to income transfers in the middle of the distribution (De Maio, 2007; Afonso *et al.*, 2015b).

2.4.3.3 Atkinson's Inequality Measure

In his great work "The Economics of Inequality" in 1970, Atkinson suggested a welfare-based inequality index as a measure of income distribution. It represents the percentage of total income that a given society would have to forgo in order to have more equal shares of income between households. Atkinson measure allows for varying sensitivity to inequalities in different parts of the income distribution. The Atkinson index is an index derived from social welfare function; and consists of the sum of each individual's welfare function.

The index depends on the degree of society aversion to inequality, where a higher value indicates greater social utility by individuals to accept smaller incomes in exchange of a more equal distribution. The most critical facet of the Atkinson index is the ability to decompose the index into within- and between- group inequality. The theoretical range of Atkinson index takes values between 0 and 1, with zero (0) being a state of equal distribution while a value of one (1) means that the society is only interested in the individual with the lowest.

The Atkinson index is expressed as;

$$A(\varepsilon) = 1 - \left(\frac{1}{N} \sum_{i=1}^{N} \left(\frac{y_i}{y} \right)^{1-\varepsilon} \right)^{\frac{1}{1-\varepsilon}}, \qquad \varepsilon \neq 1 \tag{2.7}$$

$$A(\varepsilon) = \frac{1 - \prod_{i=1}^{N} \left(y_i^{\left(\frac{1}{N}\right)} \right)}{\bar{y}}, \qquad \varepsilon = 1 \tag{2.8}$$

where y_i = the individual income; $\bar{y}$ = the average income, N = the sample size (population), and ε = the inequality aversion parameter; which takes the value between 0 and 1. The Atkinson inequality index has some shortfalls, where values are not comparable across societies even for

a given value of ε because one cannot claim that all societies have the same attitude towards inequality (Idrees & Ahmad, 2017).

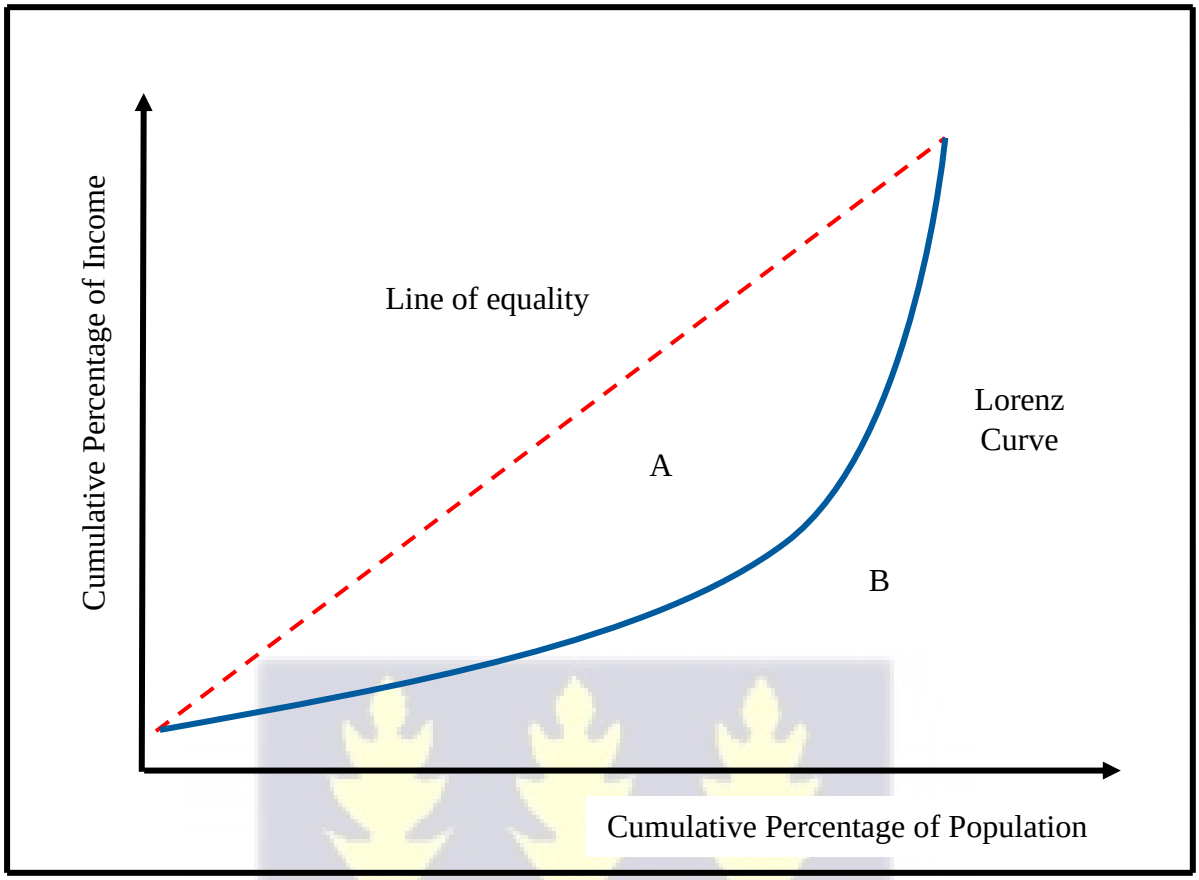

Figure 2.3: The Lorenz Curve framework

2.4.3.4 Taxation

Taxation is a practice by which a government or a tax authority mandatorily impose levies on individuals or corporations. However, a part from affecting price levels, taxation, can be used as one of the measurements to minimize the effects of the distortions and to redistribute resources to deprived members across geographical regions in Ghana. Tax policy is essential for raising revenues to finance public goods and services that favour low-income households and increase social equity (Carter & Matthews, 2012). Taxes are also an important instrument

for discouraging the consumption of commodities associated with negative externalities. (Bailey, 1995).

The compulsory nature of taxation originates from the free rider problem, that is, individuals without the incentive to contribute towards the provision of public goods and services (Stiglitz & Rosengard, 2015). Keynesian theory suggests that aggregate demand is managed by the role of taxation which affects investment, production and household spending (Wilkinson, 1992). Federici and Montalbano (2012) states that where there is consumption, there is bound to be taxation and households do generally are concerned with the level of taxes in an economy, either direct or indirect.

Theoretically, taxes can be assigned into two main categories: direct taxes on individuals and organizations; and indirect taxes on goods and services. Direct tax is a tax borne by the person or organization on whom the tax falls, and final burden is the same individual or corporation (taxpayer) (Ackah & Agboyi, 2014). Examples of direct taxes include income tax, capital gains tax, gift tax, and corporate tax. The demerits of direct taxes are tax evasion, tax avoidance, improper books of account, and tax non-compliance. The administering authority is the Ghana Revenue Authority (GRA).

Indirect taxation is defined as taxation realized upon the consumption of goods and services by consumers (individuals or households). Taxes paid by individuals or households are established on transactions with differentiated rates by producers through the channel of shifting the imposed tax on manufacturers to consumers. This therefore increases the price of goods and services. Indirect taxes in Ghana include Value Added Tax (VAT), excise duty, sales tax, custom duty levied on imports and communications services. Indirect taxes are sometimes

referred to as consumption taxes. Indirect taxes contribute significantly to domestic revenue mobilization in developed and developing countries. The above facets of indirect taxes are manifested by the inability to evade than any other forms of taxation (Alavuotunki *et al.*, 2019).

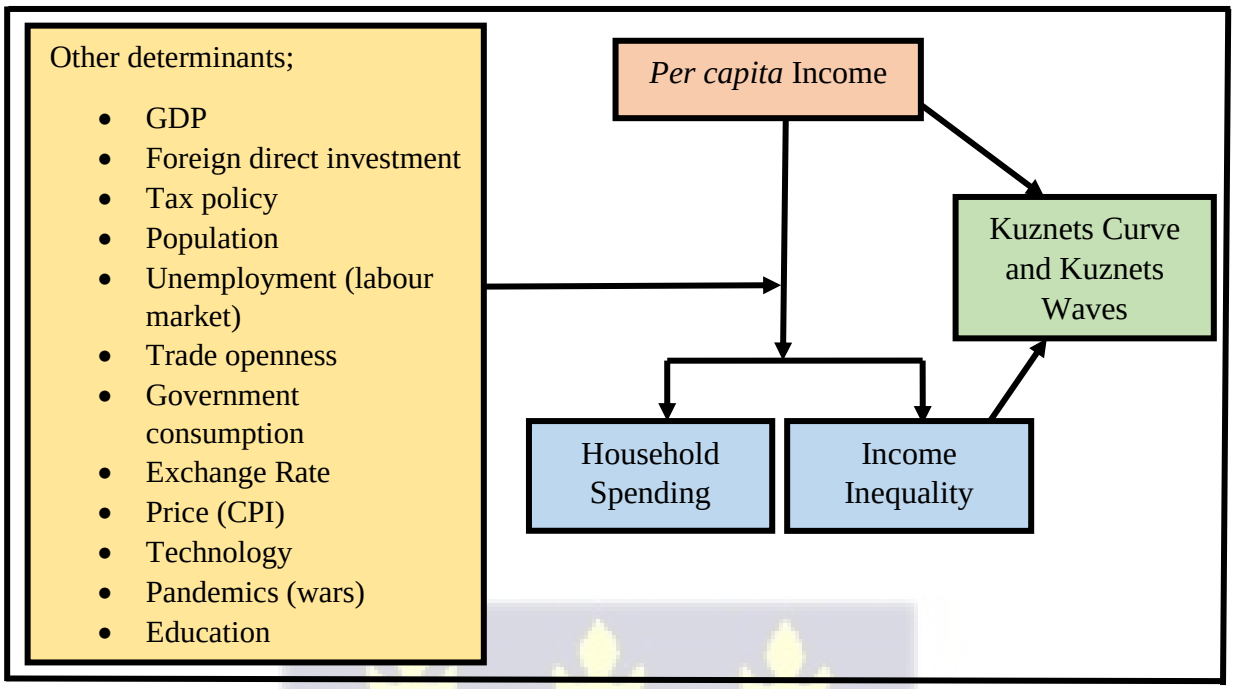

Figure 2.4: Conceptual framework of household spending and income inequality (Kuznets Process and Kuznets Waves) determinants.

Figure 2.4 above illustrates or summarises the core determinants of household spending and income inequality and the associated link of income *per capita* and income inequality to the Kuznets inverted "U" hypothesis and the Kuznets waves.

2.5 Empirical Review

The empirical literature on tax policy, income inequality and household consumption in developed and developing economies is well established. In fact, there has been little consensus about the existence of the relationship between these variables. This subsection reviews empirical studies on the interactions of tax policy on household spending and income inequality. In doing so, this section is classified into two broad categories; the first focuses on

consumption, saving, investment and tax policy nexus; and the second considers income inequality, economic growth and tax policy nexus.

2.5.1 Consumption, Savings, Investment and Tax Policy Nexus

The introduction of consumption tax in 1954 occurred in France and has been adopted by many countries around the world as pointed out by Kaneko and Matsuzaki (2018). In recent years, the relationship between household spending and tax policy had received growing attention among policy makers and researchers. The indirect tax structure represents an essential fiscal policy instrument in any country. Many economists consider consumption taxes an alternative for savings, investment and higher economic growth than income-based taxes. The preposition – a high-yielding private sector generates output – provides fiscal authorities with a tax base for levying consumption taxes and the potential for significant tax revenues and investment (Pereira, 2000; Jacob *et al.,* 2019).

However, with regards to the impact of tax on investment, earlier studies failed to outline coherent evidence on the effect of consumption taxes on aggregate private investment (see Alesina *et al.,* 2002; Djankov *et al.,* 2010; Arnold *et al.,* 2011). Alves (2019) evaluated the impact of tax structure on investment dynamics and optimal tax-investment threshold values in OECD countries considering the 1980 to 2015 period. The outcome of the panel data estimation technique indicates that an average percentage of 10.7, 6.27 and 9.19 threshold of income, firms, and consumption tax shares maximizes investment growth respectively. In addition, social security contributions harm economic growth in both the short-run and the long-run whiles tax share of firms and consumption adversely affect growth in the short term. These results are corroborated by Jacob *et al.,* (2019) work on "Consumption Taxes and Corporate Investment" using quasi-natural experiments for Dutch firms and 86 consumption

tax changes in a cross-country panel from the year 2009 to 2015. Additionally, these authors found that firms respond to changes in consumption tax rates. In particular, consumption taxes reduce corporate investment appetite for firms facing greater elastic demand for goods and services.

Recent empirical work indicates some economic consequences of tax policy on savings. Çevik (2015) emphasized the impact of tax structure on domestic savings using cointegration and vector error correction model in Turkey between the periods 1965 to 2011. The study shows the share of consumption taxes has a positive impact on domestic savings, whereas income taxes are negatively related to gross domestic savings in the long term. Kolahi *et al.,* (2016) shares similar outcome for 19 economies using dynamic generalized method of moment (GMM) estimation technique. The authors derived an aggregate consumption function by incorporating VAT into the life cycle hypothesis (LCH). Furthermore, in Lithuania, Bartkus (2017) assessed tax effect on consumption and savings. The study used a vector error correction model and quarterly data from 2002(Q1) to 2016(Q4). The main highlight shows that taxes have a minimal effect on savings, but agents tend to maintain future consumption as constant as possible. However, higher incomes hurt the impact of taxes on consumption, also over-reliance on tax-based fiscal consolidation in bad times should be minimized.

On growth and revenue performance, Miki (2011) investigated the effect of a change in a country's VAT rate on its aggregate consumption and its economic growth in a sample of 14 developed countries from 1980(Q2) to 2010(Q3). The study integrated income effect for which an increase in tax rate makes agents worse off and substitution effect in which aggregate consumption falls as tax and real cost increases. The panel data model estimation results indicate that a speculative rise in VAT rate boosts consumption and economic growth and vice

versa. This tax effect of high growth performance relatively falls in the short term after policy implementation. Bhattarai (2003) studied the UK economy and provided solution to general equilibrium model taking into account the impact of consumption tax and income tax. The main founds of the study states that consumption taxes are effective in determining household consumption and help in revenue targets than income tax. Taxing consumption to raise a given amount of revenue is better than other sources of revenue.

Consistent with the theoretical underpinnings of the negative relationship between household spending and taxes, some studies including Alm and El-Ganainy (2013), Kolahi *et al.*, (2016) and Usman (2018) among others have examined and found the existence of Keynesian effect of fiscal policy between the two variables. Carmignani (2008) used the generalized method of moment (GMM) estimation technique and unbalanced panel data of Europe spanning from 1999-2003 to estimate the impact of fiscal policy on private consumption *per capita* and social outcomes. The author noted that, in transition economies, government consumption has a Keynesian effect on household spending in boom and contraction times but, high-income countries face the non-Keynesian impact on fiscal policy. Overall public health and social protection improve welfare.

In the context of two-country analysis, Ekong and Effiong (2020) aimed at studying the economic determinants of household consumption expenditure within Ghana and Nigeria between the periods 1999 to 2018 using a fixed effect least-squares dummy variable model. In support of intertemporal substitution effect, the study shows a Keynesian effect, as gross national income and inflation rate impact positively on consumption whereas interest rates and savings deter consumption. On the way forward, the authors proposed a joint effort to deepen savings culture to improve the well-being of households. Similarly, Bonsu and Muzindutsi

(2017) used multivariate cointegration approach to analyze the macroeconomic determinants of household spending in Ghana using annual data sector level data from 1961 to 2013. The finding revealed that averagely 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 a contagious effect on growth performance and the real exchange rate.

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). The structural vector autoregressive (SVAR) model was used. The results suggested 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 study of Tochukwu *et al.*, (2015) and Idris and Sani (2021) in Nigeria corroborates this argument using ordinary least squares and ARDL model respectively.

2.5.2 Income Inequality, Economic Growth and Tax Policy Nexus

The tax policy of an economy should be efficient, that is not distorting 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 authors classified tax components accrued by individuals and corporate agencies (personal income tax, corporate tax, and social contribution) in a group of income taxes and taxes on consumption (VAT, excise tax, and various duties) into the other. 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.

However, earlier works by Alesina and Rodrik (1994) studied the link between governance structure and economic growth using panel data analysis in endogenous growth models in democratic and non-democratic economies from 1948–1985. The main findings of the study indicate that governments with attributes of capitalism develop policies to maximize economic growth. The authors added that in democratic countries with a majority in the working class, a high tax rate leads to a fall in growth rate and unequal distribution of wealth. Chan *et al.,* (2021) conducted an empirical analysis on the role of governance structure on VAT and inequality in panel data of 105 countries for the period 1984 to 2014. The generalized method of moment (GMM) estimation technique was used. They concluded that tax revenue aids effective distribution to the poor and avoids political instability. However, inequality is reduced in countries with strong institutions and governance.

The effectiveness of tax policy measures depends on the tenants of policy makers and tax compliance of citizens. In their study "Tax Revenue Reforms and Income Distribution in Developing Countries", Gupta and Jalles (2020) used instrumental variable technique to find the impact of tax policy on income distribution dynamics for 45 emerging and low-income countries between 2000 and 2015. According to the study, the Gini index falls slowly after

general tax reform, and the effect is statistically significant. This outcome is ineffective for sub-Saharan countries in reducing income inequality. However, the researchers proposed reforms on personal income tax to improve income distribution. In contrast, Younger *et al.,* (2015) incorporated the incidence analysis method to explore social spending, taxation, and indirect subsidies on poverty and inequality in Ghana. The study used the 2012/2013 Ghana Living Standard Survey, round 6, and administrative tax and expenditure data. According to the report, broad-based indirect taxes like VAT are more efficient than direct taxes. On the other hand, direct taxes are more equitable.

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. The empirical investigation suggest that VAT adoption averagely does not lead to an increase in income inequality. This is evident in low-income economies where inequality is consumption-based. Similarly, Mahler and Jesuit (2018) used a bivariate relationship and multiple regression to measure the degree of inequality reduction achieved from indirect taxes and public social transfers between the periods 1980 to 2013 for 19 developed countries. Data used in this study was household-level income survey and OECD revenue statistics. The authors controlled for the over-65 population and unemployment rate and concluded that consumption tax and social security contributions have a positive and significant impact on inequality reduction in addition to social transfers.

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 over the period 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. Blasco *et al.,* (2020) estimated the impact of consumption taxes on the distribution of net disposable income by applying a microsimulation model and household budget and income survey for 25 countries between the years 1979 to 2013. The study empirically used effective consumption tax rates to generate consumption data to replace missing data. The main highlight of the study shows that consumption tax derives a large section of tax revenue but widens income disparity. This outcome rests on behavioural factors and the propensity to consume.

In accordance with this study, Iosifidi and Mylonidis (2017) empirically employed a fixed effect two-stage least squares model to measure the distributional impact of relative tax rates on income inequality for 17 OECD countries for the period 1970 to 2001. The authors introduced population, education, economic growth, development, price stability as control factors and found that redistribution of income is only feasible through labour tax policies. They acknowledged the impact of quality institutions in enhancing redistribution policies. Obadić *et al.,* (2014) assessed the effect of taxes and social contributions in reducing income inequality for the European Union using a panel data model between 2000 and 2011. They concluded that tax policies such as labour, social contribution, and consumption taxes aids in making post-tax income distribution more equal.

On studies in Africa, Mourfou and Ouedraogo (2021) sampled West African economic and monetary countries (WAEMU) to examine the effect of tax revenue on income 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 revenue are neutral to inequality. To maintain macroeconomic performance and economic equality, the authors backed the neutrality of indirect and progressive tax in WAEMU. In addition, Indongo and Robinson (2021) applied ARDL model to analyse the relationship between income distribution and fiscal policy components using annual data for Namibia from 1996 to 2016. The main founds of the study indicate that in the short-run government expenditure has a negative effect on income disparity while taxes have a positive effect on income distribution. Yet, Obaretin *et al.*, (2017) highlight that tax variants exert an insignificant impact on income disparity in Nigeria using ordinary least squares model for the period 1981 to 2014.

