

**PRIVATE CONSUMPTION AND GOVERNMENT EXPENDITURE IN KENYA:
NONLINEAR ARDL APPROACH**

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DECLARATION

This research paper is my original work and has never been submitted for award of a degree or examination in any other university.

Signed: _____

Date: _____

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This research paper has been submitted for examination with my approval as a university supervisor.

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Date: _____

Dr. Owen Nyang'oro

DEDICATION

I dedicate this paper to my beloved mother for her encouragement throughout the entire course.

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ACRONYMS AND ABBREVIATIONS

| | |
|--------|--|
| AIC | Akaike Information Criterion |
| ARDL | Auto-Regressive Distributed Lag |
| CUSUM | Cumulative Sum |
| CUSUMQ | Cumulative Sum of Squares |
| GDP | Gross Domestic Product |
| IV-GMM | Instrumental Variable General Method of Moments |
| MPC | Marginal Propensity to Consume |
| NARDL | Nonlinear Auto-Regressive Distributed Lag |
| OECD | Organization for Economic Co-operation and Development |
| OLS | Ordinary Least Squares |
| VAT | Value Added Tax |

ABSTRACT

Several studies, both theoretical and empirical, have analyzed the question of whether government expenditure increases or decreases private consumption but the results are inconclusive. The contrasting result is mainly attributed to the use of different methodologies, model specification as well as the diverse economic structures and different government spending patterns in the respective countries. To arrive at appropriate fiscal policy implications, a country-specific study with a sound empirical investigation is necessary. This study adopts the ARDL approach to examine cointegration between private spending and public spending in Kenya for the period 1971-2018 while incorporating disposable income in the model. Furthermore, the study aims to determine asymmetry between the variables by employing the NARDL approach. Results show nonlinearity between private consumption and government expenditure. Also, both models revealed that government expenditure significantly substitutes private consumption whereas household income significantly increases private consumption. The study concludes that government expenditure suppresses private consumption because it is financed by taxes and borrowing which come at the expense of private individuals.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The effect of expansionary fiscal policy on private consumption remains the subject of a long-standing debate in academia and public policymaking (Brown et al. 2008). The underlying question of interest is whether government expenditure is effective, ineffective or neutral with respect to private consumption. There are three schools of thought which provide distinct explanations; the Ricardian equivalence theorem posits that public expenditure is neutral to private consumption (Ricardo, 1821); the Keynesian theorem asserts that government expenditure increases private consumption (Keynes, 1936); whereas the classical school stresses that extra-budgetary spending is detrimental to economic growth as it crowds out private spending (Smith, 1776).

The new classical theorem advocates for an indirect relationship between private and public spending. The classical school base its argument on the knowledge that government expenditure is mainly financed via taxes which are deducted from disposable income. Alternatively, if the government finances its expenditure through seigniorage, it will cause inflation which will negatively affect private consumption (Khan et al., 2015).

Ricardian Equivalence theorem argues that private consumption will not be affected by government expenditure regardless of the method of financing (Barro, 1989). According to Barro (1989), this theorem hinges on the assumption that individuals are rational and forward-looking. They will anticipate that the current increased government spending, may later result in higher taxes. Consequently, consumers save the extra income generated by the fiscal stimulus in an attempt to smoothen consumption over time. Permanent income will be unaffected hence private consumption remains unaltered.

Contrary to the classical view is Keynesianism. Keynes (1936) theorizes that households increase their consumption due to the additional income generated by fiscal stimulus. The Keynesian view gained momentum after the Second World War as the post-war economic recovery was widely attributed to the adoption of Keynesian policies; several governments increased public expenditure and ran fiscal deficits to rebuild their economies. Even though they faced a severe balance of

payment complications, the recovery in the post-war years was very impressive, in terms of both its spread and speed (United Nations, 2017).

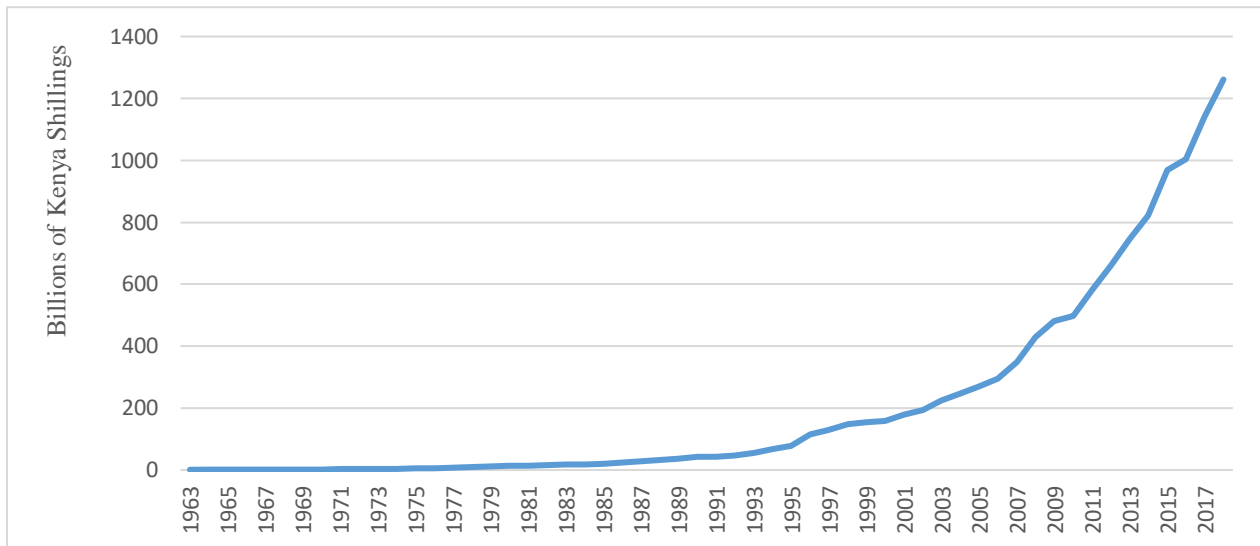
Keynesian theory's popularity, however, waned in the 1970s where several economies simultaneously endured both slow growth and inflation hitherto Keynes' theorem could not provide relevant policy response. After mid 1970s the new classical school stated that government expenditure is inefficient in promoting aggregate demand because individuals anticipate the outcome intended by fiscal policy then act in ways that counteract the projected change. However, the new Keynesians argued that despite the rational or adaptive expectations, markets cannot clear right away. Thus, government expenditure may be effective in the short-run (Jahan et al. 2014).

The conflicting schools of thought bring about various empirical studies trying to assess whether government expenditure stimulates or represses private consumption. Nonetheless, the results are inconclusive. Some researchers find the relationship to be either positive or negative and in certain circumstances neutral. Fiscal multipliers may be positive when; the economy is not under full employment, public debt is low, and government expenditure complements private consumption. Conversely, the fiscal multiplier may be negative when; there is crowding out effect i.e. government provision substitutes private provision, households are Ricardian, public debt is not sustainable and there is uncertainty (Baldacci et al. 2001).

1.1.1 Overview of Kenya's Fiscal Stance

In an attempt to promote growth, Kenya has been registering a consistent upward trend in public expenditure. Government spending in Kenya hit Ksh1, 260 billion in 2018 from a record low of Ksh 0.772 billion in 1963 (Figure: 1.1).

Figure 1.1: Total Government Expenditure Trend in Kenya

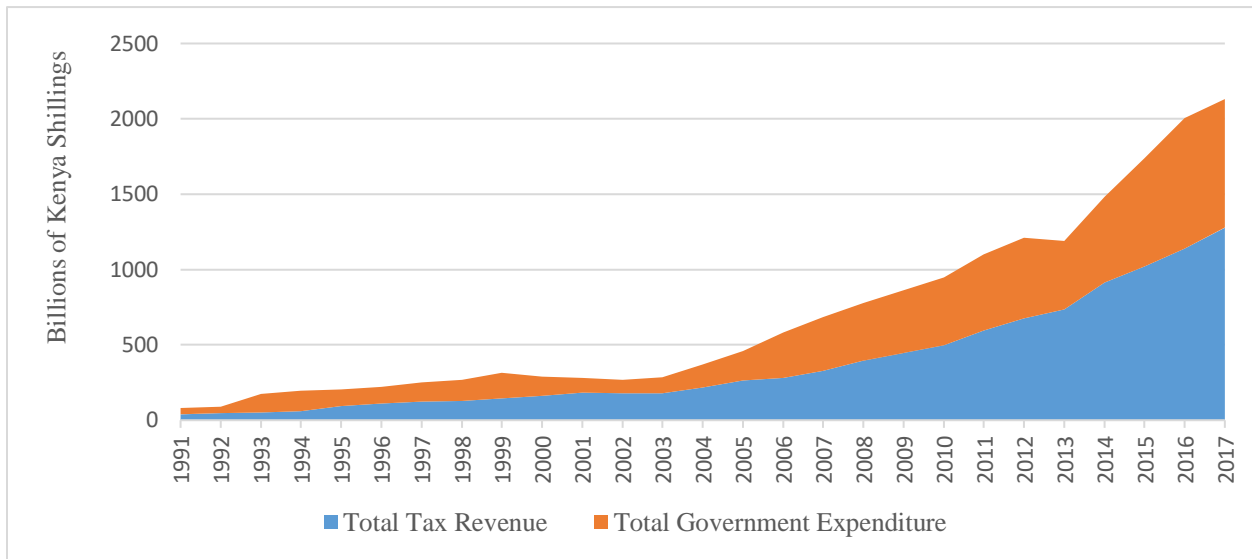


Source: The World Bank database

From 1963 to 1993 the government sustained low levels of both recurrent and development expenditure. Afterwards, public expenditure has been consistently rising especially in the last decade. While some of this growth can be explained by inflation, other factors are causing budgetary pressure such as; devolution, heavy investment in transport and energy sectors, free primary education, heavily subsidized secondary and tertiary education, and mitigation of drought among other projects in the Vision 2030.