Thilanka and Ranjith (2021) carried out an empirical analysis to identify the dynamic effect of tax compositions, tax compliance, and other variables on income inequality in Sri Lanka using Vector error correction model for the period 1985 to 2018. The state of the economy details a persistent income inequality and declining tax revenue buoyancy. The study showed mixed results with import taxes and tax compliance serve as an instrument of equality while tax non-compliance, real growth rate, and VAT add up unequal wealth distribution. In summarizing the existing empirical evidence, Alves and Afonso (2019) emphasized the need to explore the nexus between several tax items on household consumption expenditure and income inequality for OECD countries over the periods 1980 to 2015. The results from the panel model and the non-linear threshold estimation technique indicate that income tax contributes to short- and long-term GDP by reducing income disparity with threshold values of 7.19 percent and 6.94 percent respectively. Also, consumption tax contributes 11.88 percent and 11.83 percent to GDP to minimize income inequality in the short- and long-term respectively. Mainly, these values increase income gaps between different income groups.

2.6 Conclusion

The existing body of knowledge in the current study has extensively reviewed consumption hypotheses and relevant theories of income inequality. In particular, assumptions, empirical tests, various critiques, and limitations of hypotheses were reviewed. Keynes's theory of consumption asserts that rational economic agents' decisions on consumption or spending change to a tax shock (Şen & Kaya, 2016). However, the permanent income hypothesis (PIH) and life-cycle hypothesis (LCH) argue that aside from shocks, a change in tax policies will not affects economic agents' consumption decisions unless individuals reform expectations of future incomes (Şen & Kaya, 2016).

In addition, the Kuznets curve indicates that in the primary stages of economic development, there exist a positive relationship between income *per capita* and inequality. However, at a specified level of economic development (migration) there may be a negative relationship between *per capita* income and economic development. On the other hand, Kuznets waves also postulates that wars, technology, openness and tax policies are adjudged as elements of income inequality. The study also focused on sound concepts of household spending, income inequality, taxation, and attempts of measuring income inequality.

Empirically, a plethora of literature exist, firstly on consumption, savings, investment, and tax policy nexus; and secondly on income inequality, economic growth, and tax policy nexus. However, few studies in the literature focused on the relationship between household spending, income inequality and consumption based-tax (VAT). Alm and El-Ganainy (2013), Kolahi *et al.,* (2016), and Usman (2018) found a non-Keynesian effect (negative) regarding the impact of VAT on household spending. Tochukwu *et al.,* (2015), Idris and Sani (2021), and Zeynalova

and Mammadli (2020) considered a Keynesian link between VAT and household spending, implying a tax increase, shoots up private consumption.

Similarly, Mourfou and Ouedraogo (2021) and Nguyen *et al.*, (2017) found a neutral relationship between VAT and income inequality. Studies by Martinez-Vazquez *et al.*, (2012), Younger *et al.*, (2015), and Indongo and Robinson (2021) indicated a positive effect (regressive) of VAT on income inequality. In contrast, Obadić *et al.*, (2014) obtained a negative relationship (progressive) between VAT and income inequality whiles Obaretin *et al.*, 2017 illustrated that VAT has no significant impact on income distribution. Therefore, the mixed findings in the literature suggest that the impact of VAT on household spending and income inequality is largely influenced by variant methodologies (years and sample) and the introduction of other variables.

Implicitly, previous studies of Idris and Sani (2021) and Indongo and Robinson (2021) utilized the ARDL bounds testing approach and the error correction model (ECM). These studies relied on the overall F-test on the coefficient on all lagged level variables and neglected the T-test on the coefficient on the lagged level response variable for cointegration, a clear violation of the assumptions presented by Pesaran *et al.*, (2001). However, reliable and consistent results were not obtained. The instability in the conventional ARDL can be eliminated by the bootstrapping ARDL bounds testing approach developed by McNown *et al.*, (2018). The bootstrap ARDL model suggests an additional F-test on coefficient on lagged explanatory variables to complement the overall F-test and the T-test. However, applying all three (3) tests yields accurate and robust results. The motivation of this study is to fill the gap by solving the uncertainties of the conventional ARDL model with the bootstrap ARDL test for cointegration.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter focuses on the methodology employed and it is organized into four (4) sections. Section one discusses the theoretical model that informed this study and section two describes the empirical model for this study. The third section presents the econometric model, the analytical techniques, the causality procedure, and the diagnostic test procedure used. In the fourth section, data sources and descriptions of variables are discussed.

3.2 Theoretical Model

This section discusses the theoretical framework of Keynes's consumption function and the Kuznets Curve and how it relates to the existing study.

3.2.1 Keynes Consumption Function

The General theory of Keynes (1936) describes the modern theory of consumption based on the functional relationship existing between consumption expenditures and income. Keynes (1936) assumed that consumption expenditures is the function of absolute income (current disposable income after tax paid) at least in the short-run once objective factors (exogenous) such as price expectations, wealth, rate of interest among others are given (Drakopoulos, 2021).

Keynes' general theory of consumption (Keynes, 1936) expounds the impact of consumption:

> "*The amount of aggregate consumption depends mainly on the amount of aggregate income. The fundamental psychological law that ensures the reliance of great confidence both a priori from the understanding of human nature and from the detailed facts of experience, is that economic agents (both men and women) are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income*" *(Keynes, 1936: 96).*

This relationship can be shown by the following function:

$$C_t = \gamma_0 + MPC(Y_t - T_t) \tag{3.1}$$

$$C_t = \gamma_0 + MPC(Y_{dt}) \; ; \quad \gamma_0 > 0 \; ; \; 0 < MPC < 1 \tag{3.2}$$

where C_t is consumption expenditure (national or household), 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:

$$APC = \frac{C_t}{Y_{dt}} = \frac{\gamma_0}{Y_{dt}} + MPC \tag{3.3}$$

This implies that $APC > MPC$, and that the APC falls as income grows.

However, a few relevant economic policy implications are drawn from Keynes approach to consumption. The Keynesian consumption theory (Absolute Income Hypothesis–AIH) considers taxation as an effective instrument of economic policy regulation. In addition, the weight of the MPC influence the proportion of the Keynesian multiplier. Put differently, the impact of consumption tax on the poor is a reflection of a high marginal propensity to consume

(MPC) and a low marginal propensity to save (MPS) relative to the rich. Further and as specified that $MPC < APC$, aggregate demand increases as income shifts from high earners to below average earners (Drakopoulos, 2021).

3.2.2 Kuznets Hypothesis

In theory, the impact of tax policy on income inequality is inconclusive; nevertheless, it is important to recognize that there is both a negative and a positive relationship among the variables. Following Kuznets (1955) assertion that income inequality and economic performance are interconnected to each other and therefore trace out a process of a bell-shaped curve, the study adopts the Kuznets (1955) framework to examine the impact of consumption tax on income inequality as illustrated in Figure 3.1.

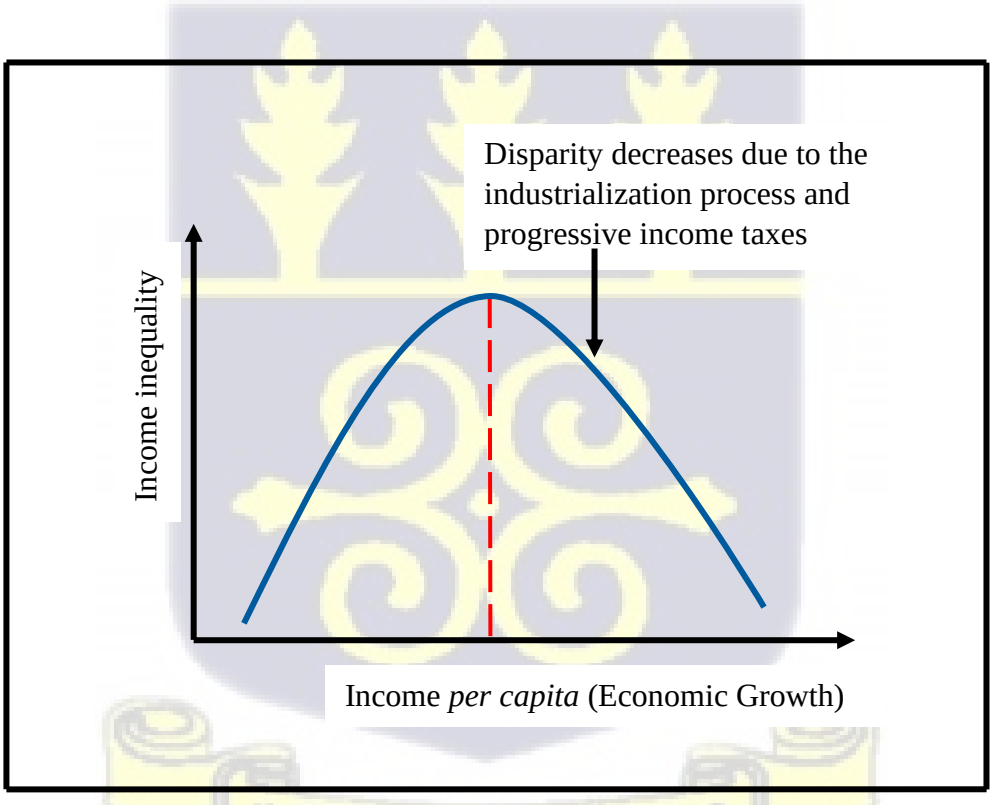

Figure 3.1: The Kuznets Curve
Source: Kuznets (1955)

Kuznets curve states that income inequality widens at the early stage of economic development (pre-industrial economy) and gradually improves as the economy experience economic growth. The income (*per capita* income) concave shaped curve is based on the initial increase and a subsequent decrease in income inequality due to the industrialization process (the population shift of unskilled labour from agricultural sector to non-agricultural sector) and progressive income taxes (Kuznets, 1955).

To establish a general framework: the income inequality Kuznets curve hypothesis (Kuznets, 1955) can be defined by the following function:

$$INEQ = f(pGDP, pGDP^2) \tag{3.4}$$

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 ($pGDP^2$) to form an inverted U shaped relationship between inequality and *per capita* income. However, it is assumed to be strictly concave in both arguments.

3.3 Empirical Model Specification

This section outlines the model specifications to estimate the effect of consumption tax, VAT on household consumption expenditure and income inequality as derived from the theoretical model. Specifically, the first part focuses on VAT contributions to GDP on household spending while the second part looks at the effect of VAT on income inequality.

3.3.1 VAT Contributions on Household Spending

Given the above excerpts from Keynes theory of consumption, the study explains that consumer spending depends mainly on present income. In detail, consumption is a function of current income at a given period. The functional form of this statement is expressed as:

$$C_t = f(Yd_t) \tag{3.5}$$

where C_t is consumption expenditure, Yd_t is disposable income, identical to gross national income Y_t after TAX. Keynes's general theory (1936) asserts that consumption expenditure is associated with disposable income. Mathematically, the Keynes AIH can be in the form:

$$C_t = \varphi_0 + \beta_i Yd_t + u_t, \tag{3.6}$$

where φ_0 denotes the intercept (or constant) term, β_i is the MPC which is measured by the change in consumption with respect to income and u_t is the disturbance term assumed to follow white noise process. Based on the derivation of equation (3.6), consumption function is reparametrized and written as:

$$HHS_t = f(Y_t, TAX_t, Z_t), \tag{3.7}$$

where HHS represents household spending, Y is national income or GDP, TAX is TAX items of which VAT is the main variable of interest and Z represents control variables. From the above-mentioned, the initial objective is to examine the impact of value-added tax (VAT) on household spending. However, equation (3.7) can be written as:

$$HHS_t = f(GNS_t, VAT_t, Z_t), \tag{3.8}$$

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

$$\begin{aligned} lnHHS_t = {} & \alpha_0 + \beta_1 lnVAT_t + \beta_2 lnGNS_t + \beta_3 lnGCS_t + \beta_4 lnPOPG_t \\ & + \beta_5 lnREER_t + \beta_6 lnPREM_t + u_t, \end{aligned} \tag{3.9}$$

where HHS represents household spending (or private consumption expenditure). The main variable of interest is VAT which denotes Value-added tax (VAT) contributions to gross domestic product (GDP). GNS is gross national savings measured a percentage of GDP, GCE stands for government consumption expenditure (or government spending) measured as

general government final consumption expenditure as a percentage of GDP, $POPG$ represent population growth rate measured annually, $REER$ is real effective exchange rate, $PREM$ is personal remittance received measured as a percentage of GDP. u_t acquires the disturbance term. The model is expressed in natural log as a log transformed data assumes that the disturbances are normally distributed on the logarithmic scale yielding a linear relationship (Xiao *et al.*, 2011). α_0 is an intercept parameter and $\beta_i = (\beta_0, \beta_1, \cdots, \beta_t)^T$ are the slope parameter or the elasticity parameter.

However, to differentiate the short-run dynamics and the long-run equilibrium of VAT as a percentage of GDP on personal consumption the study applies the ARDL framework proposed by Pesaran *et al.*, (2001) with specific extensions from McNown *et al.*, (2018). In the context of this study, the unrestricted ECM based on the bootstrap ARDL approach is specified as follows:

$$\begin{aligned}\Delta lnHHS_t = \alpha_0 + \tau_i \sum_{i=1}^{p} \Delta\, lnHHS_{t-i} + \psi_i \sum_{i=1}^{q} \Delta\, lnVAT_{t-i} + \delta_i \sum_{i=1}^{q} \Delta\, lnGNS_{t-i} \\ + \vartheta_i \sum_{i=1}^{q} \Delta\, lnGCE_t + \varphi_i \sum_{i=1}^{q} \Delta\, lnPOPG_t + \omega_i \sum_{i=1}^{q} \Delta\, lnREER_t \\ + \lambda_i \sum_{i=1}^{q} \Delta\, lnPREM_t + \phi_1 lnHHS_{t-1} + \phi_2 lnVAT_{t-1} \\ + \phi_3 lnGNS_{t-1} + \phi_4 lnGCE_{t-1} + \phi_5 lnPOPG_{t-1} \\ + \phi_6 lnREER_{t-1} + \phi_7 lnPREM_{t-1} + \partial_i Dummy_t + u_t,\end{aligned} \tag{3.10}$$

where Δ the first difference operator whiles p signifies the lag length. The first part of summation sign indicates error correction dynamics with coefficients $\psi_i, \delta_i, \vartheta_i, \varphi_i, \omega_i \; and \; \lambda_i$ showing short run elasticities. The coefficient ϕ_i represent long-run elasticities. The choice of

control variables are based on literature (see Adams *et al.*, 2008; Martinez-Vazquez *et al.*, 2012; Alm & El-Ganainy, 2013; Şen & Kaya, 2016; Bonsu & Muzindutsi, 2017 and Idris & Sani, 2021 among others), thus HHS, VAT, GNS, GCE, $POPG$, $REER$, and $PREM$ symbolizes household spending, VAT contributions to GDP, gross national income, government expenditure, population growth, real exchange rate and personal remittance received respectively. $Dummy_t$ is used to capture structural breaks.

3.3.2 The Impact of VAT on Income Inequality

The empirical model for the second objective; the impact of VAT on income inequality is derived from Kuznets (1955) inverted "U" hypothesis which reflects the relationship between *per capita* growth (economic development) and income inequality. Following the assertion by Berenguer-Rico and Gonzalo (2014) the study adopts a non-linear (polynomial) model specification of the form:

$$y_t = \beta_0 + \beta_1 z_t + \beta_1 z_t^2 + \cdots + \beta_k z_t^k + u_t \tag{3.11}$$

where y_t is the response (or dependent) variable, z_t is the independent variable and u_t are the i.i.d disturbances of white noise process. In this study polynomial of up to second order are used to fit the data, that is $k = 2$. Equation (3.11) allows for testing various forms of relationship between income inequality and economic development: (i) $\beta_1 > 0$ and $\beta_k = 0$, for $k > 0$ denoting an increasing linear relationship, of which rising levels of income inequality accompany rising *per capita* income or development. (ii) $\beta_1 < 0$ and $\beta_k = 0$, for $k > 1$ indicates a decreasing linear link. (iii) $\beta_1 > 0, \beta_2 < 0$ and $\beta_k = 0$ for $k > 2$ reveals an inverted "U" shape (or quadratic) relationship between income inequality and economic development. The zenith of the quadratic curve is reached at a point where $z = -\beta_1/2\beta_2$.

The standard Kuznets curve regression model in a polynomial form is given as:

$$INEQ_t = \alpha_0 + \beta_t pGDP_t + \beta_t pGDP_t^2 + u_t \quad (3.12)$$

where $INEQ$ captures income inequality measured by Gini coefficient at time *t*. $pGDP$ and $pGDP^2$ measures GDP *per capita* at time *t* and the square of GDP *per capita* at time *t* respectively and both are measures of Kuznets process and u_t is the i.i.d disturbances in the non-linear regression model. In modifying equation (3.12) the study adopts theoretical framework of related literature (Martinez-Vazquez *et al*., 2012; Iosifidi & Mylonidis, 2017). The theoretical model enables the study to use Gini coefficient (or income inequality) as the response variable and fiscal policy instruments as the independent variable. From the above-mentioned framework, the specified non-linear model specification to examine the impact of VAT contributions to GDP on income inequality is stated as:

$$INEQ_t = \delta_0 + \beta_1 pGDP_t + \beta_2 pGDP_t^2 + \beta_3 VAT_t + \beta_4 GCE_t + \beta_5 REER_t + \beta_6 PREM_t + \beta_7 POPG_t + u_t \quad (3.13)$$

where $INEQ$ captures income inequality (Gini index), $pGDP$ is real GDP *per capita*, $pGDP^2$ denotes the square of real GDP *per capita* which is a measure of the Kuznets curve. The primary variable of interest is VAT_t which indicates Value-added tax contributions to GDP. GCE represent government consumption expenditure (or government spending) measured as general government final consumption expenditure as a percentage of GDP, $REER$ is real exchange rate, $PREM$ is personal remittance received, $POPG$ denotes population growth rate, u_t are the i.i.d disturbances of white noise process and t is time period.

Xiao *et al.*, (2011) argues that in non-linear model specifications the errors are normally distributed and addictive on the arithmetic scale. The non-linear model specification is necessary to reduce the number of degrees of freedom, prevent multicollinearity and reduce

the probability that one or two outliers will determine the shape of the estimated lag distribution (Evans, 2002). Further and most importantly, the study follows an error-correction modelling format of Pesaran *et al.*, (2001) to investigate the long-run equilibrium and the short-run dynamic adjustment process of VAT to GDP ratio on income inequality. The unrestricted ECM in the context of bootstrap ARDL approach is specified below:

$$\begin{aligned}\Delta INEQ_t = {} & \delta_0 + \alpha_i \sum_{i=1}^{p} \Delta\, INEQ_{t-i} + \beta_i \sum_{i=1}^{q} \Delta\, VAT_{t-i} + \upsilon_i \sum_{i=1}^{q} \Delta\, pGDP_{t-i} \\ & + \pi_i \sum_{i=1}^{q} \Delta pGDP_{t-i}^2 + \varpi_i \sum_{i=1}^{q} \Delta\, GCE_t + \theta_i \sum_{i=1}^{q} \Delta\, REER_t \\ & + \vartheta_i \sum_{i=1}^{q} \Delta PREM_{t-i} + \lambda_i \sum_{i=1}^{q} \Delta POPG_{t-i} + \Omega_1 INEQ_{t-1} \\ & + \Omega_2 VAT_{t-i} + \Omega_3 pGDP_{t-1} + \Omega_4 pGDP_t^2 + \Omega_5 GCE_{t-1} \\ & + \Omega_6 REER_{t-1} + \Omega_7 PREM_{t-1} + \Omega_8 POPG_{t-1} + \lambda_i Dummy_t \\ & + u_t,\end{aligned} \tag{3.14}$$

where δ_0 equals constant term, Δ is operator of the first difference while p signifies lag length. The summation sign denotes the error correction dynamics in the short-run. The coefficient Ω_i represent long-run link between the variables. $INEQ$, VAT, $pGDP$, $pGDP^2$, GCE, $REER$, and $POPG$ indicates income inequality, VAT as a percentage of GDP, *per capita* GDP, *per capita* GDP squared, government consumption expenditure, real exchange rate and population growth rate respectively. $Dummy$ variable show structural break in the model and u_t is the i.i.d disturbances in the non-linear regression model. The choice of control variables are based on previous outcomes (see Kuznets, 1955; Adams *et al.*, 2008, Martinez-Vazquez *et al.*, 2012; Alm & El-Ganainy, 2013; Şen & Kaya, 2016; Bonsu & Muzindutsi, 2017 and Idris & Sani, 2021).