It should, however, be noted that the expanding role of the public sector is matched by unequal growth in government revenue resulting in deficits. Tax revenue, as a percentage of GDP, has generally decreased due to some constraints; among them is low demand in the private sector which cripples revenue generation from corporate income taxes and VAT (World Bank, 2019). Figure 1.2 shows tax revenue is not keeping pace with the expansion in public expenditure hence the burgeoning deficit.

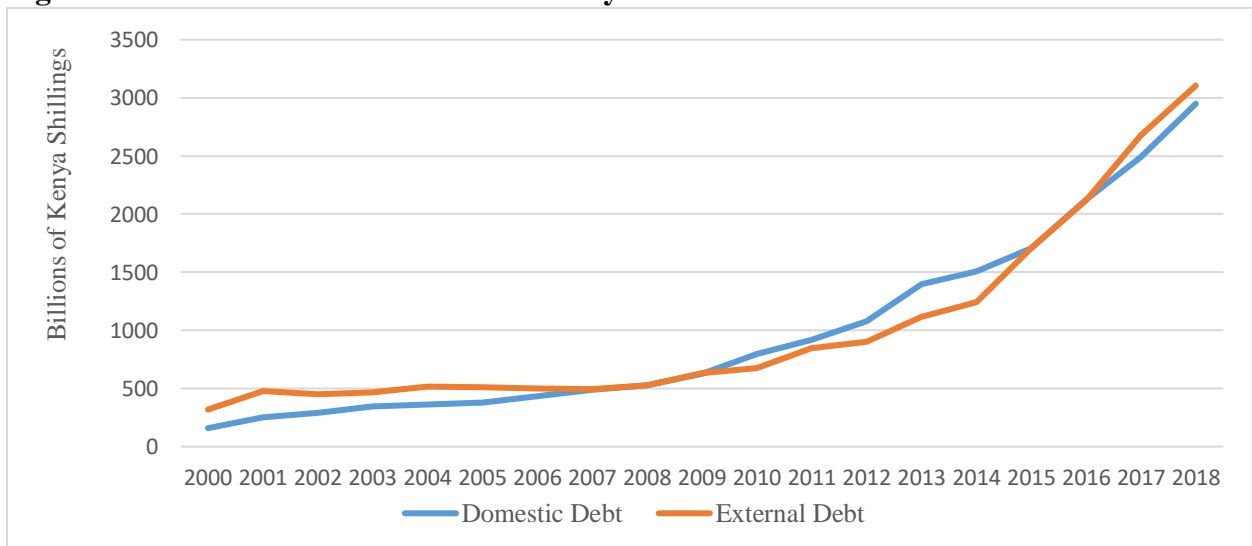
Figure 1.2: Total Tax Revenue and Total Public Expenditure



Source: The World Bank database

The deficit is primarily financed by borrowing, both domestic and external. The overall fiscal deficit has stretched to 6.3 percent of GDP in the financial year 2017/2018. At least 45.2 percent of the deficit was funded through domestic borrowing, while external borrowing financed 46.4 percent, with the balance being funded through other financings (World Bank, 2019). Figure 1.3 shows the trend of domestic debt and external debt.

Figure 1.3: Government Debt Trend in Kenya

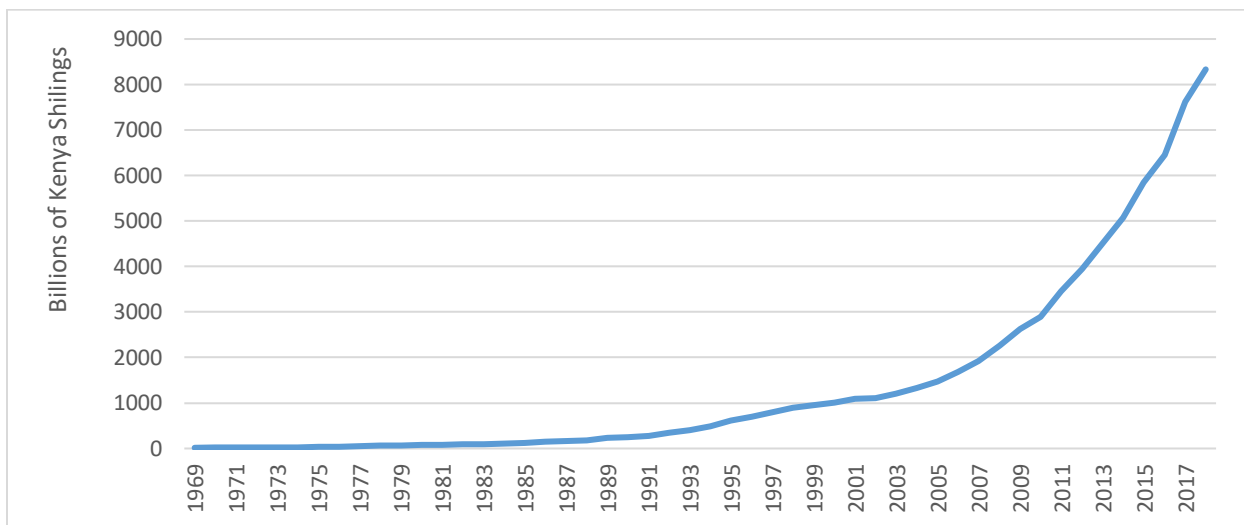


Source: The Central Bank of Kenya

1.1.2 Private consumption

Private consumption is the key indicator of economic wellbeing. In Kenya, private consumption is the largest component of GDP. It accounted for 81 percent of nominal GDP in 2018 compared with 80.8 percent in 2017 and a general average share of 78 percent since 1970 (World Bank, 2019). From figure 1.4, private consumption exhibit an increasing trend over time just like government expenditure in figure 1.1. However, since the relationship between private and public expenditure is usually controversial, there is a need for investigation.

Figure 1.4: Private Consumption Trend in Kenya



Source: The World Bank database

1.2 Statement of the Research Problem

The question of whether government expenditure increases or decreases private consumption has been analyzed by many studies both theoretically and empirically but the results are inconclusive. Some researchers like Easterly and Rebelo (1993), Christal and Price (1994) found that government spending is a powerful engine in boosting aggregate demand. On the contrary, other researchers such as Kneller et al (1999) and Barrow (1990) established that extra-budgetary spending is inefficient. The contrasting result is mainly attributed to the use of different methodologies, varied model specification as well as the diverse economic structures and different government spending patterns in the respective countries (Khalid, 1996). It follows that this question largely remains empirical. To derive effective fiscal policy implications, a country-specific study with a sound empirical investigation is essential.

In Kenya, empirical literature about the effect of public expenditure on private consumption is scanty. Nonetheless, in reference to the existing literature, government expenditure directly affects private consumption in Kenya. However, the conclusions drawn from the existing studies may be a misrepresentation of the public-private relationship because the studies omitted disposable income in their empirical analysis thereby, lessening the robustness of the model (Graham, 1993). This study re-examines the relationship using Autoregressive Distributed Lag (ARDL) approach while factoring disposable income in the analysis.

Furthermore, the existing studies in Kenya assumed a linear adjustment mechanism between private consumption and government expenditure. However, the linearity assumption may be extremely restrictive. Their relationship could be nonlinear. Whether this relationship is symmetric or asymmetric has not been established in Kenya. For this purpose, the study introduces nonlinearity to show that government expenditure could asymmetrically affect private consumption. This will be demonstrated by employing the Nonlinear Autoregressive Distributed Lag (NARDL) approach using data from 1971-2018.