3.4 Estimation Technique

The study performs 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). Indeed, Pesaran, Shin, and Smith (2001) developed a cointegration test – the ARDL bounds test, for treating time series with varied and unknown integration orders. This model has been extensively used by researchers to analyze long-term relationships as it allows for the flexible dynamic relationships between two or more variables. In general, the ARDL bounds testing approach can be utilized when variables are stationary and integrated at I(0) and I(1).

3.4.1 The Autoregressive Distributed Lag Model

Distributed lag model for time series may be described as a model that includes one or more lag values of the response variable among its explanatory variables. The model portrays a time path of the dependent variable in relation to its past values, hence referred to as dynamic models. The general form of an infinite distributed lag model is as follows:

$$y_t = \delta + \beta_0 x_t + \beta_1 x_{t-1} + \cdots + \mu_t = \delta + \sum_{i=0}^{\infty} \beta_i x_{t-i} + u_t \ , \qquad t = 1, \cdots, T \tag{3.15}$$

where y_t is the response (or dependent) variable, $x_t = (1, x_t, x_{t-1} \cdots, x_{t-i})$ are x predictor (or independent) variable, δ is the intercept (or constant) term, $\beta_t = (\beta_0, \beta_1, \cdots, \beta_{it})^T$ is an $(p + 1)$ – dimensional vector of regression coefficients, u_t are the independent and identically distributed (i.i.d) disturbances of white noise process. T denotes sample size and x_i represents independent variables.

Generally, many linear distributed lag models are classified into rational distributed lag models that can be expressed in the form of the autoregressive distributed lag models (Pesaran, 2015).

Given the above, if the lagged values of y_t are added to this distributed lag model, autoregressive distributed lag model is obtained and the conventional ARDL (p, q) framework showing a stationary unique long-term relationship between y_t and x_t is expressed in the form:

$$y_t = \gamma_0 + \gamma_1 + \sum_{i=1}^{p} \vartheta_i y_{t-i} + \pi' x_t + \sum_{i=1}^{q-1} \pi_t^{*\prime} \Delta y_{t-i} + \mu_t \tag{3.16}$$

$$\Delta x_t = P_1 \Delta x_{t-1} + p_2 \Delta x_{t-2} + \cdots + p_r \Delta x_{r-s} + \varepsilon_t = \sum_{i-1}^{r} p_i \Delta x_{t-j} + \varepsilon_t \tag{3.17}$$

where both equation (3.16) and (3.17), x_t is defined as the *k*-dimensional I(1) non-cointegrated variables. ε_t and μ_t follows a white noise process. Moreover, P_i refers $k \times k$ coefficient matrices in order that a stability can be mentioned in VAR process in Δx_t. In equation (3.16), t is deterministic trend.

3.4.2 The Unit Root Process

The stationarity process of integration order is essential for non-spurious regression and robust estimates (Ikram *et al.*, 2021). A unit root process is a generalization of the random walk model where the error terms u_t are allowed to follow a white noise process or a general linear stationary process of zero mean and finite variance, expressed as $u_t \sim (0, \sigma_u^2)$. In addition, any time series data that contains one or more characteristic root that equal unity is referred to as a unit root process. The test of unit root process between two variables was pioneered by Granger (1981). However, the presence of a unit root can be tested empirically by semi- and non-parametric augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1981) and Phillips-Perron (PP) test propounded by Phillips and Perron (1988). These tests are performed to check whether the time-periods of selected data are stationary at level, first difference or both. The augmented Dickey-Fuller unit root test of order p can be expressed as follows:

$$\Delta y_t = a_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} a_j \Delta Y_{t-j} + u_t \tag{3.18}$$

where y_t represents time series, Δ is the first-order difference operator, a_0 denotes constant, p is the dependent variable maximum number of lags, u_t follows a white noise process, while the PP unit root test is expressed in equation (3.19):

$$\Delta y_t = \gamma Y_{t-1} + a_i * D_{t-i} + u_t \tag{3.19}$$

where D_{t-i} denote deterministic trend component

The lag length for the augmented regression is chosen such that the ADF test and PP test equation residuals u_t are serially uncorrelated. In practice, model selection criterion such as the Akaike information criterion (AIC) or the Schwarz Bayesian criterion (SBC) are used to select the number of lags. The lag structure is established based on the AIC and controlling for correlation of residuals. In detail, if the null hypothesis is not rejected, the time series data is unit root and the solution is to difference and estimate the data. On the other hand, if the null hypothesis is accepted, the data is stationary and estimated without differencing.

3.4.3 The Structural Break Test

The unexpected drop to economic time series is subject to changes in regime, policy direction, and external shocks, among others (Shrestha & Bhatta, 2018). The conventional unit root test of ADF test (1981) and PP test (1988) do not account for the presence of structural break, hence a stationary series with structural break may be regarded as non-stationary series leading to biased and misleading results.

In particular, structural break could create errors in the unit root process (Shrestha & Bhatta, 2018), hence the study uses the Zivot and Andrews (2002) structural break unit root test. Zivot

and Andrews's unit root test may occur in the intercept (A), trend (B) or both (C). Given a series: $(X_1, X_2, X_3 \cdots X_t)$ where t is the time periods and X represent observations, the structural tests take the following form:

$$Model\ A\colon\ \Delta y_t = \omega + \hat{\tau} y_{t-1} + \Omega_t + \Upsilon DU_t + \sum_{j=i}^{t} \Theta_j\, \Delta y_{t-j} + u_t \tag{3.20}$$

$$Model\ B\colon\ \Delta y_t = \omega + \hat{\tau} y_{t-1} + \Omega_t + \eta DT_t + \sum_{j=i}^{t} \Theta_j\, \Delta y_{t-j} + u_t \tag{3.21}$$

$$Model\ C\colon\ \Delta y_t = \omega + \hat{\tau} y_{t-1} + \Omega_t + \Upsilon DU_t + \eta DT_t + \sum_{j=i}^{t} \Theta_j\, \Delta y_{t-j} + u_t \tag{3.22}$$

where Δ is the first difference operator, u_t is a white noise disturbance term with constant variance ϑ^2 and $t = 1, \cdots, T$ is an index of time. Δy_{t-j} terms of equation 3.20, 3.21, and 3.22 allows for serial correlation and follows a white noise process. Zivot and Andrews (2002) unit root test may occur in the intercept (A), trend (B), and intercept and trend (C). DU_t and DT_t are dummy variable for a mean shift at a break point and a trend shift, respectively. The study employs equation 3.23. Therefore;

$$DU_t = \begin{cases} 1 \cdots if > TB \\ 0 \cdots if\ t < TB \end{cases} \ and\ \ DT_t = \begin{cases} t - TB \cdots if > TB \\ 0 \ \ \cdots\ if\ t < TB \end{cases} \tag{3.23}$$

In the context of Zivot and Andrews (2002) the null hypothesis ($\Omega = 0$) entails non-stationary of no structural break, against the alternative hypothesis of trend stationary with an unspecified time break (Salahuddin *et al.*, 2018; Ikram *et al.*, 2021). The unit root process is followed by the ARDL bounds testing approach.

3.4.4 The ARDL Bounds Testing Approach to Cointegration

The statistical procedure of cointegration tests in econometric data analysis identifies the existence of the long-run relationship among two or more variables. In particular, cointegration occurs when non-stationary variables have long-run equilibrium or have the same stochastic trend in common. The idea cointegration technique into econometric literature was developed with tests including Engle-Granger test, Phillps-Ouliaries test, and Johansen-Juselius test among others. The limitation with these tests procedure of cointegration in the literature includes the restrictive assumption of integrated of order one I(1) of all system variables (De Vita & Abbolt, 2002).

The ARDL bounds testing framework of Pesaran, Shin, and Smith (2001) has many advantages over the classical cointegration tests. The conventional ARDL model identifies the presence of long-run relationship between two or more variables in levels irrespective of whether the series are I(0) or I(1). The unrestricted error correction model (ECM) can be derived from an ARDL bounds test through a simple linear transformation (see equation 3.23). In the bounds testing approach, Pesaran *et al.,* (2001) proposed a pair of tests (F-test and t-dependent test) to identify cointegration in the ARDL methodology. The null hypotheses of the cointegration tests in relation to the study are expressed as follows:

(i). the F-test on coefficient on all lagged values variables ($\boldsymbol{F_{OVERALL}}$)

$$\boldsymbol{F_{OVERALL}}: H_0: \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 = 0$$

$$against,$$

$$H_1: \Psi_1 = \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 \neq 0$$

(ii). the T-test on coefficient on the lagged level dependent variable $(\boldsymbol{t_{DV}})$

$$\boldsymbol{t_{DV}}: H_0: \Psi_1 = 0$$

$$against,$$

$$H_1: \Psi_1 \neq 0$$

The presence of cointegration (ARDL bounds test) 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).

However, most researchers in practice clearly disregard the t-dependent test and solely base conclusions on the F-test, thus allowing variables to be infirm endogenously in violation of the ARDL bounds testing approach (Pesaran *et al.*, 2001; Sam *et al.*, 2019). The bounds testing process to cointegration lacks endogeneity as the traditional unit root test suffer from low power and size properties (Pata & Kumar, 2021).

3.4.5 The Bootstrap Autoregressive Distributed Lag Model

The theoretical framework of the bootstrap ARDL model developed by 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 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 bootstrap ARDL testing process utilizes bootstrap

simulations to generate critical values capable of eliminating insecure cases based on fixed properties of integration (Nawaz *et al.*, 2019). The bootstrap ARDL method has features to accommodate endogeneity problems and feedback that may exist among the variables leading to accurate and robust inferences (Goh *et al.*, 2017). The null hypothesis of the cointegration test statistics on the lagged-levels of the independent variables is expressed as:

(iii). the F-test on coefficient on all lagged independent variables ($\boldsymbol{F_{IDV}}$)

$$\boldsymbol{F_{IDV}}: H_0: \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 = 0$$

$$against,$$

$$H_1: \Psi_2 = \Psi_3 = \Psi_4 = \Psi_5 = \Psi_6 = \Psi_7 \neq 0$$

The bootstrap ARDL bounds testing approach expressed in a bivariate ARDL (p, q) model as follows:

$$y_t = \mathrm{c} + \sum_{m=1}^{p} \omega_j' \, y_{t-j} + \sum_{n=1}^{q} \beta_k' \, x_{t-k} + \sum_{o=1}^{w} \eta_v' \, Dummy_{t,v} + u_t \tag{3.24}$$

where m, n, o are indices of lags: $m = 0, 1, 2, \cdots, p$; $n = 0, 1, 2, \cdots, q$; $o = 1, 2, \cdots, w$. t denotes the time periods $t = 1, 2, \cdots, T$; y_t is the response or dependent 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 (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 $u_t \sim (0, \sigma_u^2)$.

The error correction model (ECM) version of equation (3.24) can be reparametrized and expressed as:

$$\Delta y_t = \check{c} + \breve{\omega} y_{t-1} + \breve{\beta} x_{t-1} + \sum_{m=1}^{p-1} \breve{\delta}_j' \, \Delta y_{t-j} + \sum_{n=1}^{q-1} \breve{\gamma}_k' \, \Delta x_{t-k} + \sum_{o=1}^{w} \breve{\Pi}_v' \, Dummy_{t,v} + \breve{u}_t \tag{3.25}$$

where Δ is the differential term,

$$\omega = \left(1 - \sum_{m=1}^{p} \alpha_i\right); \quad \beta = \sum_{n=1}^{q} \pi_k$$

and δ_j, γ_k and Π_v are the functions of the original parameters in equation (3.24).

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, non-cointegration and degenerate cases (Sam *et al.*, 2019). The assessment of the above-mentioned three null hypothesis suggests two non-cointegration degenerate cases and the presence or absence of cointegration as follows McNown *et al.*, (2018):

i. degenerate case one (1): a degenerate lagged dependent variable case occurs if the calculated F-test and the t-test on the lagged level of the independent variable(s) are significant but the t-test on the lagged level of the dependent variable is insignificant.

ii. degenerate case two (2): a degenerate lagged independent variable case occurs if the overall F-test and the t-test on the lagged level of the dependent variable are significant but the t-test on the lagged level of the independent variable is insignificant.

iii. cointegration if all the test statistics $(\boldsymbol{F_{OVERALL}, t_{DV},})$ and $(\boldsymbol{F_{IDV}})$ are significant at a minimum of 5 percent level.

iv. either of the degenerate cases one (i) and two (ii) implies a case of non-cointegration.

3.5 The Causality Tests

The concept of causality test between variables from time series sequence: $(X_1, X_2, X_3 \cdots X_t)$ where t represent time periods and X represent observations is essential in data analysis.

However, in econometrics, causality entails the ability of one variable to predicting or causing another variable. For instance, if y_t and x_t affect each other with distributed lags then there exist a feedback relationship between the variables. Moving forward, the challenge in the literature is applying a suitable test procedure to detect the cause, effect and relationship among variables (Evans, 2002).

Granger (1969) developed a relatively simple causality test called Granger causality which applies a standard forecast-ability. Granger causality test analysis for two stationary variables requires carrying out a zero restriction on the specific parameters in vector autoregressive (VAR) model, as well as employing Wald or Chi-square test statistics. The causality test is predicted on calculated F-statistics for the normal Wald test with the assumption that all variables are stationary, I(1) or I(0) (Asteriou & Hall, 2007).

Further and most importantly, if there exist a cointegration system between the variables, then Granger causality test is performed on the vector error correction (VEC) model rather than VAR model. Moreover, an instance of non-stationary variables at level in a VAR model, F and Chi-square distribution may be said to have non-standard asymptotic properties. In other words, Granger causality test can be meaningless if they involve non-stationary variables. Also, the impulse functions of non-stationary variables can have large standard errors. In fact, the Wald test for Granger causality may lead to non-standard limiting distributions predicted on the use of cointegration system properties of the model (Asteriou & Hall, 2007; Enders, 2015; Brooks, 2019).

The direction of causality between the response and independent variables is expressed by Granger (1969) in an equation form as:

$$M_t = \gamma_1 + \sum_{i=1}^{f} \alpha_i N_{t-i} + \sum_{i=1}^{g} \beta_i M_{t-i} + u_{1t} \tag{3.26}$$

$$N_t = \phi_1 + \sum_{i=1}^{f} \Omega_i M_{t-i} + \sum_{i=1}^{g} \omega_i N_{t-i} + u_{2t} \tag{3.27}$$

Equations (3.26) and (3.27), states that M is related to its lag values and N is related to its lag values, where the error terms and u_{2t} follows white noise process. Indeed, several variants of Granger causality test including the Sims causality test, the Dolado and Lütkepohl causality approach, the Toda and Yamamoto causality test among others have emerged. Of note, in general terms of causality, Sims (1980) argues that it is impossible for the future to cause the present. Sims (1980) test of causality assumes a cointegrated system of observations. In addition, for non-stationary data series, the Wald test statistics never converge the chi-square distribution, causing biased results (Asteriou & Hall, 2007).

Sims (1980) suggest estimating the following VAR specifications:

$$M_t = \alpha_1 + \sum_{i=1}^{f} \beta_i N_{t-i} + \sum_{i=1}^{g} \theta_i M_{t-i} + \sum_{i=1}^{h} \lambda_i N_{t+i} + u_{1t} \tag{3.28}$$

$$N_t = \alpha_2 + \sum_{i=1}^{f} \sigma_i N_{t-i} + \sum_{i=1}^{g} \rho_i M_{t-i} + \sum_{i=1}^{h} \pi_i N_{t+i} + u_{2t} \tag{3.29}$$

where the two equations (3.26) and (3.27) include the lagged, current and lead or future values of regressors; terms such as N_{t+1}, N_{t+2} are called lead terms (Gujarati & Porter, 2010).

3.5.1 The Toda-Yamamoto Causality Test

In 1995, Toda and Yamamoto pioneered the modification of the classic Granger causality test of non-stationary time series. Toda-Yamamoto test of causality complements Sims (1980) method of causality since it grants causal inference predicated on augmented level VAR with integrated and co-integrated processes. The main advantage of the Toda and Yamamoto test of causality is that it is conducted in level VARs without regards integrated variables, cointegrated or not, avoiding potential bias associated with the presence of unit root (Adriana, 2014).

Toda and Yamamoto causality test argues that the F-statistic applied to the traditional Granger causality is invalid and without a standard distribution as time series observations are integrated or cointegrated. The Toda and Yamamoto test process involves the estimation of an augmented VAR $(k + d_{max})$ model, where k equals the optimal lag length in the prime VAR system and d_{max} is maximal order of integration of the variables in the VAR system (Adriana, 2014).

The Toda and Yamamoto causality test applies a modified Wald (MWALD) test statistic to test zero restrictions on the parameters of the prime VAR (k) model. The test has an asymptotic (chi-square) distribution with k degree of freedom. The set back of the Toda and Yamamoto causality test presupposes that in times of small sample size the asymptotic distribution may produce a considerably poor approximate distribution of the test statistic.

Toda and Yamamoto (1995) causality test are as follows:

$$Y_t = \varpi_0 + \sum_{i=1}^{k} \varpi_i Y_{t-1} + \sum_{i=1}^{k+dmax} \varpi_i Y_{t-1} + \sum_{i=1}^{k} \varphi_i X_{t-1} + \sum_{i=1}^{k+dmax} \varphi_i X_{t-1} \quad (3.30)$$

$$X_t = \phi_0 + \sum_{i=1}^{k} \eta_i X_{t-1} + \sum_{i=1}^{k+dmax} \eta_i X_{t-1} + \sum_{i=1}^{k} \phi_i Y_{t-1} + \sum_{i=1}^{k+dmax} \phi_i Y_{t-1} \quad (3.31)$$

3.6 Diagnostic Tests

The diagnostic test employed for robust inferences and valid conclusions in bootstrap ARDL model are explained in this section. These tests include the Jarque-Bera test for normality, the Breusch-Godfrey LM test for autocorrelation, the Breusch-Pagan test for heteroscedasticity, the CUSUM and CUSUM square test for consistency and stability, the recursive coefficient tests, and Ramsey RESET test for specification error. These tests are classified under the Classical Linear Regression Model (CLRM) assumptions such as:

$$E(u_t) = 0; Var(u_t) = \sigma^2 < \infty;\ Cov(u_i, u_j) = 0; Cov(u_t, x_t) = 0$$

$$and\ u_t = N(0, \sigma^2) \quad (3.32)$$

3.6.1 Normality Test

The Jarque-Bera (JB) test is a popular and commonly used normality test developed by Jarque and Bera in 1987. Normality test are based on robust measures of skewness and kurtosis. Jarque-Bera test uses features of a normally distributed random variable where the entire distribution is characterized by the moments of mean and variances. The test relies on least squares and the validity of the various goodness of fit statistics is confirmed in the circumstances where the residuals are normally distributed.

The level to which a distribution deviates (not symmetric) from its mean value refers to Skewness. It is measured by:

$$S = \frac{[E(X-\mu)^3]^2}{[E(X-\mu)^2]^3} \tag{3.33}$$

Similarly, Kurtosis is used as a measurement for tail weights and it is calculated by:

$$K = \frac{E(X-\mu)^4}{[E(X-\mu)^2]^2} \tag{3.34}$$

Of note, if the distribution is normal, then $S = 0$ and $K = 0$. Jarque-Bera (JB) test statistics is computed as:

$$JB = \frac{n}{6}\left[S^2 + \frac{(K-3)^2}{4}\right] \tag{3.35}$$

where *n* is the sample size, S and K represents Skewness and Kurtosis respectively (Brooks, 2019). The Jarque-Bera test transforms to a chi-square distribution with two (2) as the sample size of observations increases. The random variable is assumed to have a normal distribution; written as $u_t = N(0, \sigma^2)$, which reads, the error term is normally distributed around a zero mean and finite variance. The null hypothesis of normality is accepted if the calculated test statistic is higher than the critical value of the chi-square distribution. Normal and non-normal distributed data are exhibited in Figure 3.2.

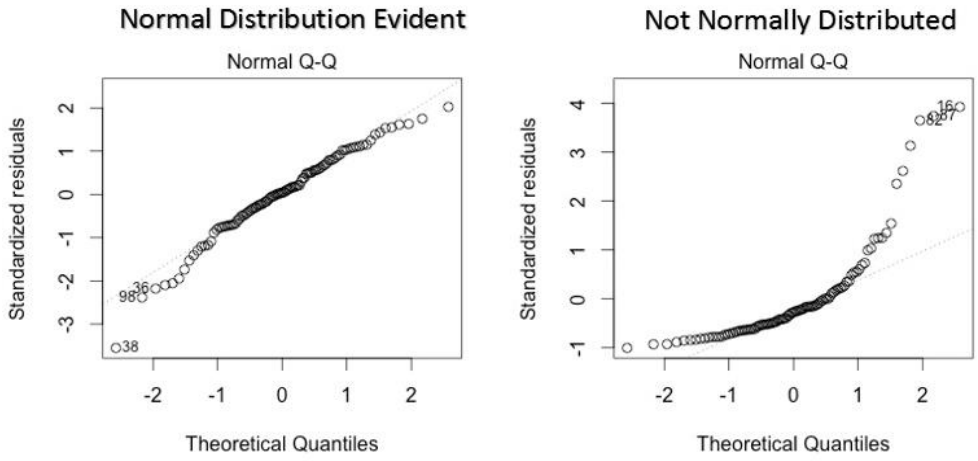

Figure 3.2: Normally and Non-Normality Distributed Data
Source: Adopted from Analytics Vidhya

3.6.2 Serial Correlation Test

The term autocorrelation is among the CLRM assumptions of least squares estimators. This assumption implies that the covariance and correlation between different error terms equal to zero, expressed as: $Cov(u_b, u_t) = 0; \ \forall \ b \neq t$, which means the errors are independently distributed. Autocorrelation proceeds as a result of a breach of the assumption that is the disturbances are said to be pairwise autocorrelated: $Cov(u_b, u_t) \neq 0; \ \forall \ b \neq t$, this expression implies that the disturbance term relating to any observation (period b) is influenced by the disturbance term relating to other observation (period *t*) (Gujarati & Porter, 2010).

The problem of autocorrelation of the error terms are experienced for many reasons (Koutsoyiannis, 1975):

- Omission of important explanatory variables.
- Misspecification of the model.
- The presence of systematic error in measurements.

The outcome of correlated error terms are classified as follows:

- The least squares estimates are linear and unbiased.
- The variance of the estimated coefficient is likely to be larger than other econometric method.
- The estimated test statistics and F-test are not reliable.
- R^2 obtained is higher than its actual value.
- The confidence interval, which is estimated, is not reliable.

An unresolved autocorrelation problem is shown in Figure 3.3.

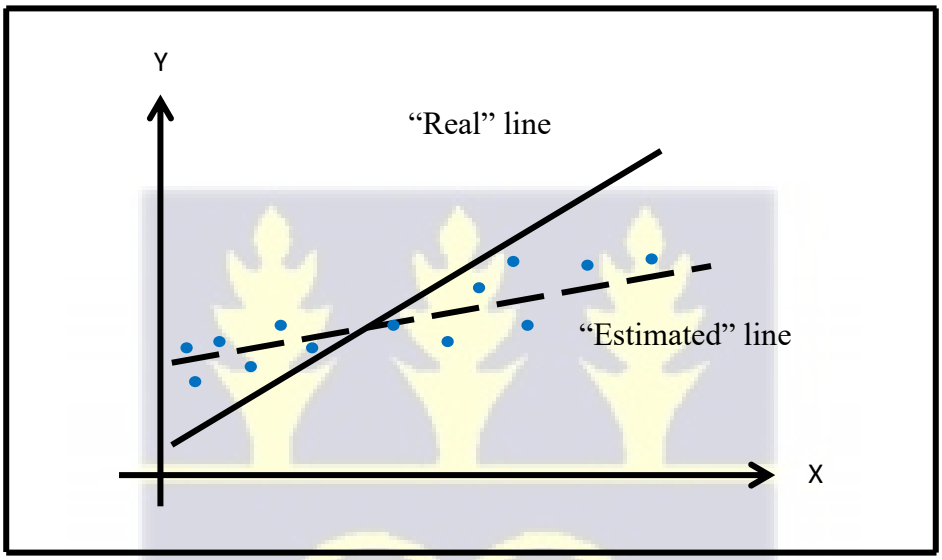

Figure 3.3: The Outcome of Autocorrelation Problem
Source: Gujarati & Porter (2010); Brooks (2019)

Further, given a multiple regression model below:

$$y_t = \alpha_0 + \phi_{1t}x_{1t} + \phi_{1t}x_{1t} + \cdots + \phi_{at}x_{at} + u_t \quad , t = 1, \cdots, T \tag{3.36}$$

where y_t is the response (or dependent) variable, $x_t = (1, x_{1t}, \cdots, x_{at})$ are c predictor (or independent) variable, α_0 is the intercept (or constant) term, $\phi_t = (\phi_0, \phi_{1t}, \cdots, \phi_{at})^T$ is an $(a + 1)$ – dimensional vector of regression coefficients, u_t are the i.i.d disturbances of white noise process. T = sample size and a is the number independent variables. The first-order

autocorrelation scheme occurs when: $u_t = \rho u_{t-1} + v_t$ with $|\rho| < 1$ where ρ is the coefficient of the autocorrelation association, v_t follows the white noise process. The parameter ρ illustrates a strong serial correlation if:

- $\rho = 0 \Longrightarrow \exists$ No autocorrelation since $u_t = v_t$ and i.i.d. error term
- $\rho \to 0 \Longrightarrow \exists$ Perfect positive correlation
- $\rho \to 0 \Longrightarrow \exists$ Perfect negative correlation

The negative and positive autocorrelation is illustrated in Figure 3.4 and 3.5 respectively:

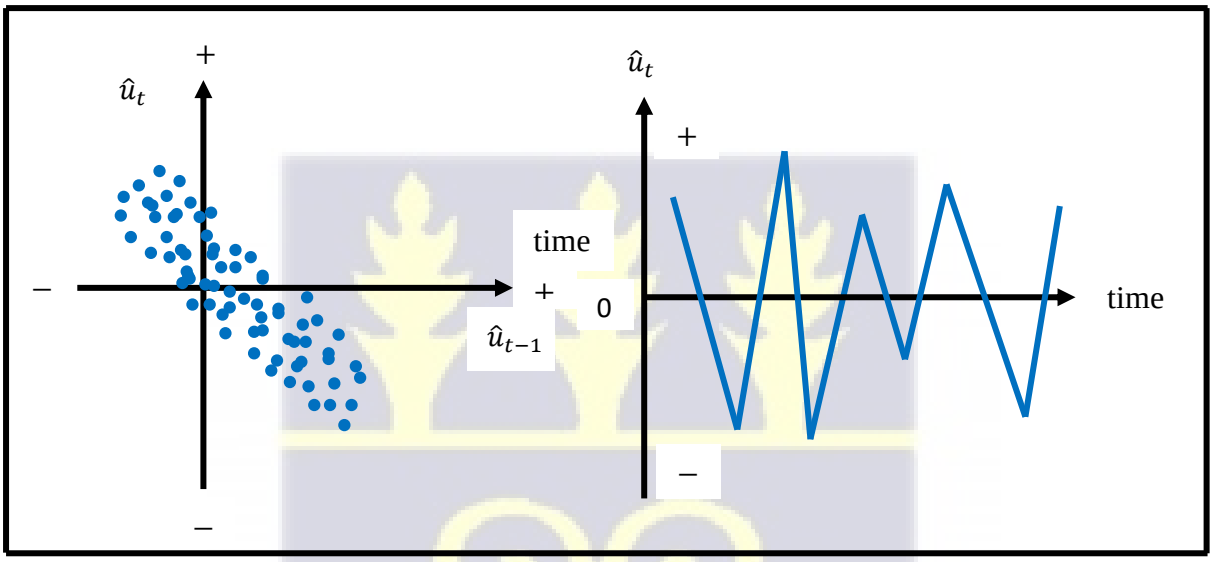

Figure 3.4: Negative Serial Correlation
Source: Gujarati & Porter (2010); Brooks (2019)

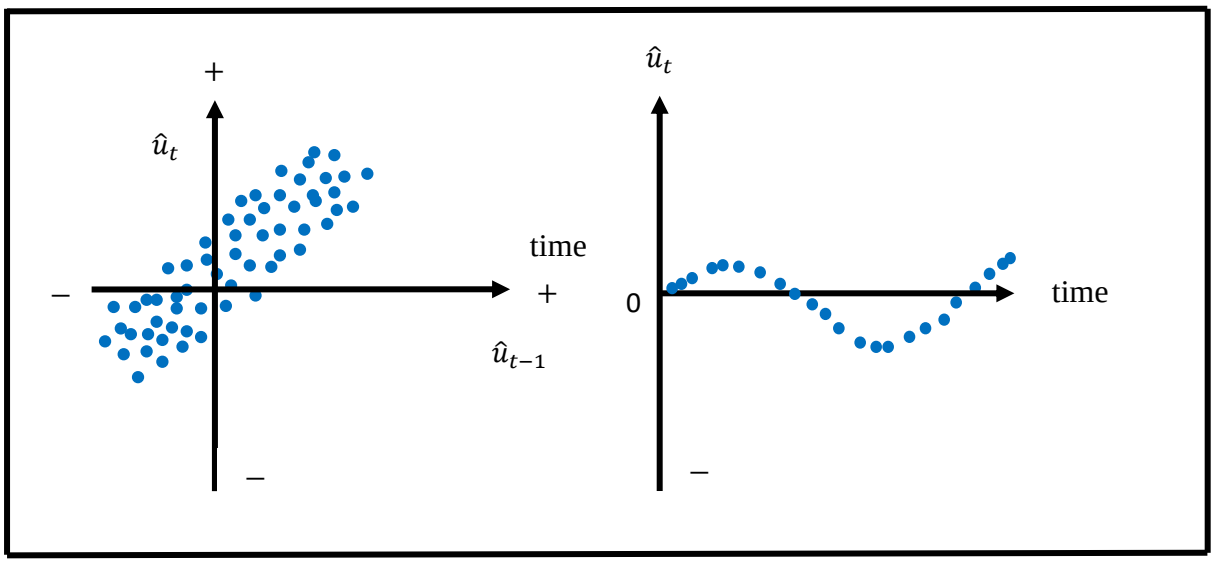

Figure 3.5: Positive Serial Correlation
Source: Gujarati & Porter (2010); Brooks (2019)

In detecting the presence of serial correlation within an econometric model, residual scatter plot (graph method), Durbin-Watson test, Breusch-Godfrey LM test among others are used. The most widely used Durbin-Watson test is biased in dynamic models and not applicable (Zeileis & Hothorn, 2002). However, to detect autocorrelation, the Breusch-Godfrey serial correlation LM test is applied. The Breusch-Godfrey LM test fits linear and non-linear dynamic models and allows non-stochastic regressors (Uyanto, 2020). The null hypothesis represents the absence of serial correlation while the alternative hypothesis says the presence of auto-correlation.

3.6.3 Test of Homoscedasticity

The assumption of homoscedasticity within the CLRM framework presupposes that the probability of the disturbances has an equal variance across observations and values of explanatory variables (Koutsoyiannis, 1975). The mathematical expression of this is:

$$Var(u_i|x_{1,i}, \cdots, x_{k,i}) = \sigma^2$$

The violation of the assumption of homoscedasticity leads to unequal variance of disturbances known as heteroscedasticity. In particular, the variance of the error terms is not constant. Symbolically expressed as (Koutsoyiannis, 1975; Gujarati & Porter, 2010):

$$Var(u_i|x_{1,i}, \cdots, x_{k,i}) = \sigma_{\mu i}^2$$

where i indicates unsteady variances that differ across observations. Cross-sectional data observations are collected from individuals or households within a specified time. Heteroscedasticity is more prevalent in cross-sectional data sets than in time-series data. Studies based on household-level estimations may originate misleading results from potential heterogeneity and cross-sectional dependence (Pereira, 2000).

The by-product of a violation of the assumptions of homoscedasticity on least squares estimators are as follows (Koutsoyiannis, 1975; Gujarati & Porter, 2010):

- Heteroscedasticity has an impact of OLS estimates causing unbiased estimates.
- The formulae of the variances of the coefficient cannot be applied to construct confidence intervals and conduct significance tests.
- The problem of heteroscedasticity in a model causes least square estimates to have a minimum variance property in a group of unbiased estimators. Therefore, they are inefficient in large samples.
- The prediction based on OLS estimates have adverse effect on high variances as well as standard errors of the estimated coefficients.

The scatter plot in Figure 3.6 is shown to differentiate between the cases of homoscedasticity and heteroscedasticity;

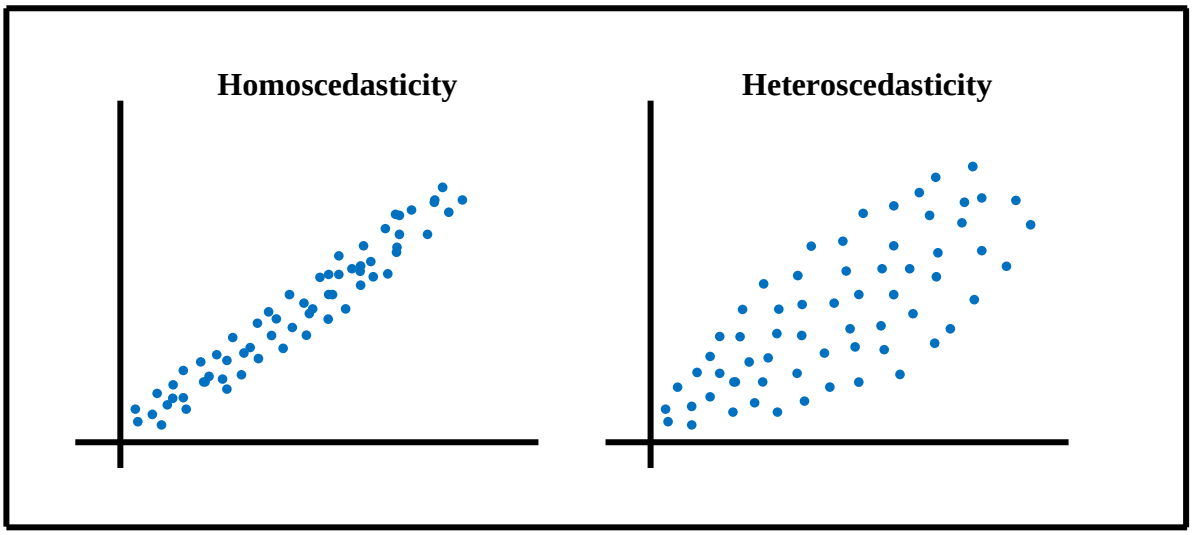

Figure 3.6: The scatter plot of both homoscedasticity and heteroscedasticity
Source: Gujarati & Porter (2010)

Most importantly, there are various test to establish homoscedasticity, some of which are the Breusch-Pagan LM test, the Glejser LM test, the Park LM test, the White test, the Harvey-Godfrey LM test among others (Koutsoyiannis, 1975; Gujarati & Porter, 2010). The Breusch-Pagan LM test is strongly favoured in this thesis for the heteroscedasticity test in linear regression model based on a Lagrange Multiplier (LM) statistic. The null hypothesis states that homoscedasticity (equal variance) exist versus the alternative hypothesis which indicates that the error terms have a non-constant variance. If the p-value exceeds the significance level, we fail to reject the null hypothesis.

3.7 Stability Test

The stability of the model is determined by the cumulative sum of recursive residuals (CUSUM) and the (CUSUM) square test as developed by Brown *et al.*, (1975). Specifically, the CUSUM and CUSUM square test are implemented on the residuals (difference between the observed value and the predicted value) of the estimated error correction model (ECM)

stated in equation (3.11) to testify the parameter constancy and the stability of the long-term parameters together with the short-term movements of the equation.

To assess the structural stability of the regression coefficient, a multiple linear regression model is given as:

$$y_t = \alpha_0 + \beta_{1t}x_{1t} + \beta_{1t}x_{1t} + \cdots + \beta_{ct}x_{ct} + u_t \quad , t = 1, \cdots, T \tag{3.37}$$

which can be written as:

$$y_t = x_t\beta_t + u_t \quad , \qquad t = 1, \cdots, T \tag{3.38}$$

where y_t is the response (or dependent) variable, $x_t = (1, x_{1t}, \cdots, x_{ct})$ are c predictor (or independent) variable, α_0 is the intercept (or constant) term, $\beta_t = (\beta_0, \beta_{1t}, \cdots, \beta_{ct})^T$ is an $(p + 1)$ – dimensional vector of regression coefficients, u_t are the i.i.d disturbances of white noise process. T = sample size and c is the number independent variables.

The study further implements CUSUM and CUSUM square tests to detect the presences of structural changes for each equation (see equation 3.10 and 3.14). These tests are graphical tests derived from recursive residuals. The recursive residuals are used to If w_t is the recursive residual, the $CUSUM_t$ and CUSUM square test (S_m) which represents:

$$CUSUM_t = \sum_{j=k+1}^{t} \frac{w_t}{\hat{\sigma}_w} \qquad t = k + 1, \cdots, T, \tag{3.39}$$

$$\hat{\sigma}_w^2 = \frac{1}{n-k}\sum_{t-1}^{n}(w_t - \overline{w})^2 \tag{3.40}$$

and,

$$S_m = \frac{\sum_{t=k+1}^{t} w_t^2}{\sum_{t=k+1}^{T} w_t^2} \tag{3.41}$$

In the CUSUM test, the null hypothesis (H_0) is that the regression coefficient β_t in equation 3.38 are stable across the data distribution. In contrast, the alternative hypothesis (H_1) is that the regression coefficient changes during the period of the sample. The CUSUM test is performed to assess the stability of the model at 5 percent of significance. Figure 3.7 illustrates CUSUM critical lines and statistics.