1.3 Research Questions

The study seeks to answer the following questions;

- i. Is the relationship between private consumption and government expenditure symmetric or asymmetric?
- ii. Is there a long-run relationship between private consumption and government expenditure?

1.4 Objectives of the Study

The broad objective is to establish the relationship between private consumption and government expenditure. The specific objectives are;

- i. To examine the existence of asymmetry between private consumption and government expenditure.
- ii. To examine the existence of a long run relationship between private consumption and government expenditure.
- iii. To provide policy implications based on the study findings.

1.5 Significance of the study

When designing fiscal policy, the degree of substitutability and complementarity between two types of expenditure (public and private) is of major concern to policy makers (Kwan, 2006). This study provides information on the behavior of private consumption, the largest component of GDP in Kenya, upon changes in government expenditure. The information will aid policy makers to predict the behavior of private individuals in an economy resulting from fiscal policy changes as well as to control such behavior following development plans.

Although there exist a few studies based on the public-private relationship, this study tests a hypothesis that has not yet been tested in Kenya (as per the knowledge of the researcher); the study tests for asymmetry between the variables by using NARDL approach. Also, as per my best knowledge, this is the first study in Kenya to relate disposable income to the public-private relationship. The study hypothesizes that disposable income has a significant role to play and thus, should be incorporated in the model to enhance its robustness.

The NARDL approach is an improvement on the ARDL approach. This approach is superior because it does not discredit hidden intangible relationships between the variables which may otherwise be violated by the linearity assumption and it provides additional test i.e. the symmetry test, which gauges the long-run and short-run asymmetries through partial sum concept. As such, the findings of this study will not only enhance economic policy decisions but also provide a solid basis for further research.

1.6 Organization of the Paper

Chapter one presents the introduction, chapter two presents the theoretical orientation of the study. It also reviews the empirical literature. Research methodology is discussed in chapter three which consists of the theoretical framework adopted, model specification as well as the method of estimation. Chapter four discusses the empirical findings. Lastly, chapter five summarizes this study, provides policy implications and suggests on areas that require additional research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Chapter two focuses on the theoretical orientation of this study. This chapter also reviews empirical works that are related to the study and an overview of major findings.

2.2 Theoretical Literature Review

2.2.1 The Classical Theorem

According to Smith (1776), government expenditure is a destabilizing force in private markets. Moreover, classical economists consider borrowing from the public to finance government expenditure as “destruction of capital” which could have been used for private spending. The classical theorem does not favor government expenditure for boosting aggregate demand.

Increased government spending, unless financed by seigniorage, would only raise the interest rate. Simply because if money supply is constant while government spending increases, firms shall compete with the government for loanable funds hence the interest rate will rise. The high cost of maintaining loans will substitute private spending with public spending, an outcome commonly termed as “the crowding out effect” (Huang, 2006).

2.2.2 The Neoclassical Paradigm

Neoclassical economists also believe that government spending crowds out private consumption by increasing interest rates. If the government borrows, a greater demand for money will be created. Assuming money supply is constant, the interest rate will rise. As a result, private firms will face a lower rate of return hence investments decrease. With fewer investments, output reduces and consumption falls (Baxter and King, 1993).

Bernheim (1989) mentions that extra-budgetary spending result to fiscal deficits that depress capital accumulation. The fiscal deficit has adverse effect on most macroeconomic variables especially private consumption. Note that the neoclassical theorem assumes full employment in the economy suggesting that deficit spending will also cause inflation in the long-run which will adversely affect private consumption. Thus, neoclassical economists would anticipate to find an inverse correlation between private expenditure and government expenditure.

2.2.3 The Keynesian Theorem

Keynes (1936) argued that to pull an economy out of depression or recession, there is a need for increased government spending financed by borrowing and lower taxes to stimulate private consumption. In other words, the government has to actively infuse the economy with capital to spend through borrowing money.

The Keynesian theorem stresses that consumption primarily depends on income (Keynes, 1936). The Keynesian consumption function is summarized as;

$$C = C_o + mpc(Y) \quad (2.1)$$

According to Chakraborty (2006), public expenditure as a component of national income, Y , stimulates aggregate demand in an economy because households feel wealthier. The perceived increase in income will raise the marginal propensity to consume, mpc , and consequently consumer spending will increase. Thus, in a Keynesian model, positive shocks in public spending increase private spending.

2.2.4 The Ricardian Equivalence Theorem

The Ricardian proposition is an extension of Ricardo (1821) debt neutrality proposition which entails that government expenditure financed by borrowing corresponds to merely postponement of taxes, therefore, it can neither influence private consumption nor private investment in the economy. In other words, government expenditure is neither beneficial nor detrimental to aggregate demand. The theorem hinges on the following restrictive assumptions; intergenerational altruism, rational individuals, forward-looking individuals, perfect capital markets, no liquidity constraints, and non-distortionary taxes (Bernheim, 1989).

If government expenditure is financed through borrowing, individuals would expect the government to compensate for the public debt by increasing taxes in future. As a result, consumption will not change but savings will increase as individuals will save the additional perceived income generated by the fiscal stimulus to smoothen their consumption over time. The increase in national savings will neutralize any increase in interest rate, thus private investment will also remain unchanged (Barro, 1989). Therefore, in a Ricardian case, one may presume to find an insignificant correlation between private and public spending.

2.3 Empirical Literature Review

Empirical research in regard to the impact of public expenditure on private consumption can broadly be classified into three categories. Some researchers base their findings on the classical theoretical foundation where the relationship is negative, others base their findings on the Keynesian theoretical foundation which advocates for a positive relationship, and the last category supports the Ricardian Equivalence Theorem which claims that the relationship is neutral.

One of the empirical studies that found a direct correlation between private consumption and public consumption was done by Nieh (2006). Using data for 23 OECD countries ranging between 1981 and 2000, the study employed both Fully Modified OLS and Dynamic OLS to investigate if public consumption crowds in private consumption. The results indicated that indeed private consumption and public expenditure are complements.

Chen et al. (2014) also employed Dynamic OLS to examine the link between private consumption and public expenditure in China from 1996-2013. Unlike Nieh's study, this study included disposable income in the model. The result revealed that public expenditure increases private consumption.

Keho (2019) employed both Johansen cointegration and ARDL approach to analyze the link between government and private spending in Cote d'Ivoire. The study used annual data from 1970-2016. Per capita GDP was used as a substitute for disposable income. Results revealed that public expenditure positively affects private spending.

In China, Khan et al. (2015) also found that public expenditure directly affects private consumption. The study employed ARDL bound testing approach using data from 1985-2013. Real GDP was incorporated in the model as an alternative for disposable income.

Bernardini and Peersman (2018) attempted to examine if there exists an integration relationship between government spending and private spending in China. Using data from 1985-2013 the study employed ARDL. Results revealed that indeed government expenditure directly affects private consumption.

Ismail (2010), investigated how government expenditure affects private expenditure in Malaysia from 1971-2006. Using Johansen cointegration the study demonstrated that in Malaysia, private consumption and government spending complement each other. Similarly, by employing Johansen

cointegration approach using data for 20 Italian regions, D'Alessandro (2010) found evidence supporting the Keynesian hypothesis. Karras (1994) used Engle-Granger cointegration technique to estimate the long-run equilibrium between public and private consumption. Results reveal that public spending improve private consumption.

In the Kenyan context, Gichohi (2015) employed Johansen cointegration to investigate whether government expenditure on health, infrastructure, defense, public order and security encourages or stifles household consumption from 1963-2012. The study found that all the four components have a direct impact on private consumption. Kametu (2018) used ARDL technique to explore cointegration between private spending and public spending in Kenya from 1970-2014. The result showed that government expenditure significantly increases private consumption.

Another group of studies reveal that public spending crowds out private consumption thus rendering Keynesian plea unconvincing. To mention a few; Ho (2001) applied panel cointegration and Dynamic OLS to examine if public expenditure crowds in or crowds out private consumption in 24 OECD countries. The result indicated that government spending substitute private consumption.

Like Ho (2001), Dahmardeh et al. (2011) also applied Dynamic OLS and panel cointegration to examine the public-private relationship in 13 Asian countries from 1990-2006. However, this study estimated two models; one model with disposable income and the other without disposable income. The empirical results showed that when disposable income is incorporated in the model, government expenditure substitutes private consumption, supporting the “crowding-out effect” hypothesis. Bouakez and Rebei (2007) also concluded a similar result in the United States for the period between 1952Q1 and 2001Q4. The study rejected the Keynesian hypothesis which states that the two types of spending are complements.

Mosikari and Eita (2017) adopted the ARDL technique and Dynamic OLS to examine how public expenditure affects private spending in Lesotho from 1980-2014. Variables used for the analysis were private consumption, public debt, inflation rate, government expenditure, GDP, and population growth. The findings showed that public debt and public expenditure significantly decrease private consumption.

Almosabbeh (2019) explored the correlation between private spending and government expenditure in Egypt from 1970-2016. The study employed ARDL approach to explore cointegration and NARDL approach to test their asymmetric relationship. Results from the ARDL approach revealed that the effect of government expenditure on private spending is insignificant. Whereas findings from the NARDL approach revealed that positive shocks of government expenditure suppress private consumption.

Kwan (2006) confirmed the crowding out mechanism between private spending and government expenditure, although this relationship was asymmetric. The study used panel data from 1960-2002 in East Asia. Results indicate that the substitutability was mild in Japan, China, Korea, and Hong Kong while it was extreme in Thailand and Malaysia and almost zero in Philippine.

Some empirical studies are consistent with the Ricardian Equivalence proposition. Such studies found an insignificant or neutral relationship between private spending and government expenditure. Among these studies, Mahmud et al. (2012) examined the public-private linkage in Bangladesh by using Johansen cointegration. The findings were in line with the Ricardian equivalence proposition in that private consumption was found to be unrelated to government expenditure.

Divino et al. (2013) tested the Ricardian Equivalence theorem in Argentina, Mexico, Chile and Brazil by using quarterly data from 1996Q1 to 2007Q4. The variables used were private consumption, public expenditure, real interest rate, and disposable income. Results from Engle-Granger and Johansen cointegration tests showed presence of cointegration between the variables for all countries. To consolidate this finding, the model was estimated again by alternative procedures; OLS and Full Information Maximum Likelihood. Results showed that increased public expenditure has an insignificant impact on private consumption.

Ghali (1997) used Granger causality test to analyze causality between public expenditure and per capita GDP in Saudi Arabia. Empirical results revealed that public expenditure does not influence GDP. The same conclusion was inferred based on the cross-sectional analysis made by Kormendi et al. (1985). Using data on 47 countries, the result did not reveal a significant correlation between per capita GDP and public expenditure.

2.4 Overview of the Literature

From the existing research works, there is no consensus regarding the effect of government expenditure on private consumption. Some studies support the existence of a negative relationship. For example, Ho (2001), Dahmardeh (2011), Mosikari et al. (2017), among others. In contrast, studies such as Karras (1994), Nieh (2006), D'Alessandro (2010), support a direct relationship. Whereas Kormendi (1985), Divino et al. (2013), Mahmud et al. (2012), and others show evidence of a neutral relationship. This justifies the exploration of this relationship especially in emerging economies, such as Kenya, where development projects cause budgetary pressure.

Empirical studies examining how public expenditure influences private consumption in Kenya are highly limited. The few existing studies failed to incorporate disposable income in their analysis yet private consumption is highly dependent on disposable income (Keynes, 1936). A suitable model for examining the substitutability between public spending and private spending has to include disposable income (Graham, 1993). The study, therefore, re-examines the public-private relationship while incorporating disposable income in the model.

Almosabbeh (2019) and Kwan (2006) found a nonlinear cointegration between public and private spending. To arrive at appropriate fiscal policy implications, establishing the nature of the underlying cointegration is necessary. In Kenya however, the same has not yet been established. The study attempts to fill in this gap by employing NARDL approach to test for asymmetry between the variables.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter illustrates theoretical framework, model specification, as well as the estimation techniques. It also describes the chosen variables and the data source.

3.2 Theoretical Framework

The theoretical framework adopted was used by Aschauer (1985), Karras (1994), and Ho (2001). Consider an individual with preferences over private consumption and consumption from the public sector. Assume that at any time period, t , the individual strives to maximize his expected utility as;

$$U_t = E_t \left[\sum_{j=0}^{\infty} \phi^j u(c_{t+j}^*) \right] \quad (3.1)$$

E_t is the expectation operator. $u(\cdot)$ represents a utility function, ϕ is the individual's discount factor, and c_t^* denotes effective consumption which according to Bailey (1971) it is given as;

$$c_t^* = c_t + \theta g_t \quad (3.2)$$

θ measures the relationship between private consumption c_t and government expenditure g_t . If $\theta > 0$, c_t and g_t are considered as substitutes. If $\theta < 0$, c_t and g_t are regarded as complements. The greater the value of θ , the greater the degree of substitutability or complementarity.

A function of g should be introduced into the individual's utility function to prevent it from being a decreasing function of g_t in instances where θ is negative (Barro, 1989). Equation 3.1 would then be modified to;

$$U_t = E_t \left[\sum_{j=0}^{\infty} \phi^j u(c_{t+j}^* + \varphi(g_{t+j})) \right] \quad (3.3)$$

Now, when θ is negative, the marginal utility of g_t will always be positive, provided that c_t is positive. Assuming individuals have no control over the choice of g_t and $d\varphi/dg > 0$, the

contribution of g_t into the utility through the function $\varphi(\cdot)$ can be ignored when solving the maximization problem.

The individual strives to maximize expected utility subject to the following budget constraint;

$$a_{t+1} = (a_t + y_t - c_t - \tau_t)(1+r) \quad (3.4)$$

Where a_t is initial wealth, y_t represents disposable income, τ_t denotes taxes, and r denotes time-invariant rate of interest. Equation (3.5) expresses the individual's budget constraint in terms of its present discounted value:

$$\sum_{j=0}^{\infty} (1+r)^{-j} E_t [c_{t+j}] = a_t + \sum_{j=0}^{\infty} (1+r)^{-j} E_t [y_{t+j} - \tau_{t+j}] \quad (3.5)$$

Equation (3.5) implies that current consumption should be equivalent to the sum of accumulated wealth as at t and current disposable income.

Note that the government also has an intertemporal budget constraint given by;

$$b_{t+1} = (b_t + g_t - \tau_t)(1+r) \quad (3.6)$$

Where b_t represents government debt.

Expressing equation 6 in terms of its present discounted value¹;

$$\sum_{j=0}^{\infty} (1+r)^{-j} E_t [\tau_{t+j}] = b_t + \sum_{j=0}^{\infty} (1+r)^{-j} E_t [g_{t+j}] \quad (3.7)$$

Equation (3.7) means that tax revenue should be equivalent to the sum of the initial public debt, b_t and current level of government expenditure.

The individual is presumed to be forward-looking and knows that the current public debt implies higher tax obligations in future. Therefore, the individual's and the government's budget constraints may be combined to obtain an economy wide budget constraint;

¹ Equations (3.5) and (3.7) have been derived based on the assumption that $\lim_{j \rightarrow \infty} (1+r)^{-j} a_{t+j} = 0$ and

$\lim_{j \rightarrow \infty} (1+r)^{-j} b_{t+j} = 0$

$$\sum_{j=0}^{\infty} (1+r)^{-j} E_t [c_{t+j}^*] = (a_t - b_t) + \sum_{j=0}^{\infty} (1+r)^{-j} E_t [y_{t+j}] + \sum_{j=0}^{\infty} (1+r)^{-j} E_t (\theta - 1) [g_{t+j}] \quad (3.8)$$

Note that equation 3.8 has been stated in terms of c_t^* .

The problem faced by the representative individual now is maximizing his expected utility, subject to the economy-wide budget constraint i.e. maximizing equation (3.3) subject to equation (3.8).

The maximization problem is;

$$L = \sum_{j=0}^{\infty} \phi^j E_t [u(c_{t+j}^*)] - \lambda \left[\sum_{j=0}^{\infty} (1+r)^{-j} E_t [c_{t+j}^* - y_{t+j} - (\theta - 1)g_{t+j}] - (a_t - b_t) \right] \quad (3.9)$$

The necessary first-order condition is;

$$E_t [u'(c_{t+j}^*)] (\phi(1+r))^j = \lambda \quad \forall j = 0, 1, 2, \dots \quad (3.10)$$

Using equation (3.10), the Euler equation for consumption between period t and t+1 is derived as;

$$u'(c_t^*) = \phi(1+r) E_t [u'(c_{t+1}^*)] \quad (3.11)$$

Equation (3.11) implies that at optimal consumption, the individual cannot be better off by decreasing consumption in one period in order to increase it in the next period.

3.3 Empirical Model Specification

To empirically examine cointegration between private and public expenditure, the study specifies the model below based on the theoretical framework;

$$C = \beta_0 + \beta_1 G + \varepsilon_t \quad (3.12)$$

Where C denotes private consumption per capita and G represents government expenditure per capita, β_0 denotes the constant, β_1 represents the coefficient of government expenditure whereas ε_t denotes the stochastic error term.

The study, however, considers the argument brought forth by Graham (1993), that excluding disposable income might invalidate the public-private consumption relationship. Therefore, the model is extended with per capita disposable income, Y^d , and the model specification becomes;

$$C = \beta_0 + \beta_1 G + \beta_2 Y^d + \varepsilon_t \quad (3.13)$$

Where β_2 is the long-run coefficient of disposable income.