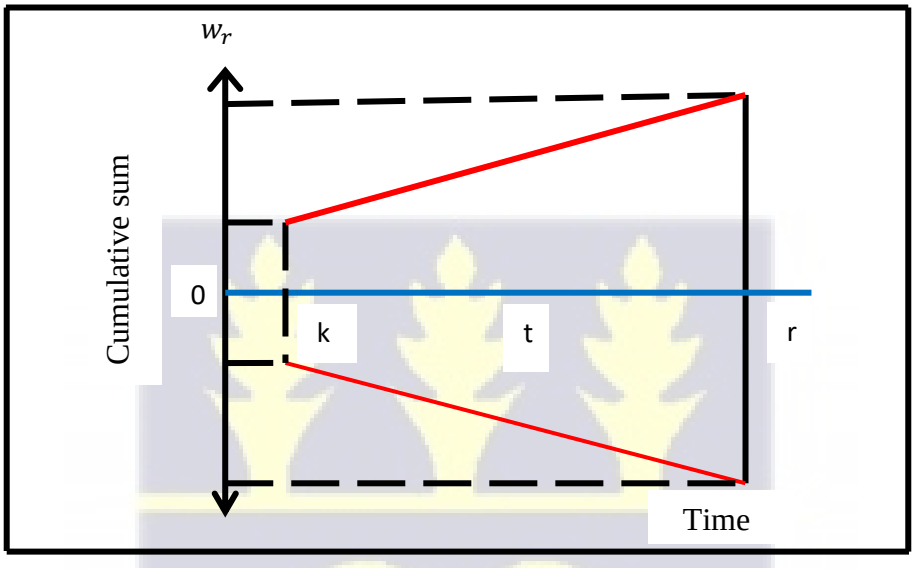

Figure 3.7: CUSUM Critical lines and Statistics
Source: Adopted from Baltagi (2011).

3.8 Recursive Coefficient Test and Curves

The Recursive coefficient test is a graphical representation of all the coefficients in an econometric model. The stable coefficient through the graph relies on an increasing sample size from the minimum to the last observations through the graph test (Evans, 2002). This type of test has been applied by different researchers including Bonsu and Muzindutsi (2017); Idris & Sani (2021); Fosu and Twumasi (2021); Pata and Kumar (2021); Ikram *et al.*, (2021).

3.9 Model Specification Test

Ramsey (1969) developed the Regression Specification Error Test (RESET) to detect general functional form or model misspecification. The RESET test is performed to examine the following errors (Evans, 2002; Gujarati & Porter, 2010).

- Omission of important variables
- Inappropriate non-linear functional forms
- Simultaneous-equation bias
- Incorrect use of lagged dependent variables

In the same way, several studies have employed the Ramey RESET test (see Bonsu & Muzindutsi, 2017; Idris & Sani, 2021; Fosu & Twumasi, 2021; Pata & Kumar, 2021; Ikram *et al.*, 2021).

3.10 Data and Variable Definition

The study uses macro-level data for the period 2000 to 2019, on a semi-annual basis. The choice of Ghana as sampled country is relevant based on the introduction of value-added tax in 1998 and its contribution to GDP overtime as well as the availability of credible data on the variables.

However, to achieve the above-mentioned intents, the study follows Ryan and Giles (1998) by adopting a linear interpolation and extrapolation technique to convert the annual data of household spending, income inequality, VAT revenues as a percentage of GDP, government consumption expenditure, gross national savings, real effective exchange rate, *per capita* income growth, personal remittance received and population growth into semi-annual frequency data. The objective of this technique is to have sufficient data points to satisfy the requirements for implementing the bootstrap ARDL model time series analysis. Concise details of the variables are discussed. The choice of explanatory (or control) variables is based on

attempts to eliminate serial correlation challenges, appropriate model specification, order of integration of variables among others. All variables are expressed in real terms. The main advantage of using variables in real terms are their adjustment for inflation.

3.10.1 Dependent Variables

Household Spending (HHS)

Generally, consumption may be viewed as the total demand for all consumer goods and services. Household spending or household final consumption expenditure is the market value of all goods and services including frequently purchased items, less frequently purchased items, health expenditure, education expenditure, expenditure on housing, imputed rent for proportion of households who owns dwelling units, expenditure on household amenities (light, water, cooking fuel and toilet facilities), miscellaneous expenditure, asset and durable consumer goods, and expenditure on transfer payment or remittance (World Bank, 2016). On the whole, household spending, measured by real GDP in constant 2010 US dollars constitutes the largest portion of GDP growth among expenditure items and on average comprises over 60 percent of GDP (Organisation for Economic Co-operation and Development, 2013).

Income Inequality (INEQ)

Income inequality as measured by the Gini coefficient or index is expressed theoretically as the entire income distribution of a country. Gini index ranges between zero (0) and (1), with 0 indicating equal income distribution and 1 representing high income inequality. The literature has widely used Gini index to study wealth distribution. Therefore, the Gini index is used as a measure of income inequality. Specifically, the study make use of Solt (2020) Standardized World Income Inequality Database (SWIID version 9.0) based on household income pre-tax income distribution spanning from 2000 to 2016. The SWIID is the most comprehensive source

of income inequality. In addition, the study complements data observations from "*Statista*" (2017 to 2019).

3.10.2 Independent Variables

Value-Added Tax (VAT)

Value-added tax is a consumption tax set to the value of goods and services at each stage of production and distribution. *VAT* symbolizes Value-added tax contributions to gross domestic product (GDP). Actual data values are drawn from the "Fiscal Data Report" of the Ministry of Finance and the Ghana Revenue Authority. The variable is expressed as VAT contributions (domestic VAT and import VAT) in Ghana as a percentage of GDP based on 2010 US dollars. Following Carroll, Cline and Neubig (2010) the study uses VAT revenue contributions to GDP as a proxy for VAT rate due to unavailability of tax rate in time series manner. However, an inverse relationship is expected between VAT and household consumption expenditure as predicted in Keynes AIH. Likewise, a positive sign is expected for income inequality.

Real effective exchange rate (REER)

The relative effective exchange rate, a proxy for the relative price of internationally durable goods is an important indicator used to measure the competitiveness of a country's economy (World Bank, 2016). *REER* takes the relative price of the same goods in the local market then compare it with product in a different region. Put differently, *REER* is estimated by calculating the basket of goods in one economy followed by its comparison with a similar basket of goods in another economy (Angelo, 2021). The data is sourced from WDI database.

Specifically, *REER* is acquired through the weighted average of the nominal effective exchange rate and computed as Sebastian *et al.*, (2014):

$$REER = \prod_{i=1}^{n}\left[\left(\frac{\varepsilon}{\varepsilon_i}\right)\left(\frac{\rho}{\rho_i}\right)\right]\psi_i \tag{3.41}$$

where ψ_i is the exchange rate of the local currency, ε_i denotes the exchange of foreign currency in indexed form, ψ_i is the weight attached to foreign currency or country; its total sum equals one (1) and ρ, ψ_i, and n represents wholesale price index (WPI), consumer price index (CPI) and the number of countries or currencies in the index other than the domestic country respectively. Thus, a fall in REER (as the price of dollar rises) may decrease or increase household consumption expenditure and income respectively and as such the expected sign could be positive or negative.

Government consumption expenditure (GCE)

The government final consumption (formally general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security, but excludes government military expenditures that are part of government capital formation (World Bank, 2016). The interrelation of government spending to household spending could either be a substitute or a complement (Fosu & Twumasi, 2021). The coefficient of government expenditure is expected to be positive or negative to household spending. ($where\ \vartheta, \varpi > 0\ or\ < 0$).

Real GDP per capita growth (pGDP and pGDP^2)

GDP *per capita* is gross domestic product divided by mid-year population. Similarly, GDP at purchase's price is the sum of gross value added by all resident producers in the economy plus any taxes and minus any subsidies not included in the value of the product. GDP *per capita* growth is measured by annual percentage growth rate of GDP *per capita* based on constant

2010 US dollars (World Bank, 2016). In particular, this variable is used to determine the "Kuznets Process" (Kuznets, 1955).

Real GDP *per capita* income square determines the inverse relationship between income inequality and development with features of higher incomes, welfare state, post-industrial and developed economy ($i.e.\pi < 0$). The actual *per capita* GDP in real terms explains pre-industrial economy, rural urban migration and wage disparity. The study expects the coefficient of real GDP variable to be positive ($i.e.\upsilon > 0$) while the square of real GDP *per capita* income is expected to be negative ($i.e.\pi < 0$) (Kuznets, 1955; Lloyd-Ellis & Bernhardt, 2000; Huang, 2004).

Population growth (POPG)

Population growth is defined as the rate of change of an increase or decrease in the number of people living in a specific country or globally over time. Growth in population is mainly influenced by fertility rate and fatality rate. Other factors include migration, economic growth and development, female labour participation rate, education and health cost and government paternalistic role, among others. The literature has largely overlooked the role of population growth on consumer spending and income inequality (household welfare) (see Alm & El-Ganainy, 2013; Iosifidi & Mylonidis, 2017; Mahler & Jesuit, 2018).

Moreover, given the importance of growth in population and its resulting consumption pattern projections, aggregate demand is likely to increase as well as affect income share. Population growth are crucial drivers of household spending and income inequality but lack of empirical investigation of these critical variables in a study inspired its inclusion in both models. Population growth is measured by annual population growth in percentages. Household

spending and income inequality are expected to have a scale effect, reflected in positive relation with the total population of the Ghanaian economy. The expected sign of this variable could be positive.

Personal remittance received (PREM)

Personal remittances comprise personal transfers and compensations of employees measured by GDP based on 2010 US dollars. Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from non-resident individuals. Compensation of employees refers to the income of border, seasonal and other short-term workers who are employed in an economy where they are not resident and of resident employed by non-resident entities. The expected sign of this variable could be positive or negative.

Gross national saving (GNS)

Theoretically, savings is the income after household spending which ultimately enhances capital formation, investment and growth performance. National saving is the sum of private and public savings. Generally, saving equal to a nations' income minus consumption and government expenditure measured in GDP based on 2010 US dollars. The value of delayed spending (savings) depends on price and rate of interest expectations. The data for the variable gross national savings is obtained from WDI database. In the context of this study, gross national saving is a proxy for consumer savings. However, a high or low savings culture leads to a fall or an increase in consumer spending for normal goods respectively ($\delta < 0; \delta > 0$). Therefore, the expected sign of GNS could positively or negatively affect household consumption expenditure.

Table 3.1 further indicates the definitions, unit of measurement and theoretical expectations of the coefficient of each variable.

Table 3.1: Variables Detail

Variables	Description	Details and Measurement	Data Source	Expected Signs
HHS	Household spending	Market value of durable and non-durable goods and services measured by real GDP	WDI	Response variable
INEQ	Income inequality	Gini index proxy for income inequality ranges between zero and one	SWIID & Statista*	Response variable
VAT	VAT as a percentage of GDP	Value-added tax on goods and services (domestic and import) measured by real GDP, a proxy for VAT rate	MoF & GRA	Negative
REER	Real effective exchange rate	Real value of domestic currency against weighted average of several foreign currency	WDI	Negative
GCE	Government consumption expenditure	Percent of GDP, a sum of goods and services purchased and compensation of employees	WDI	Positive or negative
*p*GDP	Real GDP *per capita*	Real GDP *per capita*, measured by annual growth rate, its squared is included to capture "Kuznets process"	WDI	Positive and negative
GNS	Gross national savings	Percent of GDP, a sum of private and public savings	WDI	Positive or negative
PREM	Personal remittance received	Percent of GDP, comprise of personal transfers and compensation of employees	WDI	Positive
POPG	Population growth	Population growth is measured by annual population growth in percentages	WDI	Positive

Source: Author's compilation.
Note: WDI, SWIID, MoF & GRA represents World Development Indicators, Standardized World Income Inequality Database (SWIID version 9.0), Ministry of Finance and Ghana Revenue Authority respectively; *J. Degenhard (2021).

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The main empirical findings are reported in this chapter and in reference to research objectives. The presentation of the findings includes the following: descriptive statistics, stationarity test, structural break test, lag length criteria, cointegration test, long-run and short-run estimates of the bootstrap ARDL model, causality test, and post estimation diagnostic tests of the empirical models.

4.2 Descriptive Statistics of Data

The essential component of descriptive statistics is to explore the primary characteristics of data observations within a study. In general, descriptive statistics helps to outline the variability and distribution of data. Table 4.2 presents descriptive statistics of 39 observations which provides an overview of data used in the study. However, to provide a better summary of data characteristics, the mean, median, standard deviation, skewness, and kurtosis are presented to explore the primary features of the data including its range, variations, degree of asymmetry and peakedness or flatness respectively.

Indeed, Jarque-Bera (JB) statistics show that *p*GDP, $pGDP^2$, GNS and INEQ are normally distributed at 1 and 5 percent levels of significance respectively. On the other hand, HHS, VAT, REER, GCE, PREM and POPG are non-normally distributed. HHS, VAT, GCE, *p*GDP, PREM exhibit a long right tail positive skewness with $pGDP^2$ having the longest right tail while HHS, INEQ, VAT, REER, GNS, PREM, POPG exhibit platykurtic distribution, notably the other variables exhibit leptokurtic normal distribution. The coefficient of HHS observed from the sampled period ranges between 69.033 in the period 2019s1 and 94.232 in the period 2008s1

of minimum and maximum values respectively with mean and standard deviation values of 81.111 and 7.556 respectively. The highest coefficient of Gini index is 43.7 percent in the period 2010s1 by the standard deviation 0.584767 with 41.85 representing minimum Gini index over the period 2000s2. On average, income inequality recorded approximately 43.25 percent.

The highest VAT revenue to GDP ratio of 15.614 was experienced in 2019s1 and the lowest ratio of 0.860 recorded in 2000s2 with estimated standard deviation of 5.061 and mean value of 6.513 as a percentage of GDP. Moreover, *per capita* income in Ghana over the period averaged 3.584 with a standard deviation 2.448 and values ranges from a minimum of -0.114 to a maximum of 11.315 in 2015s1 and 2011s1 respectively. The high GDP *per capita* growth recorded for the period 2011s1 could be attributed to the production of crude oil in commercial quantities (Alagidede *et al.*, 2013).

The statistics suggest that the weighted average of REER is about 89.027 and that of GCE represent 10.154 of total GDP. The average GNS is found to be 15.664 of total GDP. With regards to PREM and POPG, the averages are about 2.896 of GDP and 2.405 of annual growth respectively. In all, the descriptive statistics indicate some level of variations in the variables and applying them to the bootstrap ARDL require identifying their state of stationarity.

Table 4.2: Descriptive Statistics for Macro–level variables

	HHS	INEQ	VAT	REER	GCE	*p*GDP	*p*GDP^2	GNS	PREM	POPG
Mean	81.111	43.049	6.513	89.027	10.154	3.584	18.681	15.664	2.896	2.405
Median	82.071	43.250	4.678	95.260	9.873	3.267	10.675	18.412	0.925	2.450
Maximum	94.232	43.700	15.614	110.023	15.308	11.315	128.039	24.901	10.490	2.580
Minimum	69.033	41.850	0.860	64.241	7.069	-0.114	0.013	3.882	0.422	2.163
Std. Dev.	7.556	0.585	5.061	14.821	1.818	2.448	25.470	6.676	2.732	0.130
Skewness	0.070	-0.833	0.586	-0.429	0.776	1.077	2.657	-0.685	0.806	-0.382
Kurtosis	1.892	2.359	1.830	1.818	3.449	4.360	10.700	1.920	2.638	1.840
Jarque-Bera	2.029	5.174	4.454	3.467	4.241	10.542	142.224	4.940	4.434	3.132
p-value	0.363	0.075	0.108	0.177	0.120	0.005	0.000	0.085	0.109	0.209
Sum	3163.333	1678.895	254.001	3472.064	396.019	139.768	728.556	610.910	112.961	93.797
Sum Sq. Dev.	2169.621	12.994	973.455	8347.220	125.646	227.653	24650.580	1693.833	283.687	0.643
Observations	39	39	39	39	39	39	39	39	39	39

Source: Author's formation using EViews 12 version.
Note: For response variables, HHS denotes Household spending and INEQ is Income inequality. For determinants VAT, REER, GCE, *p*GDP, *p*GDP^2, GNS, PREM, and POPG represent VAT to GDP ratio, Real effective exchange rate, Government consumption expenditure, *per capita* GDP, squared *per capita* GDP, Gross national savings (proxy for consumer income), Personal remittance received and Population growth respectively.

4.3 Stationarity Test

The preliminary step towards the long-run relationship between response or (dependent) variable (household spending and income inequality) and its determinants is to conduct a unit root test. The study, therefore carried out the unit root test to verify the degree of cointegration of the individual variables using the conventional ADF test (Dickey and Fuller, 1981) and PP test (Phillips and Perron, 1988). The unit root tests determine the scheme of integration amongst the variables and stationarity. The bootstrap ARDL model developed by McNown *et al.,* (2018) does not require the restrictive assumption that all series are integrated of the same order. This allows for the inclusion of both I(0) and I(1) in a long-run relationship, similar to Pesaran *et al.*, (2001). In addition, Goh *et al.,* (2017) argues that the bootstrap process ensures the correct inferences for degenerate case one (1).

The results are presented in Table 4.3a and 4.3b for log-transformed and non-linear models using ADF test and PP test for unit root test. In particular, Table 4.3a reports intercept only and both trend and intercept test equation at levels and first differencing respectively by employing ADF test and PP test on log-log variables. As indicated in the table, ADF test and PP test statistics show a mix of stationarity at level and first difference with an intercept and test equation of trend and intercept. HHS, REER, VAT, GNS, and PREM shows a state of unit root at first difference of intercept and both trend and intercept test equation with ADF test statistics. Again, the ADF test statistics for GCE and POPG are stationary at levels and first differencing.

Similarly, the PP test statistics indicate that VAT exhibits stationarity at level (intercept) and first difference (intercept and both trend and intercept). The remaining variables of PP test in Table 4.3a are stationary at first difference (intercept and both trend and intercept test equation). However, at significance levels of 1 percent, 5 percent, and 10 percent, all variables

in Table 4.3a turns to be stationary after first difference for both ADF test and PP test statistics with some indicating a mix of I(0) and I(1) process.

Table 4.3a: Unit root test of Log transformed variables: Model A

Variable	At level		First difference		Outcome
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
	t-statistics		*t-statistics*		
	Augmented Dickey-Fuller test statistic				
lnHHS	-1.080	-1.946	-3.377**	-4.190**	I(1)
lnVAT	-1.678	-0.985	-3.763***	-4.617***	I(1)
lnGNS	-1.794	-4.162	-1.105***	-4.529***	I(1)/I(0)
lnREER	-0.112	-2.327	-3.928***	-4.128**	I(1)
lnGCE	-3.019**	-3.154	-5.167***	-5.112***	I(1)/I(0)
lnPREM	-1.228	-2.594	-4.347***	-4.299***	I(1)
lnPOPG	0.609	-6.262***	-4.195***	-3.525*	I(1)/I(0)
	Phillip-Perron test statistic				
lnHHS	-0.495	-1.314	-3.270**	-3.271***	I(1)
lnVAT	-2.845*	-0.971	-3.781***	-3.917**	I(1)/I(0)
lnGNS	-1.129	-1.002	-3.440**	-3.444*	I(1)
lnREER	-0.003	-1.721	-3.186**	-3.127**	I(1)
lnGCE	-2.344	-2.367	-3.725***	-3.667**	I(1)
lnPREM	-1.013	-2.079	-4.211***	-4.155**	I(1)
lnPOPG	0.303	-1.095	-3.400**	-4.220***	I(1)

Source: Author's formation using EViews 12 version.
Note: ***, ** and * indicates the significance level of which the null hypothesis is rejected at 1%, 5% and 10% respectively.

Table 4.3b presents non-linear (polynomial) variables unit root test using ADF test and PP test statistics. The PP test as indicated in the table, reveals that while INEQ exhibits a unit root process at level (intercept) and first difference (both trend and intercept), VAT, *p*GDP, *p*GDP^2, REER, GCE, POPG shows stationarity at first differencing (intercept, and both trend and intercept of test equation). Moreover, with ADF test statistics, the REER is I(1) with test equation of intercept, and trend and intercept. Likewise, HHS, VAT, *p*GDP, *p*GDP^2, GCE, POPG exhibit stationary process at levels and first difference of intercept, and both trend and

intercept. Indeed, with ADF test and PP test statistics, all variables are I(0) and I(1) or both, thus rejecting the null hypothesis at 1 percent, 5 percent, and 10 percent level of significance. However, Table 4.3a and 4.3b show that none of the series are integrated at second difference I(2), and they show a rejection of H_o (no structural break point) for all series.

Table 4.3b: Unit root test of Non-Linear (Polynomial) variables: Model B

Variable	At level		At first difference		Outcome
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
	t-statistics		*t-statistics*		
	Augmented Dickey-Fuller test statistic				
INEQ	-3.121**	-0.276	-1.273	-5.380***	I(1)/I(0)
VAT	-3.224**	-2.145	0.723	-3.485*	I(1)/I(0)
*p*GDP	-2.844*	-2.785	-5.095***	-3.128	I(1)/I(0)
$pGDP^2$	-3.209**	-3.194	-5.098***	-5.041***	I(1)/I(0)
REER	-1.076	-2.497	-3.876*	-4.056**	I(1)
GCE	-2.943**	-3.235*	-4.094***	-4.100**	I(1)/I(0)
POPG	0.311	-4.474***	-4.616***	-3.570*	I(1)/I(0)
	Phillip-Perron test statistic				
INEQ	-3.532**	0.432	-2.352	-6.621***	I(1)/I(0)
VAT	-1.120	-1.714	-2.866*	-3.218*	I(1)
*p*GDP	-2.320	-2.287	-3.580**	-3.500*	I(1)
$pGDP^2$	-2.451	-2.425	-4.670***	-4.613***	I(1)
REER	-0.051	-1.581	-3.293**	-3.217*	I(1)
GCE	-2.338	-2.422	-4.014***	-3.920**	I(1)
POPG	-0.027	-1.304	-3.642***	-4.312***	I(1)

Source: Author's formation using EViews 12 version.
Note: ***, ** and * indicates the significance level of which the null hypothesis is rejected at 1%, 5% and 10% respectively.

4.4 Structural Break Test

The structural break test is applied through the endogenous procedure of Zivot and Andrews (1992). As mentioned above, the conventional unit root test of ADF test and PP test disregards those structural breaks. Table 4.4 shows the outcome of Zivot and Andrew's (1992) structural break unit root tests. The Zivot-Andrews unit root test shows 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, 2005, 2006, 2007, 2008, 2010, 2012, 2013, 2014, or 2015. The Zivot and Andrews (1992) test reports structural break dates as shown in Table 4.4.

Table 4.4: Zivot-Andrews (ZA) unit root test

	ZA test at level		ZA test at first difference	
Variable	t-statistics	Break years	t-statistics	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
*p*GDP	-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

Source: Author's formation using EViews 12 version.
Note: ***, ** and * significant at 1%, 5% and 10% respectively.

However, the structural break years resonate with critical events or economic shocks 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 coincides with economic expansion, namely, revenue growth, debt relief from heavily indebted poor countries (HIPC) initiative, the multilateral debt relief initiative (MDRI) as well as tight fiscal policies (see Ackah *et al.*, 2009; Younger, 2016). Moreover, considering the structural break dates determined in the ZA unit root test shows a significant impact on household spending and income inequality over the period of study. The test further shows that

[2]"Dumsor" which means turn off – turn on in a dialect of the Akan language.
[3]The West Africa Gas Pipeline (WAGP), a channel for natural gas flow from Nigeria was curtailed in August 2012 as a result of undersea pipeline accident in the Togolese waters.

for all variables, the null hypothesis of unit root with structural break is rejected at first difference.

4.5 Lag Selection Criteria

The next step after performing the unit root tests is to establish the maximum lag length for the bootstrap ARDL model. The optimal lag order of vector autoregression (VAR) model are used to select the appropriate lag for the bounds test analysis and this is reported in Tables 4.5a and 4.5b. The results selected two (2) as the optimal lag as indicated in the tables below.

Table 4.5a: Lag order selection for Log-log model A

Lag	LogL	Lag order criteria				
		1	2	3	4	5
		LR	FPE	AIC	SC	HQ
0	188.854	NA	9.7E-14	-10.103	-9.795	-9.996
1	497.532	480.166	5.5E-20	-24.530	-22.066*	-23.670
2	576.087	91.648*	1.5E-20*	-26.172*	-21.553	-24.560*

Source: Author's estimates using EViews 12 version
Note: *LR* sequential modified LR test statistic (each test at 5% level), *FPE* Final prediction error, *AIC* Akaike information criterion, *SC* Schwarz information criterion, *HQ* Hannan-Quinn information criterion, * indicates lag order selected by the criterion

However, AIC generates reliable and accurate results for maximum lags of variables compared to LogL, SC, HQ, FPE, and LR (Lütkepohl, 2006). The AIC is appropriate for small sample data, hence the lowest value for the criteria is selected using AIC. As reported in Table 4.5a and 4.5b, based on AIC, the maximum lag length is two (2) for the semi-annual frequency between the periods 2000 – 2019 in the case of Ghana. Therefore, this study uses the BARDL *(1, 0, 0, 2, 0, 1, 0)* and *(1, 2, 2, 0, 1, 2, 1, 0)* for model A and B respectively to investigate the long-run relationship between household spending, income inequality and value-added tax. (see Appendix 3 and 4 for top 20 computed BARDL models based on AIC).

Table 4.5b: Lag order selection for Non-linear model B

Lag	LogL	Lag order criteria				
		1	2	3	4	5
		LR	FPE	AIC	SC	HQ
0	-415.285	NA	36.4239	23.460	23.768	23.568
1	-38.433	586.2133	4.7E-07	5.246	7.710*	6.106
2	38.358	89.5903*	1.4E-07*	3.702*	8.321	5.314*

Source: Author's estimates using EViews 12 version
Note: *LR* sequential modified LR test statistic (each test at 5% level), *FPE* Final prediction error, *AIC* Akaike information criterion, *SC* Schwarz information criterion, *HQ* Hannan-Quinn information criterion, * indicates lag order selected by the criterion

4.6 Bootstrap ARDL bounds test cointegration analysis

Following Pesaran *et al.,* (2001), Narayan (2005) and McNown *et al.,* (2018), the bootstrap ARDL 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 F-overall test, t-dependent and F-independent ($F_{OVERALL}$, t_{DV}, and F_{IDV}) as reported in Table 4.6a and 4.6b are significant at one (1) percent and higher than the lower bound I(0) and upper bound I(1). Thus, the null hypothesis of non-cointegration cannot be accepted. McNown *et al.,* (2018) proposed the bootstrap procedure to generate the lower and upper bound critical values for the F-test on coefficient on all lagged independent variables (F_{IDV}) through a simulation method which is quite inconvenient for many researchers. Therefore, the study obtains the lower bound and upper bound critical values for the third test (F_{IDV}) from Sam *et al.,* (2019).

Narayan (2005) argues that determinate and robust results for cointegration are obtained if the calculated F-statistics lies above the critical values of lower bound, I(0) and upper bound, I(1). Overall, McNown *et al.,* (2018) observes that, a clear picture of cointegration exist if all three null hypotheses are rejected at the same time. The results suggest long-run cointegration and

relationship between the variables used in the model. Table 4.6a and 4.6b represents the cointegration for log-log model and non-linear model respectively.

Table 4.6a: Bootstrap cointegration ARDL bounds test results: Model A

Test	Model	Calculated value	Lower bound	Upper bound	Cointegration Status
$F_{OVERALL}$	lnHHS = *f*(lnVAT, lnGCE, lnGNS, lnREER, lnPREM, lnPOPG), *BARDL (1, 0, 0, 2, 0, 1, 0)*, k(6)	10.74[a]	3.15	4.43	Cointegrated
t_{DV}		-5.28[a]	-3.43	-4.99	
F_{IDV}		11.87[a]	3.37	5.74	

Source: Author's formation using EViews 12 version.
Note: Case III (unrestricted intercept and no trend) with k=6 and n=40 are selected, k and n denotes number of regressors and sample size respectively. Critical value bounds for $F_{OVERALL}$ and t_{DV} (Model A) are sourced from Nayaran (2005) while critical value bounds for F_{IDV} (Model A) are retrieved from Sam *et al.,* (2019). [a] represents 1% significance level.

Table 4.6b: Bootstrap cointegration ARDL bounds test results: Model B

Test	Model	Calculated value	Lower bound	Upper bound	Cointegration Status
$F_{OVERALL}$	INEQ = *f*(VAT, *p*GDP, pGDP^2, GCE, REER, PREM, POPG), *BARDL (1, 0, 0, 2, 0, 1, 0)*, k(7)	37.83[b]	2.96	4.26	Cointegrated
t_{DV}		-5.34[b]	-3.43	-5.19	
F_{IDV}		17.37[b]	3.23	5.44	

Source: Author's formation using EViews 12 version.
Note: Case III (unrestricted intercept and no trend) with k=7 and n=40 are selected, k and n denotes number of regressors and sample size respectively. Critical value bounds for $F_{OVERALL}$ and t_{DV} (Model B) are sourced from Nayaran (2005) while critical value bounds for F_{IDV} (Model B) are sourced from Sam *et al.,* (2019). [b] represents 1% significance level.

4.7 Bootstrap ARDL cointegration estimates

The next step to cointegration analysis is to estimate the long-run and short-run dynamics of the model. The results of the long-run and short-run dynamic impact of VAT on household spending and income inequality (macro-level household welfare indicators) together with other relevant determinants are depicted in Table 4.7.1 and 4.7.2. The long-run and short-run

elasticities of the impact of VAT as a percentage of GDP on household spending drawn from the BARDL model are given in Table 4.7.1.

4.7.1 Dynamic relation between VAT and consumer spending: The case of log-log model

Table 4.7.1: Long-run and short-run elasticities of the bootstrap ARDL model A

Response variable: lnHHS			
Variable	Coefficient	Standard error	t-Statistics
(a)Long-run elasticities			
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
$BREAK^{A}$	-0.028	0.020	-1.389
(b)Short-run elasticities			
ΔlnGNS	-0.074***	0.007	-10.852
$\Delta lnGNS_{t-1}$	-0.013*	0.007	-1.980
ΔlnREER	-0.015	0.038	-0.394
$\Delta BREAK^{A}$	0.019***	0.008	2.428
$\Delta BREAK_{t-1}{}^{A}$	0.035***	0.008	4.305
ECT_{t-1}	-0.676***	0.070	-9.657
Constant	3.074***	0.319	9.640

Source: Author's formation using EViews 12 version.
Note: Superscripts ***, ** and * denotes statistical significance at 1%, 5% and 10% levels respectively.

The long-run elasticity coefficient of VAT, a proxy for VAT rate against household spending or household consumption expenditure is negative and significant as shown in Table 4.7.I. It means that VAT rate reduces consumer spending in Ghana at least by 0.033 percent, keeping other things constant. The results indicate that consumer spending is VAT rate inelastic in the long-run. Further, when VAT rate increases, consumers more or less do not tend to change their consumption significantly in the long-run. This finding aligns with studies including Alm and El-Ganainy (2013) for 15 European countries, Şen and Kaya (2016) for Turkey and Usman

(2018) for Nigeria. Conversely, studies including Kolahi *et al.,* (2016), Tochukwu *et al.,* (2015), and Idris and Sani (2021) found a positive relationship between private consumption expenditure and VAT share to GDP for a group of developing countries and Nigeria respectively.

In addition, long-run elasticity coefficient of government consumption expenditure indicates a negative coefficient sign with a one (1) percent level of significance. An expansion of government expenditure, reduces household spending by 0.075 percent, holding other variables constant. The results are in line with the conclusion that the negative relationship between government expenditure and private spending crowed outs household spending in Ghana (Fosu & Twumasi, 2021). In particular, government relies on taxation to expand the provision of public goods. Howbeit, a rise in government expenditure means an increase in tax to finance these spending. This increase in tax rate leads to a fall in income which hurts consumer spending (Fosu & Twumasi, 2021).

In the case of gross national savings, a proxy for consumer savings, the long-run elasticity coefficient is significant at one (1) percent. A one (1) percent increase in consumer savings leads to 0.105 percent decline in household spending, keeping other things constant. The results are in line with the theory of savings and consumption. Savings play a significant role in consumption decisions of households and that an increase in disposable income not consumed is saved (Ekong & Effiong, 2020).

Moreover, the long-run elasticity coefficient of relative effective exchange rate exerts a negative and significant impact on household spending at (1) percent. A one (1) percent increase in relative effective exchange rate result in a 0.187 percent reduction in consumption

expenditure keeping other things constant. The estimated coefficient of real effective exchange rate implies that an appreciating exchange rate increases the share of consumer spending (Adedeji & Adegboye, 2013). The negative relationship discovered between relative effective exchange rate and household consumption expenditure is contrary with the findings of Bonsu and Muzindutsi (2017) for Ghana and Zeynalova and Mammadli (2020) for Azerbaijan.

Further and as expected the long-run elasticity coefficient of population growth shows a positive and significant value at one (1) percent. A one (1) percent increase in population growth rate leads to 1.333 percent increase in private consumption spending, holding all other variables constant. The coefficient for personal remittance received is positive but insignificant.

However, the results indicate no short-run elasticity of VAT rate on household spending. Meanwhile studies including Alm and El-Ganainy (2013) and Şen and Kaya (2016) concluded that VAT has a significant and detrimental impact on consumption in the short-run for Fifteen (15) European Union countries and Turkey respectively. On the other hand, Idris and Sani (2021) found a positive and significant impact of VAT on consumption in Nigeria. In all, no short-run elasticity evidence of population growth, personal remittance received and government consumption expenditure is found on household spending.

The short-run elasticity coefficient of gross national savings, a proxy for consumer savings and its lag are similar to the long-run estimates in terms of coefficient signs. The coefficient of gross national saving indicates that a one (1) percent increase in gross national savings leads to 0.074 percent fall in household spending at one (1) percent significance level, keeping other factors constant. The relative effective exchange rate coefficient in the short-run is negative and insignificant.

The error correction term (ECT_{t-1}) shows the speed of adjustment from the short-run to long-run. It is negative and statistically significant at one (1) percent as expected with a rejection of the null hypothesis. The high speed of adjustment value of -0.676 specifies that approximately about 67.6 percent of the short-run disequilibrium is restored in the long-run equilibrium steady-state position within a year.

4.7.2 Dynamic influence of VAT on income inequality: A non-linearity approach

The long-run and short-run coefficients estimates of the impact of VAT revenue as a percentage of GDP on income inequality are given in Table 4.7.2. The outcome of the long-run impact of VAT share to GDP (a proxy for VAT rate) on income inequality indicates that the coefficient is negative and insignificant in Ghana. This is further corroborated by prior studies in developed (OECD) countries (see Nguyen *et al.,* 2017; Iosifidi & Mylonidis, 2017; Alavuotunki *et al.,* 2019) and developing (sub-Saharan Africa) countries (see Obaretin *et al.,* 2017; Gupta & Jalles, 2020; Mourfou & Ouedraogo, 2021). Additionally, these studies support this observation and argues that VAT policies are ineffective in reducing income inequality in OECD countries and sub-Saharan Africa. Likewise, Younger *et al.,* (2015) concludes on the notion of high-level efficient consumption tax policies in Ghana compared to other relevant tax policies.

Moreover, to examine Kuznets (1955) assertion of the inverted "U" relationship between income inequality and economic development, the coefficient for *per capita* income exerts significant and positive pressure on income inequality. If *per capita* income increases by a constant unit, income inequality will increase by 0.271 units on average, holding other factors constant. This corroborates with the first phase of Kuznets curve indicating income inequality and *per capita* income increases at an increasing rate (at the initial stages of development,

income inequality rises as the economy expands). Further and most importantly, the coefficient for squared *per capita* income is negative, an expected result indicating income inequality decrease at a decreasing rate with economic expansion but statistically insignificant. The above-mentioned conditions are necessary but insufficient to explain Kuznets curve, suggesting invalidity of Kuznets hypothesis for Ghana.

Furthermore, the coefficient for relative effective exchange rate, a proxy for the relative price of internationally durable goods is (-0.061), representing a negative impact on income inequality and highly significant at one (1) percent. This relationship explains that if relative effective exchange rate increases by a one unit, income inequality decreases by 0.061units, holding other independent variables constant. The findings are in line with Min *et al.,* (2015) for 69 developed countries.

The positive sign of personal remittance received suggest that a unit increase in personal remittance received contributes income inequality to increase by 6.869 units at one (1) percent significance level, keeping other variables constant. Put differently, the concentration of these remittances are found among rich households, leading to widening of incomes in Ghana. This is consistent with the findings of Adams and Page (2005), Acosta *et al.,* (2009), Acharya and Leon-Gonzalez (2012), and Meyer and Shera (2017). In particular, Acosta *et al.,* (2009) argued that remittances lead to an appreciation in real exchange rate which worsens the wellbeing of poor households but contradicts Adams *et al.,* (2008) for Ghana. The disparities in these results could be due to variations in sample observations and control variables, in each of these studies. In addition, government consumption expenditure exerts positive effect on income inequality but insignificant. Also, population growth rate result in a decrease on income inequality but

insignificant. This is in line with the study by Iosifidi and Mylonidis (2017) for 17 OECD countries but not in support of the study by Mahler and Jesuit (2018).

Table 4.7.2: Long-run and short-run estimates of the bootstrap ARDL model B

Response variable: INEQ			
Variables	Coefficient	Standard error	t-Statistics
(a)Long-run results			
VAT	-0.015	0.036	-0.405
*p*GDP	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
$BREAK^B$	-1.161***	0.135	8.610
(b)Short-run results			
ΔVAT	0.062***	0.009	7.068
ΔVAT_{t-1}	0.016*	0.008	1.973
Δ*p*GDP	0.010***	0.002	4.064
$\Delta pGDP_{t-1}$	-0.006***	0.002	-4.084
ΔGCE	0.012***	0.002	6.179
ΔREER	0.006***	0.001	6.297
$\Delta REER_{t-1}$	0.003***	0.001	3.438
ΔPREM	-0.009***	0.002	-4.723
$\Delta BREAK^B$	-0.107***	0.018	5.898
ECT_{t-1}	-0.085***	0.004	-20.351
Constant	2.681***	0.128	20.883

Source: Author's formation using EViews 12 version.
Note: Superscripts ***, ** and * denotes statistical significance at 1%, 5% and 10% levels respectively.

The short-run analysis illustrates that the coefficient of VAT share to GDP (proxy for VAT rate) is positive and significant at one (1) percent. Thus, on average a unit increase in VAT rate increases income inequality by 0.06 units, holding other factors constant. This is consistent with conclusions drawn by Sung and Park (2011); Martinez-Vazquez *et al.,* (2012) and Blasco *et al.,* (2020).

The coefficient of *per capita* income and its lag is shown to have a positive and negative relationship on income inequality at a high level of significance (1 percent). 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. A unit increase in *per capita* income increases income inequality by 0.010, if other factors hold constant, which identifies the importance of *per capita* GDP on standard of living. 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. The results indicate that as the gap between high-income earners and low-income earners widens, a few sections of the population may have their living conditions affected by the total earnings leading to an increase in *per capita* income (Kousar *et al.*, 2019).