3.4 Measurement of Variables

Private Consumption per capita (C): Depicts the market value of goods and services acquired by private individuals. It also includes expenditures of private companies or organizations. It is measured in natural logarithm.

Government Expenditure per capita (G): Comprises development expenditure and recurrent expenditure excluding military expenditure. It is expected to either substitute private consumption (Bailey, 1971) or complement it (Karras, 1994). G is also measured in natural logarithm form.

Household Income per capita (Y^d): Refers to the labor income that remains after tax deductions and other government obligations i.e. the amount of money households have available for either consumption or saving. It also includes returns to private investments. Some studies such as Khan et. al. (2015) and Keho (2019) have used GDP as a proxy for disposable income, but it was due to unavailability of reliable data on household income. As predicted by the Keynesian theory, disposable income positively affects private consumption. Y^d is measured in natural log.

3.5 Pre-estimation Tests

Conducting normality test and unit root tests before estimation is necessary for exploring statistical characteristics of the time series and for identifying a suitable method of estimation. The ARDL and NARDL approach require the error limits to be normally distributed and serially independent and the variables to be I(0) and I(1). Note that ARDL and NARDL cannot be effective if any of the variables is I(2).

3.5.1 Normality Test

Normality implies that u_t is independent of all explanatory variables. It also entails that u_t is independently and identically distributed with $E(u_t) = 0$ and $Var(u_t) = \sigma^2$ (Wooldridge, 2012). The study employs Shapiro-Wilk (SW) test to ascertain if series u_t is normally distributed because the SW test has the highest power among all tests for normality (Razali et al. 2011).

3.5.2 Unit Root Tests in the Absence of Structural Breaks

Presence of unit roots may result to spurious inference hence the need to be appropriately accounted for to achieve valid inference. The study adopts Phillips-Perron (PP) test and Augmented Dickey-Fuller (ADF) test. ADF test includes lagged terms of the dependent variable to cater for serial correlation (Wooldridge, 2012). The number of lagged terms has to be determined through various selection criteria so this study uses Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC) to select maximum lag length.

The ADF test model with a time trend is;

$$\Delta c_t = \alpha + \Psi t + \beta c_{t-1} + \sum_{j=1}^k c_{t-j} + v_t \quad (3.14)$$

Where α denotes the drift, t represents the trend variable, c_{t-j} indicates the lagged terms, and k denotes the maximum lag length selected to make sure the pure white noise error term, v_t is not serially correlated. The null provides for nonstationarity. If the null fails to be rejected, the nonstationary series $I(d)$ is differenced d -times (Gujarati and Porter, 2009).

The study further uses PP test to consolidate the findings. Unlike the ADF, PP does not assume homoscedasticity or normality instead it corrects for the possible presence of heteroscedasticity and autocorrelation using nonparametric statistical methods without the inclusion of the lagged terms (Gujarati and Porter, 2009). PP test model is represented as;

$$c_t = \alpha + \theta c_{t-1} + u_t \quad (3.15)$$

Where α is the drift and time trend, θ represents the coefficient of the lagged variable, and u_t is white noise error term.

3.5.3 Unit Root Tests in the Presence of Structural Breaks

Structural breaks may be attributed to factors such as economic crises, policy or institutional changes, and shifts in political regimes among others. Bai and Perron (2003) emphasized on the significance of accounting for structural breaks while testing for stationarity because they usually cause unanticipated shift in a series which may invalidate the findings. They further argued that ADF and PP tests are ineffective on series with structural breaks; they are biased as to non-rejection of the null because such series usually mimic series with real unit roots. For that reason, there is need to employ a test that accounts for possible breaks. This study adopts Bai and Perron (BP) unit root test because it identifies multiple unknown structural breaks. The BP test model is;

$$y_t = x_t'\beta + z_t'\gamma_j + v_t \quad t = T_{j-1}, \dots, T_j \quad \forall j = 1, \dots, m$$

Where y_t represents the response, x_t and z_t represent covariate vectors, γ and β denote the corresponding vector coefficients, whereas u_t represents the disturbance term, T_0, \dots, T_m are the unknown break points. The aim is to estimate the vector coefficients γ_j and β and the break points T_0, \dots, T_m

The null hypothesis suggests zero breakpoints. If the null is rejected, the study tests for cointegration allowing for structural changes. Generally, tests based on error correction models such as the ARDL and Johansen cointegration are more powerful when structural breaks are present than tests based on Dickey Fuller statistics such as the Engel-Granger cointegration approach (Campos et al. 1996).

3.6 Estimation Method

Initially, the study uses the standard ARDL approach to explore cointegration between private and public expenditure. Disposable income is factored within the model. By using this approach, the ARDL (p^0, p^1, p^2) model is as follows:

$$\Delta C_t = \rho + \theta_0 C_{t-1} + \theta_1 G_{t-1} + \theta_2 Y_{t-1} + \sum_{j=0}^{p^0} \alpha_{0j} \Delta C_{t-j} + \sum_{j=0}^{p^1} \alpha_{1j} \Delta G_{t-j} + \sum_{j=0}^{p^2} \alpha_{2j} \Delta Y_{t-j} + \varepsilon_t \quad (3.16)$$

This involves selecting the lag length of the ARDL (p^0, p^1, p^2) model in the three variables using Akaike Information Criteria (AIC). θ_0 denotes the Error Correction Term (ECT). If ECT is

negative and statistically significant, it reflects cointegration and the speed at which short run deviations return to long-run balanced position. θ_1 and θ_2 are associated with the long run model coefficients which are derived as $\beta_1 = -\theta_1 / \theta_0$ and $\beta_2 = -\theta_2 / \theta_0$. Whereas α_0 , α_1 , and α_2 are short run coefficients. ε_t is error limit at time t.

The study also uses NARDL to test for asymmetry between the variables. NARDL is an improvement of ARDL approach by moving from the linear case to the nonlinear case. It explores hidden cointegration i.e. it avoids deleting the intangible correlations between the variables that may otherwise be violated by the assumption of linearity (Granger and Yoon, 2002). Therefore, the NARDL approach tests a complex hypothesis i.e. whether the cointegration is linear, nonlinear or nonexistent. Also, NARDL approach does not necessarily need a large sample as opposed to other nonlinear approaches (Shin et al. 2014).

To employ NARDL, the explanatory variable, G, has to be divided into partial sums;

$$G_t = G_0 + G_t^+ + G_t^- \quad (3.17)$$

Note that to analyze hidden cointegration, Schorderet (2001) suggests that only one explanatory variable appears in the equation for clarity of exposition. Thus, the asymmetric long-run regression is as follows;

$$C_t = \alpha + \theta^+ G_t^+ + \theta^- G_t^- + \mu_t \quad (3.18)$$

Where u_t denotes the error term, while both θ^- and θ^+ represent the associated asymmetric long-run coefficients. Inserting partial sum processes of G_t in the ARDL model derives a NARDL (p, q) model:

$$\Delta C_t = \eta + \rho C_{t-1} + \theta^+ G_{t-1}^+ + \theta^- G_{t-1}^- + \sum_{j=1}^p \alpha_j \Delta C_{t-j} + \sum_{j=1}^q (\alpha_j \Omega_j^+ \Delta G_{t-j}^+ + \Omega_j^- \Delta G_{t-j}^-) + \varepsilon_t \quad (3.19)$$

Just like in equation (3.16), θ^+ and θ^- represent long-run information of the asymmetry through which long run asymmetric coefficients are derived in accordance with the equation; $\beta^+ = -\theta^+ / \rho$ or $\beta^- = -\theta^- / \rho$. Whereas Ω_j^+ and Ω_j^- represent the short-run asymmetric coefficients.

Equation (3.19) corrects for weak endogeneity and nonstationarity in the explanatory variables. The choice of an appropriate lag structure (p,q) using Akaike Information Criteria (AIC) renders the model free from autocorrelation. The following equation is used to test for cointegration:

$$\eta = \rho = \theta^+ = \theta^- = 0$$

The null hypothesis of symmetry is tested by using the Wald statistic which follows an asymptotic χ^2 distribution.

$$H_0: (\beta^+ = -\theta^+/\rho) = (\beta^- = -\theta^-/\rho)$$

The alternative hypothesis provides for asymmetry:

$$H_a: (\beta^+ = -\theta^+/\rho) \neq (\beta^- = -\theta^-/\rho)$$

Failing to reject the null, that is considering the relationship to be symmetric implies that the relationship is linear. Rejecting the null i.e. considering the relationship to be asymmetric means that the relationship is nonlinear.

3.7 Post-estimation Tests

The study conducts normality test using Jarque-Bera test. Heteroscedasticity is tested using Breusch-Pagan test whereas residual autocorrelation is tested using Breusch Godfrey test. In addition, Model stability is tested using CUSUM test and CUSUMQ test.

3.8 Data

Annual data from 1971 to 2018 is used. The series include government expenditure, private consumption, and household income, all measured in per capita terms. Data has been sourced from The World Bank database; World Development Indicators.

CHAPTER FOUR: EMPIRICAL FINDINGS AND DISCUSSION

4.0 Introduction

This chapter presents and discusses empirical results. First is descriptive statistics that highlights the summary of the time series data, it is then followed by pre-estimation tests, selection of optimal lag for the model, results of the estimation techniques employed in the study, and findings on diagnostic tests.

4.1 Descriptive Statistics

This section highlights a brief description of the variables under study from 1971-2018. The results are presented in table 1.

Table 1: Descriptive Statistics

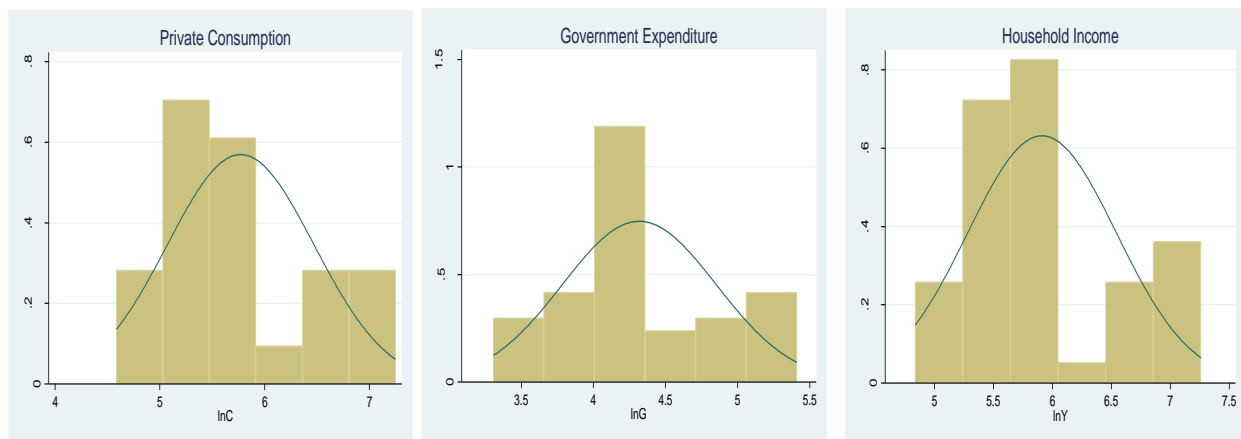
| Variable | Obs | Mean | Std dev | Minimum | Maximum | Skewness | Kurtosis |
|----------------|-----|-------|---------|---------|---------|----------|----------|
| C | 48 | 5.772 | 0.701 | 4.587 | 7.249 | 0.555 | 2.341 |
| G | 48 | 4.318 | 0.534 | 3.307 | 5.410 | 0.330 | 2.433 |
| Y ^d | 48 | 5.913 | 0.632 | 4.838 | 7.260 | 0.638 | 2.431 |

From table 1, the minimum and maximum values for the three variables are not unusually far from their mean indicating that the data has no outliers. The standard deviation is quite small implying that the observations are close to the mean, on average.

All the variables have a positive skewness indicating that the distributions are skewed towards the right. In other words, the right tail is longer or most observations are clustered on the left side of the distribution. Having the skewness very close to zero implies that the data likely comes from a normal distribution which is usually symmetric or zero skewed.

The kurtosis of all variables is positive indicating a distribution that has a peak i.e. curve not flat relative to the normal distribution bell curve. Having the kurtosis less than 3 implies that the tails are not heavy. It also means that the dataset comes from a relatively normal distribution because a normal distribution is supposed to have a kurtosis between zero and three. Figure 4.1 displays a graphical representation of the skewness and kurtosis.

Figure 4.1: Histogram of Private Consumption, Government Expenditure and Income



4.2: Pre-Estimation tests

4.2.1 Normality Test Results

Normality indicates the likelihood of the data set coming from a normal distribution. Thus, to determine whether or not the series are normally distributed, the study employs Shapiro Wilk Wald Test for normality. Table 2 presents the results.

Table 2: Shapiro Wilk Normality Test Results

| Variable | Obs | Wald Statistic (W) | Covariance Maxtrix (V) | z-statistic | p-value | Conclusion |
|----------------|-----|--------------------|------------------------|-------------|---------|---------------|
| C | 48 | 0.935 | 2.949 | 2.301 | 0.011 | Non-normality |
| G | 48 | 0.953 | 2.128 | 1.606 | 0.054 | Normality |
| Y ^d | 48 | 0.913 | 3.974 | 2.936 | 0.002 | Non-normality |

Shapiro-Wilk test for normality suggests rejection of the null hypothesis of normality when the p-value is less than 0.05. From table 2, the p-values for private consumption and income per capita are less than 0.05. Hence, the study rejects H_0 and concludes that the two variables are not normally distributed. Whereas the p-value for government expenditure is larger than 0.05. Therefore, the study concludes that government expenditure follows a normal distribution.

4.2.2 Unit Root Tests in Absence of Structural Breaks Results

Unit root testing is necessary in order to identify a proper estimation technique to avoid spurious results. The study uses ADF test to ascertain whether or not the variables are stationary. Table 3 shows results of the ADF test.

Table 3: ADF Test Results

| Variable. | At Level | | | At First Difference | | |
|----------------|-------------|---------|----------------|---------------------|---------|------------|
| | t-Statistic | p-value | Comment | t-Statistic | p-value | Comment. |
| C | -1.945 | 0.631 | Non-stationary | -4.158*** | 0.005 | Stationary |
| G | -2.018 | 0.592 | Non-stationary | -3.556** | 0.034 | Stationary |
| Y ^d | -1.664 | 0.766 | Non-stationary | -3.586** | 0.031 | Stationary |

***, **, * refers to significance of the 1%; 5% and 10% respectively

The decision criterion is rejecting H_0 whenever the absolute value of the t-statistic is larger than McKinnon's critical values at different significance levels indicated by the asterisk. Alternatively, we reject H_0 if the p-value is less than 0.05. Table 3 reveals that all variables are nonstationary at level. Nevertheless, when the variables are differenced once, stationarity is achieved. This implies that all the variables are I (1). To consolidate the findings, the study employs Phillips Perron test. Table 4 shows the results.

Table 4: Philips Perron Test Results

| Variable. | At Level | | | At First Difference | | |
|----------------|-------------|---------|----------------|---------------------|---------|------------|
| | t-Statistic | p-value | Comment | t-Statistic | p-value | Comment. |
| C | -1.696 | 0.753 | Non-stationary | -5.050*** | 0.000 | Stationary |
| G | -1.882 | 0.664 | Non-stationary | -4.941*** | 0.000 | Stationary |
| Y ^d | -1.509 | 0.826 | Non-stationary | -4.795*** | 0.000 | Stationary |

***, **, * refers to significance of the 1%; 5% and 10% respectively

Similarly, according to Phillips Peron test, all variables are I (1). Since no variable is I (2) or higher, both the ARDL and NARDL are efficient.

4.2.3 Unit Root Test in Presence of Structural Breaks Results

ADF and PP tests have less power in detecting unit root in the presence of structural breaks. Structural breaks usually affect model stability and may cause forecasting errors. For that reason, the study tests for unit root using Bai and Perron test which identifies unknown structural break points. Table 5 indicates BP test results.

Table 5: Bai and Perron Structural Break Test Results

| Variable | Break Date | Optimal Breakpoint | Critical Value** |
|----------------|------------|--------------------|------------------|
| C | 1996 | 204.363 | 8.58 |
| | 2007 | 10.618 | 10.13 |
| G | 1986 | 136.780 | 8.58 |
| | 1998 | 29.222 | 10.13 |
| | 2009 | 67.753 | 11.14 |
| Y ^d | 2007 | 240.254 | 8.58 |

The break in private consumption trend in 1996 as well as the break in government expenditure trend in 1986 and 1998 could be attributed to Kenya's structural changes such as inflation and high lending rate which generally led to depreciation of the Kenya shilling by about 182 percent between 1986 and 1999. In addition, another domestic shock, the post-election violence, might be the explanation for the break in private consumption, government expenditure and income trend in 2007, 2009, and 2007 respectively.

4.3 Optimal Lag Selection Criteria

Selecting an optimal lag length is essential because too many lags not only reduce the degrees of freedom but also increase the probability of multicollinearity and serial correlation. On the contrary, insufficient lags could cause misspecification of the model (Gujarati and Porter, 2009). From table 6, the appropriate lag length according to all information criteria is one.