The sign of government expenditure in the short-run indicates that the distribution of income and the final benefits are important. The positive impact of government expenditure continuous in the short-run at 1 percent significance level. If government expenditure increases by one unit, income inequality increases by 0.012 units, holding other factors constant. Furthermore, the sign of relative effective exchange rate is positive and highly significant at 1 percent. It can therefore be concluded that from the above results if relative effective exchange rate shifts upwards by a unit, income inequality is expected to rise by 0.006 and its lag by 0.003 units, holding other factors constant.

The coefficient for personal remittance received is negative and significant at 1 percent, holding other factors constant, which suggests that in Ghana remittances are highly concentrated within the poor in society during the short-run. This is consistent with studies of Adams *et al.*, (2008) for Ghana as well as Gustafsson and Makonnen (1993) for the African nation of Lesotho, Anyanwu and Erhijakpor (2010) for 33 African countries.

The error correction term ($\vartheta = -0.221$) reflects the econometrics condition of being negative (–1) as expected. However, the error correction term of –0.221 justifies that the income inequality equation moves to a long-run equilibrium path with 22.1 percent speed of adjustment from the short-run path towards the long-run path within a year. This indicates a slow or moderate speed of adjustment from short run imbalance to long run equilibrium steady state.

4.8 Toda – Yamamoto causality test

Based on the results from the bootstrap ARDL cointegration test presented in Table 4.6a and 4.6b, the study further tests the causality among the variables. Cointegration suggest that the linear combination between the response variables and the independent variables are stationary. "A variable X causes variable Y if the past values of X have a statistical impact on the current or future values of Y". However, to understand the causal dynamics between household spending, income inequality and value-added tax over the period 2000 – 2019, the Toda and Yamamoto causality test for long-run causality is applied. This type of causality has an advantage over the standard Granger causality technique because the maximum lag length determined in the VAR system does not change, producing robust and reliable results (Adriana, 2014). The results of Toda and Yamamoto causality tests over the three variables are presented in Table 4.8 and illustrated in Figure 4.1.

Table 4.8: 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	unidirectional
VAT does not granger cause HHS	25.685	2	0.033***	
	Model 2			
Null hypothesis	Chi-sq	df	Prob.	Direction of causality
INEQ does not granger cause VAT	1.148	2	0.563	unidirectional
VAT does not granger cause INEQ	39.672	2	0.005***	

Source: Author's formation using EViews 12 version.
Note: ***, ** and * significant at 1%, 5% and 10% respectively.

The empirical results suggest that a long-run Granger causality test runs from value-added tax to household spending at 5 percent significance level in the household spending equation. In the same way, a causal relationship is established and runs from value-added tax to income inequality at 5 percent significance level in the income inequality equation. Specifically, there is a unidirectional causality from value-added tax to household spending as well as from value-added tax to income inequality. This indicates that VAT granger causes household spending and income inequality, suggesting a one-way relationship between them.

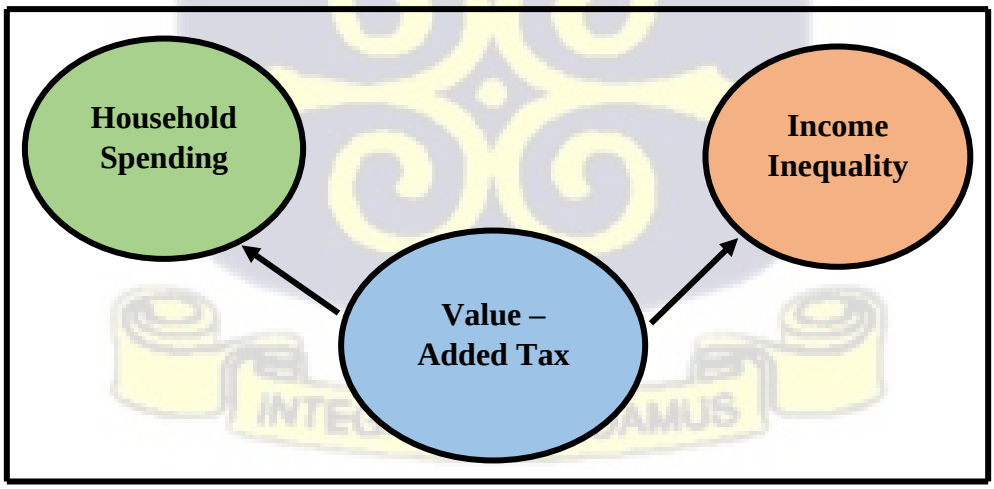

Figure 4.1: Causality between Household Spending, Income Inequality and Value–Added Tax

4.9 Diagnostic test

The diagnostic test results as depicted in table 4.9 indicate that the model pass all diagnostic tests. The Ramsey RESET test results indicate the models do not suffer from misspecification problem or the models have correct functional forms. The Breush Godfrey serial correlation LM test shows there is no serial correlation at 5 percent significance level. The Jarque-Bera normality test results indicates that all residuals are normally distributed. In addition, ARCH test shows that there is no heteroscedasticity problem in the models, of which the disturbance terms are homoscedastic.

Table 4.9: Diagnostic tests

Test	**Model A**		**Model B**	
	F-statistic	Prob.	*F*-statistic	Prob.
Breusch Godfrey serial correlation LM test	1.662	0.212	0.594	0.563
Heteroskedasticity Breush-Pagan-Godfrey test	1.153	0.365	0.672	0.787
Heteroskedasticity ARCH test	0.232	0.633	0.613	0.439
Jarque-Bera Normality test	0.076	0.963	2.756	0.252
Ramsey RESET test	3.422	0.077	0.880	0.361

Source: Author's formation using EViews 12 version.
Note: For the Breusch-Pagan-Godfrey (LM) test, the null is no serial correlation. For the Breush-Pagan-Godfrey test and the Arch test, the null is no heteroscedasticity. For the Jarque-Bera test, the null is normality. For Ramsey RESET test, the null is the correct functional form.

4.10 Stability of the model

To determine the robustness of the models, the structural stability test for parameter on the axis cumulative sum of recursive residuals CUSUM and CUSUMSQ approach proposed by Brown *et al.*, (1975) are applied. However, with reference to the assumptions, if the plot remains within the 5 percent level of critical bounds, then it means the parameters of the model are stable and consistent. The graphical representation of CUSUM and CUSUMSQ are shown in Figure 4.2, 4.3, 4.4 and 4.5.

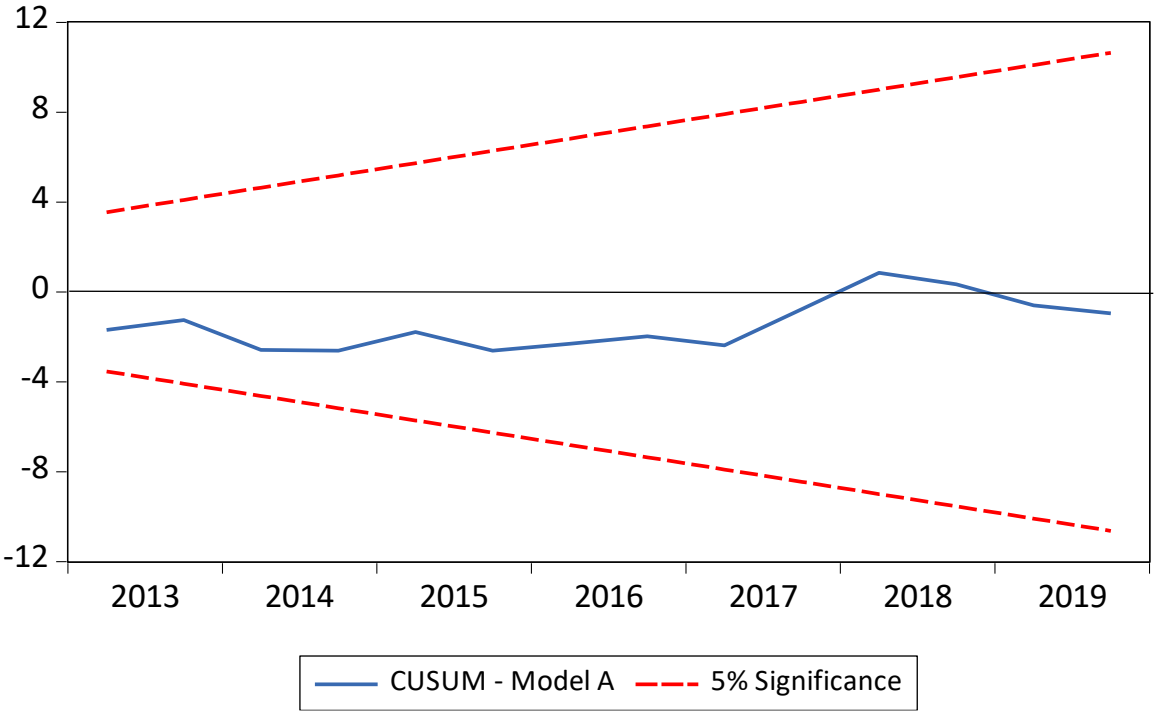

Figure 4.2: Plot of CUSUM for coefficients' stability of BARDL model A.
Source: Author's formation from data 2000–2019.

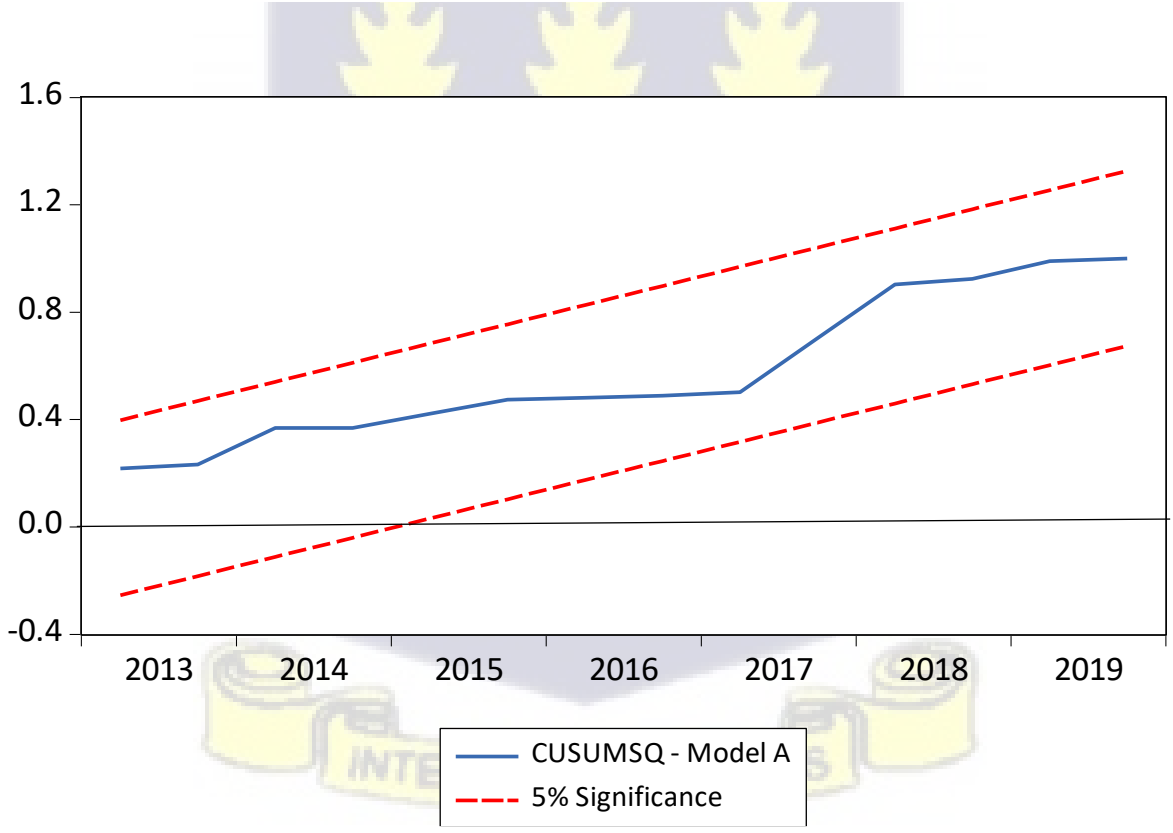

Figure 4.3: Plot of CUSUMSQ for coefficients' stability of BARDL model A.
Source: Author's formation from data 2000–2019.

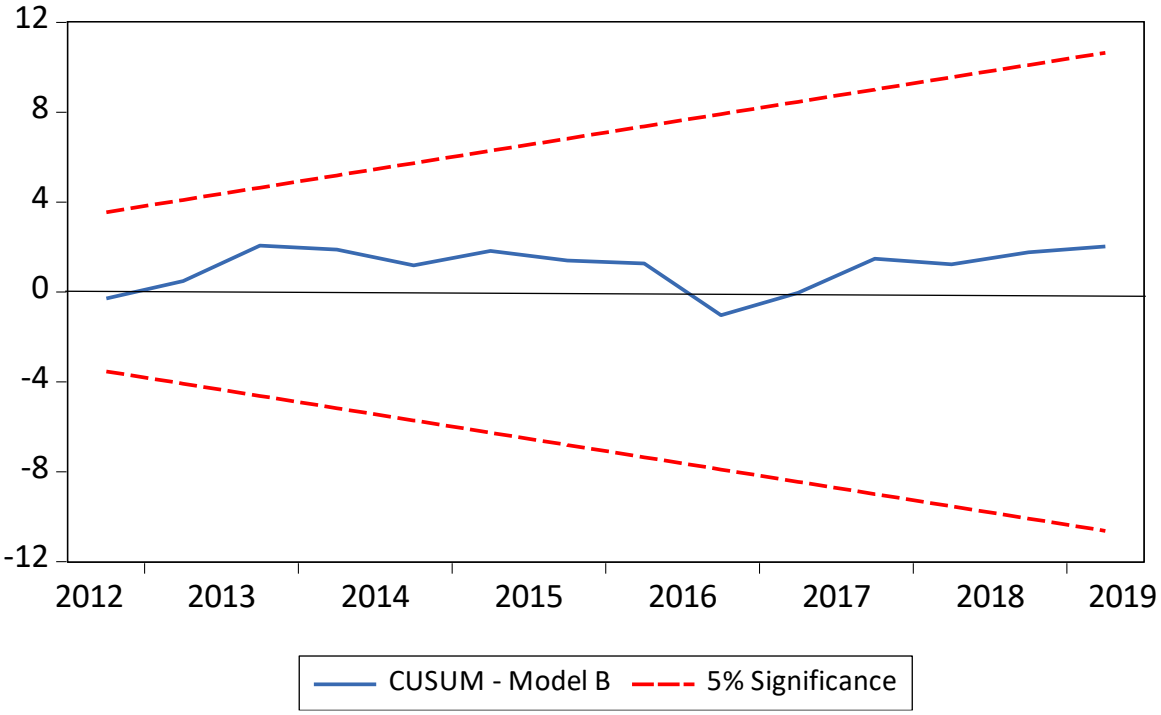

Figure 4.4: Plot of CUSUM for coefficients' stability of BARDL model B.
Source: Author's formation from data 2000–2019.

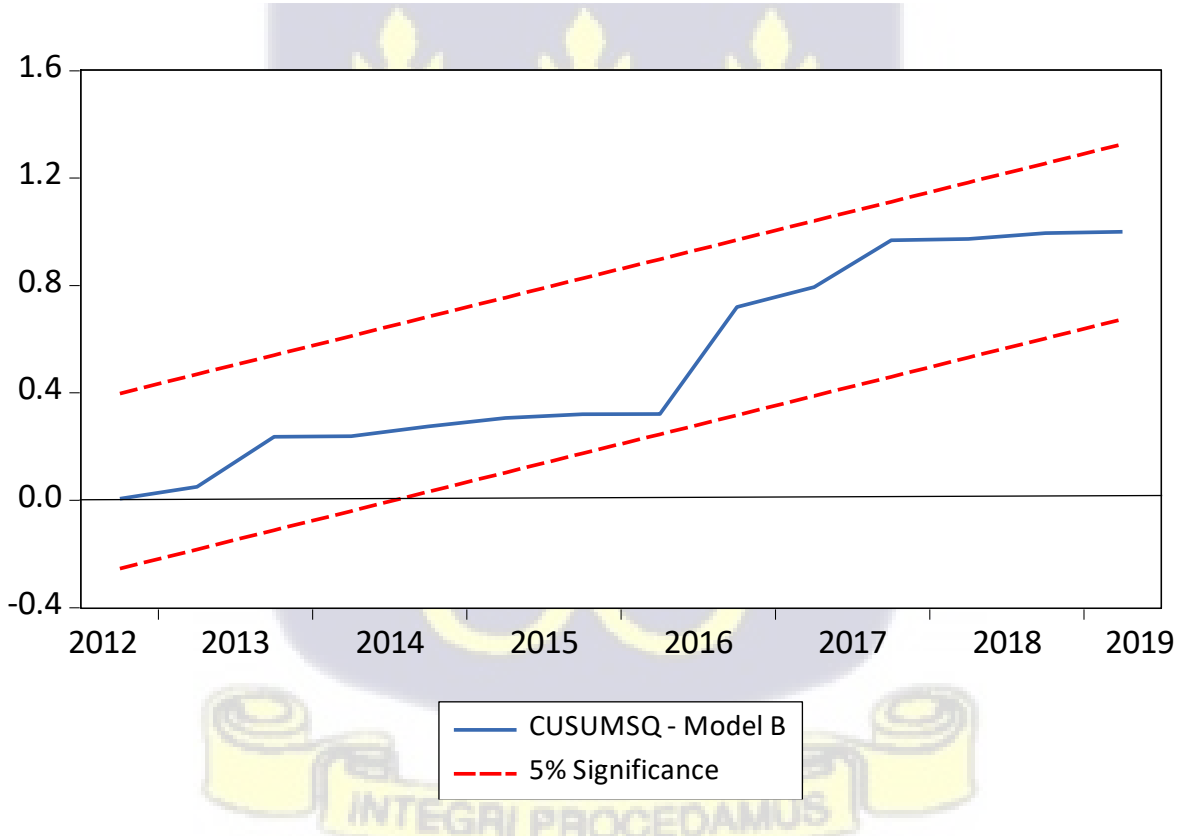

Figure 4.5: Plot of CUSUMSQ for coefficients' stability of BARDL model B.
Source: Author's formation from data 2000–2019.

Figure 4.2, 4.3, 4.4 and 4.5 shows the cumulative sum of the residuals (CUSUM and CUSUM of squares (CUSUMSQ)) charts. The results of the CUSUM and CUSUMSQ test are within the range of the asymptotic and the bootstrap critical values, hence the residuals are free from spurious inferences. This confirms the stability of the long-run and short-run estimated parameters at a 5 percent significance level. In detail, the estimated coefficient of the cointegration bootstrap ARDL models *(1, 0, 0, 2, 0, 1, 0)* and *(1, 2, 2, 0, 1, 2, 1, 0)* are reliable and consistent in the long-term and in the short-term.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the main highlights of the study, outlines some policy implications from the main findings and further suggests viable areas for future exploration.

5.2 Conclusion

Research on consumption tax cannot be overlooked as VAT contributes significantly to tax revenue growth. However, there is scant literature available that explored the interrelation between private consumption, income inequality, and consumption tax at the macro-level. A review of the literature reports varying results (for instance positive, negative, indirect, direct, and bidirectional relationships) on the role of tax policy, growth performance, investment, and savings on household spending patterns and income inequality. This study, therefore contributes to the extant literature by estimating the long-run and short-run relationship among household spending and income inequality and consumption tax using the bootstrap ARDL model.