Table 6: Optimal Lag Selection Criteria

| Lag | LL | LR | FPE | AIC | HQIC | SBIC |
|-----|---------|---------|----------|---------|---------|---------|
| 0 | 61.809 | | | -2.673 | -2.628 | -2.551 |
| 1 | 171.755 | 219.89* | 1.4e-07* | -7.262* | -7.081* | -6.775* |
| 2 | 179.740 | 15.971 | 1.5e-07 | -7.215 | -6.900 | -6.364 |

| | | | | | | |
|---|---------|--------|---------|--------|--------|--------|
| 3 | 187.211 | 14.942 | 1.6e-07 | -7.146 | -6.695 | -5.929 |
| 4 | 190.400 | 6.378 | 2.2e-07 | -6.882 | -6.295 | -5.300 |

Note: * indicates the lag length chosen by a criterion.

4.4 Empirical Results of the ARDL model

The study employs ARDL bounds testing approach to determine whether or not there is cointegration. Table 7 displays the results.

Table 7: Standard ARDL Bounds Test Results

| Test | Statistic | Critical Values | | | | | |
|--------|-----------|-----------------|--------|--------|--------|--------|--------|
| | | 10% | | 5% | | 1% | |
| | | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) |
| F-test | 10.668 | 3.299 | 4.314 | 4.032 | 5.162 | 5.728 | 7.093 |
| t-test | -5.072 | -2.575 | -3.236 | -2.903 | -3.594 | -3.561 | -4.299 |

Kripfganz and Schneider (2018) critical values and approximate p-values

The decision criterion is to reject the null of no cointegration when the F-statistic and t-statistic are above the I (1) critical bound. Note that if the test statistics fall between the critical bounds, the outcome is said to be indeterminate. From table 7, the test statistics are above the I (1) critical bound at all levels of significance. The study, therefore, rejects the null and concludes there is cointegration. The coefficient estimates of the study model, where equation (3.16) is estimated, are shown in table 8.

Table 8: Results of the Standard ARDL (1 1 0) Model

| Variable | Coefficient | t-statistic | p-value |
|--------------------|-------------|-------------|---------|
| Constant | -0.494 | -4.49*** | 0.000 |
| C(-1)) / ECT | -0.416 | -5.07*** | 0.000 |
| G(-1) | 0.511 | 5.51*** | 0.000 |
| Long run estimates | | | |
| Variable | Coefficient | t-statistic | p-value |
| G | -0.606 | -2.48** | 0.017 |
| Y ^d | 1.624 | 7.87*** | 0.000 |
| Obs | 47 | | |
| R ² | 0.860 | | |
| Adj R ² | 0.846 | | |

***, **, * refers to significance of the 1%; 5% and 10% respectively

Table 8 reveals that in the long run, 1 percent increase in government expenditure per capita significantly decreases private consumption per capita by 0.61 percent *ceteris paribus*. However, 1 percent increase in government expenditure in the short run significantly increases private consumption by 0.51 percent. These results support classical and neoclassical theoretical foundation where government expenditure is argued to eventually suppress private consumption through the crowding out effect; increased government spending requires more taxes or borrowing which usually come at the expense of private spending. Other studies that rendered the Keynesian plea unconvincing are Ho (2001), Kwan (2006), Bouakez and Rebei (2007), among others.

The findings sharply contrast with the findings of Gichohi (2015) and Kametu (2018). The studies found a significant positive correlation between the two types of expenditure in Kenya. This is attributed to addition of disposable income in the model as evidenced by Dahmardeh et al. (2011). Their study estimated two models; one model with disposable income and the other without disposable income. The results showed that when disposable income is incorporated in the model, government expenditure substitutes private consumption.

The study also found that 1 percent increase in income per capita significantly increases private consumption per capita by 1.62 percent *ceteris paribus*. This is because when income increases the marginal propensity to consume rises hence more consumption. Also, with more income, individuals are able to increase their consumption and savings for private investments. These results agree with Dahmardeh et al. (2011), Chen et al. (2014), and Keho (2019) among others.

The ECT measures the speed at which short run deviations adjust towards the long run. From table 8, the adjustment coefficient (-0.416) implies that 41.6 percent of the short run disequilibrium is corrected within a year. The adjusted R squared (0.846) implies that the estimated model describes 84.6 percent of variations in private consumption.

4.4.1: ARDL Diagnostic Tests

From the diagnostic perspective, table 9 displays post estimation test results.

Table 9: Results of the Diagnostic Tests for the ARDL model.

| Test | Test statistic | p-value | Null Hypothesis |
|-------------|----------------|---------|-----------------|
| Jarque-Bera | Chi2(2) = 0.25 | 0.8847 | Normality |

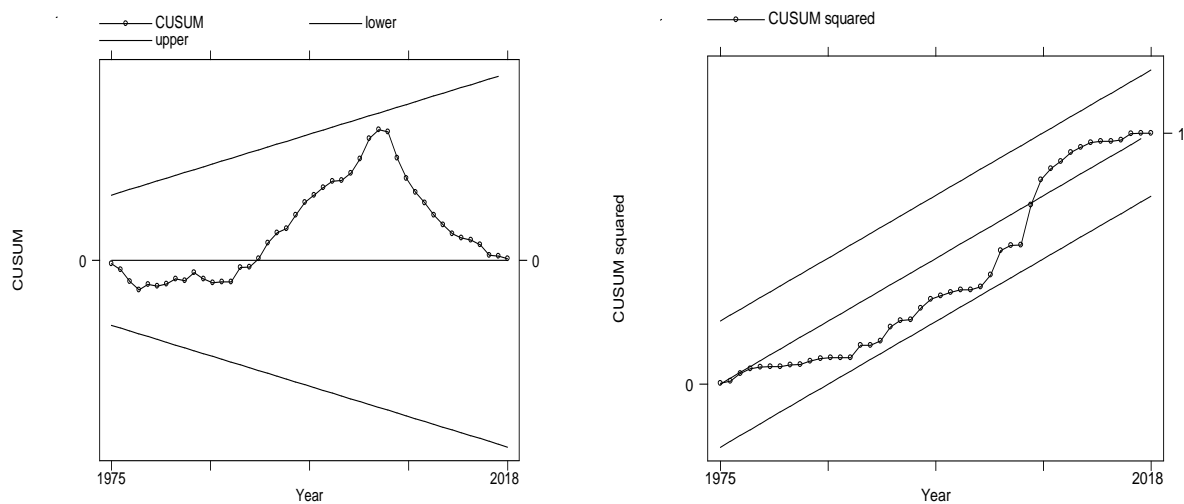
| | | | |
|--------------------|-----------------|--------|-----------------------|
| Breusch-Godfrey LM | Chi2(1) = 0.736 | 0.3909 | No serial correlation |
| Breusch-Pagan | Chi2(1) = 0.88 | 0.3469 | Constant variance |
| Ramsey Reset | F(3, 39) = 1.04 | 0.3870 | No omitted variables |

Having a p-value of less than 0.05 in all tests, the study fails to reject the null hypothesis. The study concludes that the residuals follow a normal distribution (using Jarque-Bera test), the residuals are not serially correlated (using LM test), and they are homoscedastic i.e. they have constant variance (using Breusch-Pagan test). The study also concludes that the ARDL (1 1 0) model is properly specified (using Ramsey RESET test).

4.4.2 ARDL Model Stability Test Results

The study conducts CUSUM and CUSUMSQ tests to investigate stability of the ARDL (1 1 0) model. Figure 4.2 reveals the results of the tests.

Figure 4.2: Standard ARDL CUSUM & CUSUMQ Results



Both the CUSUM and CUSUMQ lines fall within the 0.01 significance line. We therefore conclude that the standard ARDL (1 1 0) model is stable and can be used for forecasting.

4.5 Empirical Results of the NARDL model

The study employs NARDL approach to primarily determine if the correlation between public and private expenditure is asymmetric and to examine the nature of the effect of positive and negative shocks of government expenditure on private consumption. Table 10 displays the findings, where equation (3.19) is estimated.

Table 10: Results of Nonlinear ARDL Model

| Variable | Coefficient | t statistic | p-value |
|----------------|-------------|-------------|---------|
| Constant | -1.197 | -2.40** | 0.022 |
| C(-1) / ECT | -0.623 | -6.03*** | 0.000 |
| G_POS(-1) | -0.257 | -2.08** | 0.046 |
| G_NEG(-1) | -0.332 | -3.01*** | 0.005 |
| D(C(-1)) | -0.106 | -0.93 | 0.358 |
| D(C(-2)) | -0.213 | -1.93* | 0.062 |
| D(G_POS) | 0.046 | 0.28 | 0.780 |
| D(G_POS(-1)) | 0.291 | 2.00* | 0.054 |
| D(G_POS(-2)) | 0.282 | 1.99* | 0.055 |
| D(G_NEG) | -0.0124 | -0.09 | 0.933 |
| D(G_NEG(-1)) | 0.168 | 1.23 | 0.229 |
| D(G_NEG(-2)) | 0.259 | 1.81* | 0.080 |
| Y ^d | 0.842 | 7.34*** | 0.000 |

Asymmetry Statistics:

| Variable | Long run effect (+) | | | Long run effect (-) | | |
|--------------------|---------------------|-------------|---------|---------------------|-------------|---------|
| | Coefficient | F statistic | p-value | Coefficient | F statistic | p-value |
| G | -0.412 | 3.132* | 0.086 | 0.533 | 6.037** | 0.020 |
| Long run asymmetry | | | | Short run asymmetry | | |
| Variable | F statistic | | p-value | F statistic | | p-value |
| G | 16.03*** | | 0.000 | 0.533 | | 0.471 |

Cointegration Test Statistics:

| | | | |
|-------------|--------|-------------|--------|
| t statistic | -6.033 | F statistic | 19.537 |
|-------------|--------|-------------|--------|

From table 10, both the F-statistic and t-statistic are above the upper bound at one percent significance level. Therefore, the study rejects the null of no cointegration. Having ECT as negative and statistically significant further confirms presence of cointegration. On the other hand, it implies that any shock or deviation will be fully adjusted in less than two years (precisely 19 months).

The results show that the deterministic variable, household income (Y^d), significantly increases private consumption at elasticity coefficient 0.84. As argued by the Keynesian theorem, increased income raises the marginal propensity to consume hence more consumption. Also, when income increases, individuals not only increase their consumption but also save more for private investments. The results agree with Dahmardeh et al. (2011), Chen et al. (2014), and Keho (2019) among others.

Asymmetry statistics reveal that in the short-term, positive shocks of government expenditure significantly decrease private consumption whereas negative shocks of government expenditure significantly increases private spending. However, in the long term, both positive shocks and negative shocks of government expenditure significantly decrease private consumption by 41 percent and 53 percent respectively. These findings are in line with the classical argument; government expenditure suppress private spending because it is financed by tax revenue and borrowed funds which could have been used for private investments. Another study that found similar results using NARDL is Almosabbeh (2019).

Results related to the test of asymmetry show that the short run asymmetry is not significant. However, under the long run, the F statistic is bigger than the critical value and p-value is less than 0.05. Therefore, the study rejects the null of symmetry and concludes that the cointegration between government expenditure and private consumption in Kenya is asymmetric. The result proves the hypothesis of this research which states that the public-private relationship is nonlinear. Other studies that established asymmetry between the variables include Kwan (2006) and Almosabbeh (2019).

4.5.3: NARDL Diagnostic Tests

Table 11 presents post estimation test results for the NARDL model.

Table 11: Results of the Diagnostic tests for the NARDL model

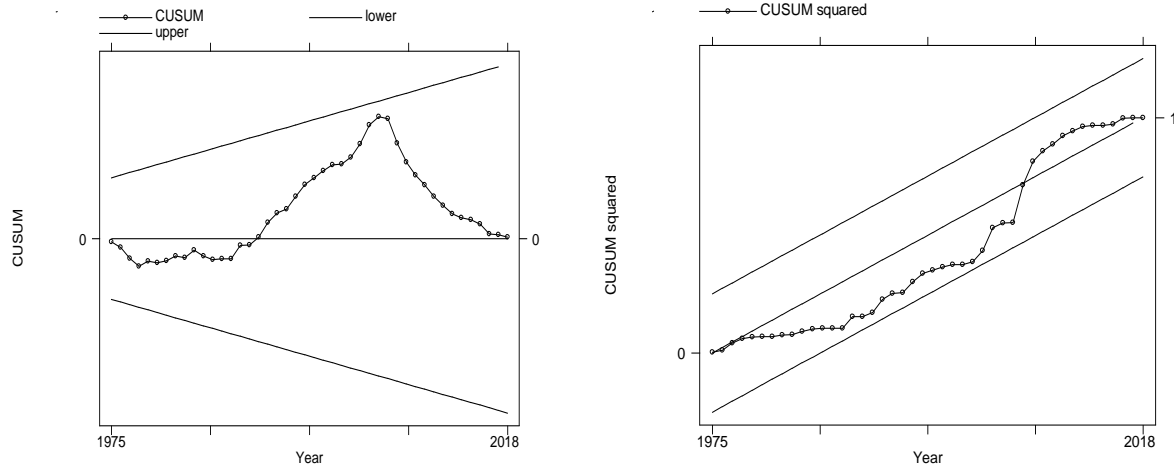
| Test | Test statistic | p-value | Null Hypothesis |
|------------------|------------------|---------|-----------------------|
| Jarque-Bera | Chi2 = 2.923 | 0.232 | Normality |
| Portmanteau test | Chi2 = 16.30 | 0.698 | No serial correlation |
| Breusch-Pagan | Chi2 = 0.469 | 0.494 | Constant variance |
| Ramsey Reset | F(3, 39) = 2.117 | 0.120 | No omitted variables |

Having the p-value as less than 0.05 in all tests, the study fails to reject the null in all tests and concludes that; the residuals follow a normal distribution; there is no serial correlation; the residuals have a constant variance; and the model has no omitted variables.

4.5.4 Model Stability Test Results

The study conducts CUSUM and CUSUMSQ tests to investigate stability of the estimated coefficients. Figure 8 reveals the results.

Figure 4.3: NARDL CUSUM & CUSUMQ Results



From figure 4.3, both the CUSUM and CUSUMQ lines fall within the specified boundaries. Hence we conclude that the NARDL model parameters are stable and can be used for forecasting.

CHAPTER FIVE: CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

Chapter five comprises of summary of the study and provision of policy implications. It also includes limitations of the study. Lastly, it presents suggestions on aspects of this study that require more research.

5.2 Summary

The study aimed to examine the impact of government expenditure on private consumption in Kenya using ARDL approach. The theoretical framework of this study is centered on the intertemporal utility maximization model which explains substitutability between public and private consumption. The study used annual data ranging from 1971-2018. The variables used in the study include private consumption per capita, household income per capita, and government expenditure per capita. They were measured in natural logarithm form.

The ARDL bounds test showed evidence of cointegration between the variables. The results indicate that government expenditure adversely affects private consumption; 1 percent increase in government expenditure significantly reduces private consumption by 0.61 percent. The findings advocate the classical and neoclassical theoretical foundation. The study also established a direct relationship between disposable income and private consumption as argued by the Keynesian school; 1 percent increase in income per capita significantly increases private consumption by 1.62 percent.

The study also aimed to investigate asymmetry between private consumption and government expenditure using the NARDL approach. Results indicate that when government expenditure increases, it decreases private consumption by 0.41 percent and is statistically significant. On the contrary, when government expenditure decreases, it also decreases private consumption by 0.53 percent and was found to be statistically significant. From these results, it is clear that the relationship is asymmetric because the effect of positive shocks differ from the effect of negative shocks in both magnitude and direction. As evidenced by the symmetry test, the long run asymmetry coefficient is statistically significant implying that the relationship between private consumption and government expenditure is indeed asymmetric.

5.3 Conclusion

From the findings, government expenditure crowds out private consumption thus confirming the classical and neoclassical argument. These findings however contradict previous case studies in Kenya who found that the public-private relationship is positive. It is because this study considered the argument brought forth by Graham (1993), that excluding disposable income might invalidate the public-private consumption relationship. This study asserts that indeed disposable income plays a significant role in the public-private relationship.

In addition, the study established that the public-private relationship in Kenya is nonlinear. Implying that the linearity assumption in empirical analysis is a misspecification error and could give misleading results. Therefore, future studies should always take into consideration the nature of the relationship.

5.4 Policy Implications

Based on the findings, the study gives the following policy implications;

- Increased government expenditure is financed through deficit financing which raises the interest rate because government bonds compete with private securities for loanable funds in the money market. This lowers the return on private investments and consequently, private consumption is negatively affected. On a similar note, borrowing from the public to finance government expenditure is like withdrawing capital which could have been used for private investments and consumption.
- Higher taxes is an alternative way of financing government expenditure. This not only put upward pressure on prices but also reduce household income thus lowering the incentive to consume.

5.5 Limitations of the Study

In Kenya, the informal sector represents more than 80 percent of employment. The informal space is opaque and has no financial records hence it is difficult to know income and consumption levels. Therefore, the available data may not bring out the true picture of the entire private consumption and income per capita of the Kenyan economy.

5.6 Suggestions for Further Research

The study recommends that future studies should aim to investigate which components of government expenditure better facilitate growth in private consumption in Kenya. Furthermore, the studies could factor in the burgeoning domestic debt in Kenya to examine how it shapes private consumption.

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