The primary objective of this study was to examine the effect of VAT, a proxy for VAT rate on household spending and income inequality in Ghana using time series data on semi-annual basis for the period 2000 – 2019. Data were collected from World Development Indicators (WDI), Standardized World Income Inequality Database version 9.0 (SWIID), "Fiscal Data Report" of Ministry of Finance (MoF) and the Ghana Revenue Authority (GRA). The results for the unit root process revealed a mix of I(0) and I(1) among the variables. The empirical analysis employed the bootstrap bounds testing approach developed by McNown *et al.*, (2018) with an augmented version from Sam *et al.*, (2019). A cointegration relationship existed among

the variables with a Zivot-Andrews test coincidently outlined major economic events and shocks in Ghana within the period of the study.

The study also examines the long-run and short-run relationship between VAT, household spending and income inequality and finally examine the direction of causality between VAT, household spending and income inequality. The study further controlled for equally important macroeconomic variables including population growth, *per capita* income, real effective exchange rate, gross national savings, personal remittance received and government consumption which affected household spending and income inequality. However, given the inability of the bootstrap ARDL bounds test to establish the direction of causality among variables, we employed the Toda–Yamamoto (1995) causality test.

The first objective examines the long-run and short-run dynamics of VAT rate on household spending using a log-transformed-based approach. The log-log model exhibits the elasticity of the response and explanatory variables. The empirical results revealed that a high significance level of VAT rate hurts household spending in the long-run and has no dynamic influence. The long-term elasticity indicates that an increase of one percentage point in VAT rate leads to a decrease of 0.033 percent in consumer spending. The results showed that VAT rate has an inelastic, negative, and statistically significant long-run effect on consumer spending. This suggests that an upward revision of the VAT rate leads to a minor change in (or turns not to reduce) consumption levels of households in the long-run. In addition, the second objective considers the long-run and short-run dynamic linkage between VAT rate and income inequality by applying a non-linear model. The results indicate that the VAT rate increases income inequality in the short-run with a high significance level but its influence in the long-run is

immaterial. Thus, there is a detrimental effect on income distribution as a result of a unit increase in VAT rate in the short-run, implying the regressive nature of VAT in Ghana.

The results from the Toda-Yamamoto causality test revealed unidirectional (one-way) Granger causality between the variables. However, the evidence of a long-run unidirectional Granger causality running from VAT to household spending and income inequality suggests that VAT is an important factor in the economic well-being and standard of living process of the country. This implies, therefore that a downward revision of VAT can improve household consumption expenditure or have a positive multiplier effect on income distribution whereas an upward revision of VAT can have a constraint on household consumption expenditure and income distribution.

Above all, numerous diagnostic tests including Breusch Godfrey serial correlation LM test, Heteroskedasticity Breush-Pagan-Godfrey test, Heteroskedasticity ARCH test, Jarque-Bera Normality test, Ramsey RESET test were carried out indicating robust residuals at a 5 percent significance level. The cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) plots indicated that the estimated coefficients obtained from the model were stable in the short-term and in the long-term respectively, hence empirical outcomes are suitable for policy making.

5.3 Policy Recommendations

The general objective of the study was to examine the dynamic effect of consumption-based tax (value-added tax) on household spending patterns and income inequality in Ghana. The results suggest that VAT can reduce household consumption expenditure in the long-run but leaves no effect in the short-run. Specifically, the elasticity of consumer spending with respect

to VAT is inelastic in the long-run. Similarly, the VAT rate tends to be insignificant in the long-term while at the same time VAT rate exhibit a highly significant level and a negative effect on income inequality in the short-term.

Indeed, these empirical findings offer vital policy implications for Ghana and other developing countries that have adopted the VAT policy. Additionally, the results are interesting for policymakers to assign greater importance to consumption tax policy (Value-added tax) amid post-COVID-19 recovery, the Russia-Ukraine war, and building a resilient economy. From a policy perspective and regarding the aforementioned findings, the study makes the following recommendations:

- fiscal authorities should focus on expanding the VAT base, as VAT tends to be less distortionary on consumer spending (inelastic) in the long-term, to maintain aggregate demand and strengthen domestic resource mobilisation.
- to integrate the potential short to medium-term or long-run impact of VAT on household consumption decisions and income inequality by concerned authorities and policymakers (MoF and GRA) when designing a VAT policy (fairness and welfare outcomes) for food and non-alcoholic beverage expenses, agricultural inputs, education, transport, housing, utilities, medical supplies, telecommunications and others.
- in the short-term, revenue accrued from VAT should be fine-tuned by fiscal authorities (MoF and GRA) to provide public goods and services, including social intervention policies and benefits. By this, high-income inequality and the low consumption pattern of households could be addressed.
- the use of digital platforms to improve VAT efficiency and strengthen voluntary compliance among citizens and business activities (inclusive of the underground

economy) devoid of leakages, for instance, tax avoidance (legal), tax evasion (illegal), corruption, fraud, and others.

5.4 Further Study Areas

Notwithstanding the contribution to the literature, this study has some limitations. First, the data for all the variables do not have a continuous series. However, resorting to the linear interpolation and extrapolation technique to fill in the missing values does not alter the long-run cointegrating relationships between the variables but could lead to econometric issues such as size distortions and loss of power (Ghysels & Miller, 2014; Miller, 2019).

Second, the study was restrained with large data sample and could not take into account equally important variables including direct taxes (personal and corporate income taxes) and other components of indirect tax (excise tax and communication tax). This however does not bias the findings of this current study as in recent times the volume of VAT revenue growth is highly significant among other tax components. Further studies can look into the role of these tax components and consumer price index (CPI) on household spending and income inequality.

The study further suggests a threshold model to examine the impact of tax policy on macro-level indicators (for instance, household consumption and income inequality). Perhaps, it is vital to know the threshold values of tax policy to maximize or minimize household consumption and income inequality.

The finding of the study proposes micro-level household research to analyze the impact of tax policy on household consumption and income inequality in Ghana. The availability of timely data on the African sub-Regions could generate panel data analysis on the impact of tax policy

on household spending patterns and income inequality to assess how the results would change from a country-specific study. The above-mentioned areas for further studies could help facilitate more in-depth academic research understanding with evidence-based outcomes for fair, effective, and efficient tax structure and policy with the African sub-Regions.

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APPENDICES

Appendix 1

Table A1: Summary of the empirical outcomes

Model	Expected sign	Conclusion
a) lnHHS = *f*(lnVAT, lnGCE, lnGNS, lnREER, lnPREM, lnPOPG)		Cointegration
• Value-added tax	Negative	Negative
• Government consumption	Positive or Negative	Negative
• Gross national savings	Positive or Negative	Negative
• Relative effective exchange rate	Negative	Negative
• Personal remittance received	Positive or Negative	Positive
• Population growth	Positive	Positive
b) INEQ = *f*(VAT, *p*GDP, *p*GDP^2, GCE, REER, PREM, POPG)		Cointegration
• Value-added tax	Negative	Negative
• GDP *per capita*	Positive	Positive
• GDP *per capita* square	Negative	Negative
• Government consumption	Positive or Negative	Positive
• Relative effective exchange rate	Negative	Negative
• Personal remittance received	Positive or Negative	Positive
• Population growth	Positive	Negative

Appendix 2

Table A2: Outcome of correlation matrix test

Variables	HHS	INEQ	VAT	REER	GCE	*p*GDP	*p*GDP^2	PPG	PREM	GNS
HHS	1.000									
INEQ	-0.360	1.000								
VAT	-0.734	0.796	1.000							
REER	0.847	-0.591	-0.905	1.000						
GCE	-0.161	-0.163	-0.236	0.109	1.000					
*p*GDP	0.254	0.280	0.008	0.176	0.236	1.000				
*p*GDP^2	0.227	0.293	0.037	0.099	0.317	0.939	1.000			
PPG	0.895	-0.545	-0.902	0.959	0.049	0.063	0.020	1.000		
PREM	-0.693	0.685	0.867	-0.866	0.044	0.042	0.184	-0.849	1.000	
GNS	-0.766	-0.231	0.264	-0.460	0.130	-0.574	-0.589	-0.502	0.220	1.000

Note: For response variables, HHS denotes Household spending and INEQ is Income inequality. For determinants VAT, REER, GCE, *p*GDP, *p*GDP^2, GNS, PREM, and POPG represent VAT to GDP ratio, Real effective exchange rate, Government consumption expenditure, *per capita* GDP, squared *per capita* GDP, Gross national savings (proxy for consumer income), Personal remittance received and Population growth respectively.

Appendix 3

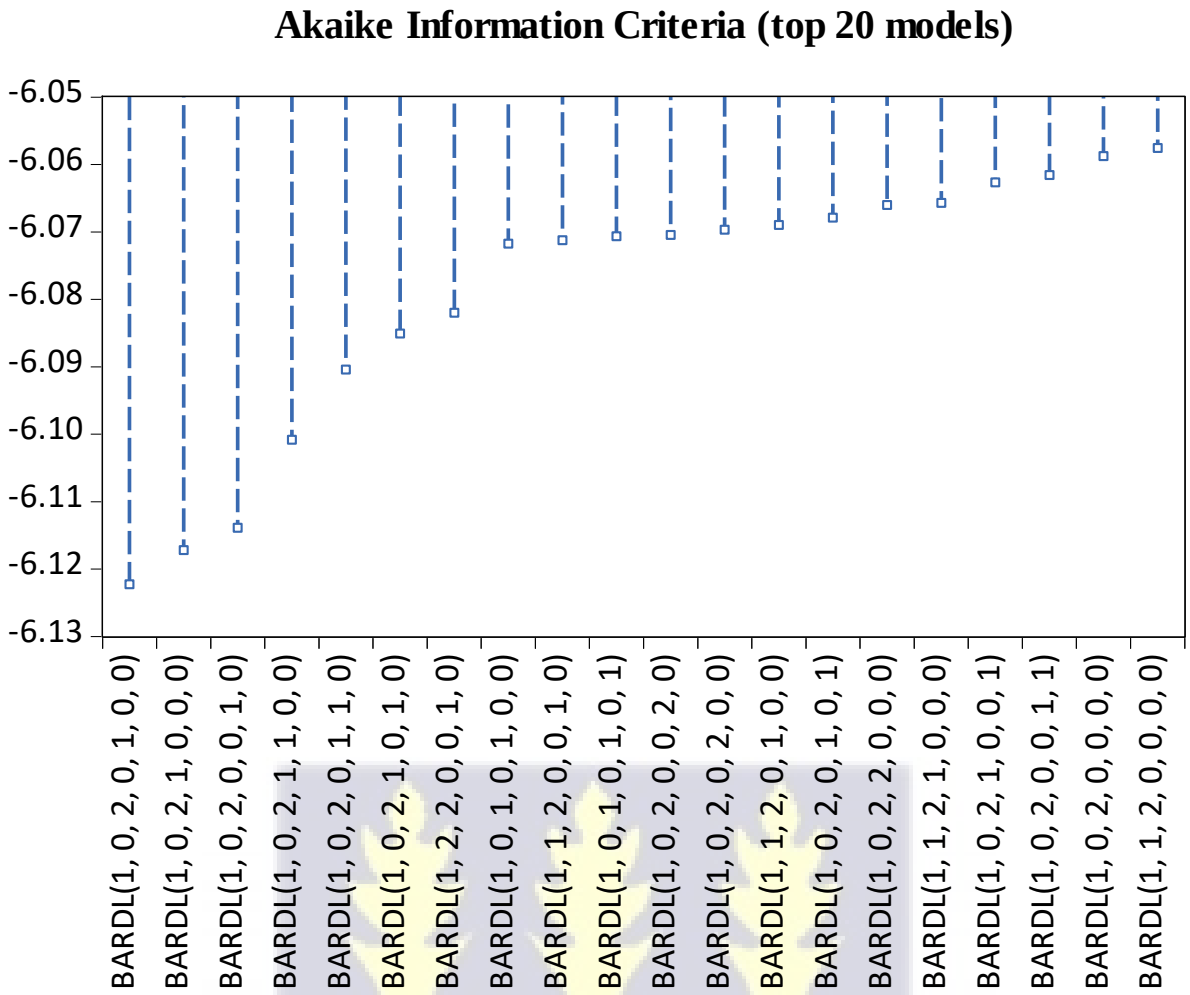

Figure A3: Akaike information criteria graph model A.
Source: Author's estimates from data 2000–2019.

Appendix 4

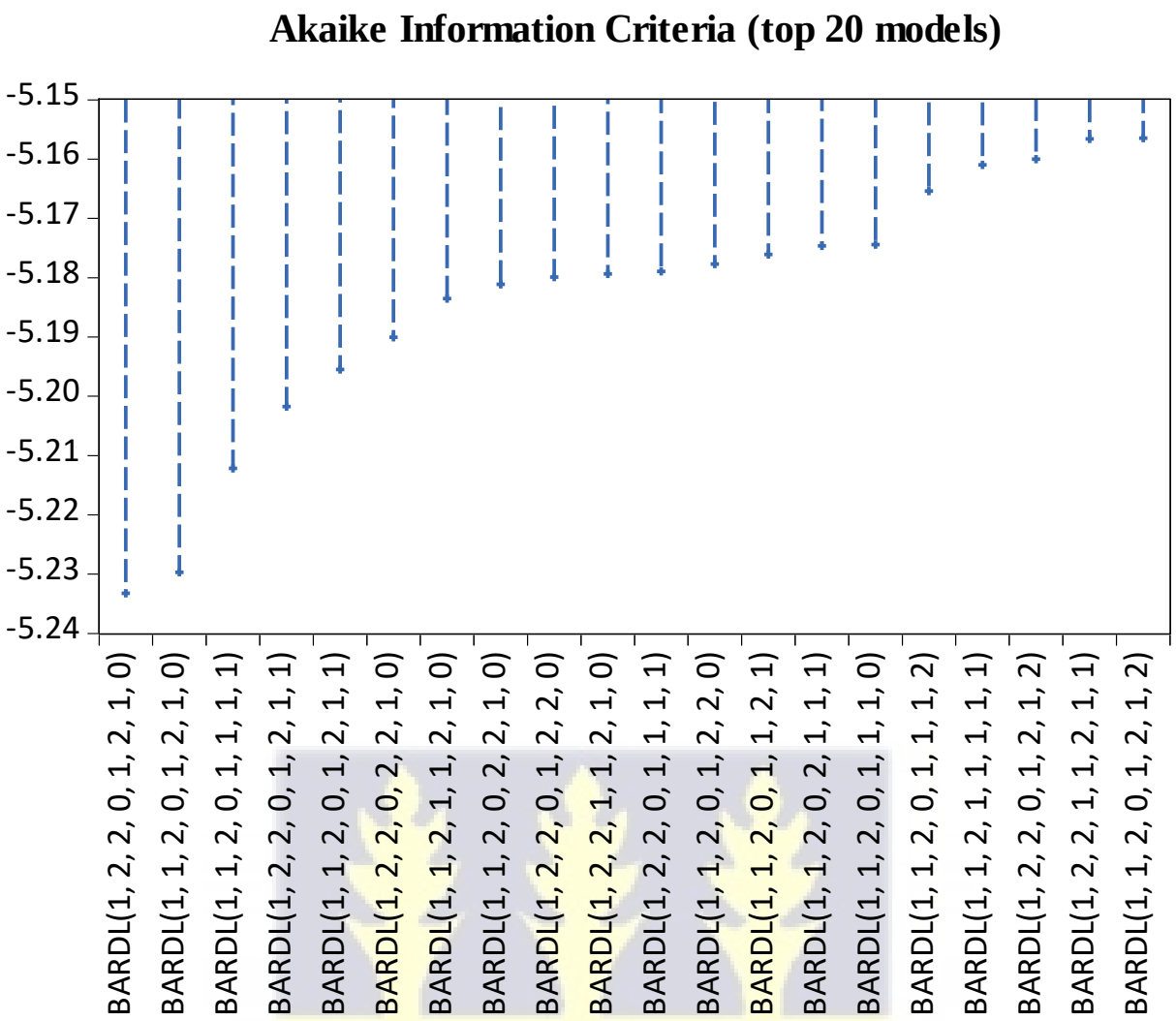

Figure A4: Akaike information criteria graph model B.
Source: Author's estimates from data 2000–2019.

Appendix 5

Structure of the Methodology

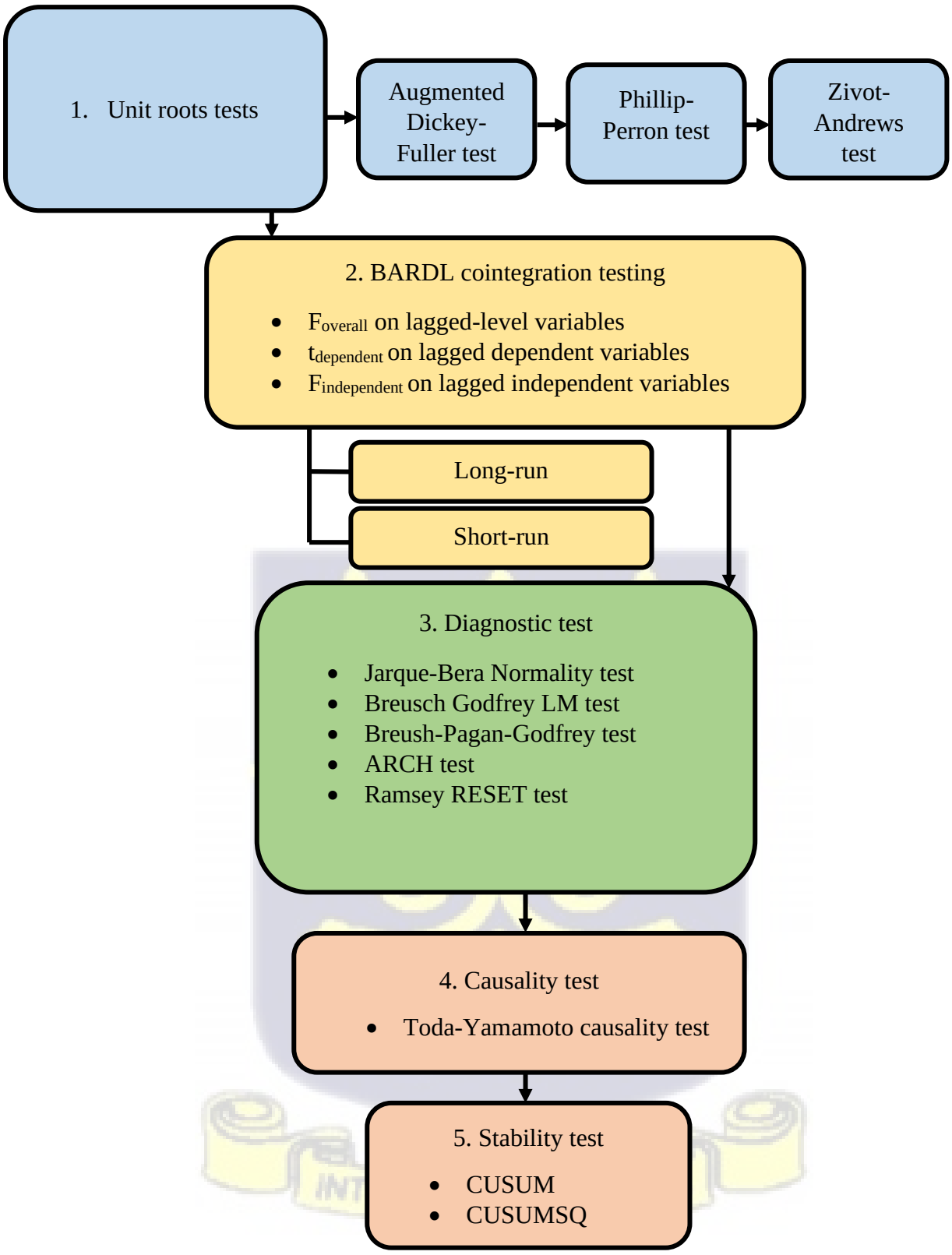

Figure A5: The sequence of methodology followed by this study