PUBLIC DEBT, SELECTED MACROECONOMIC FACTORS, GOVERNANCE AND SUSTAINABLE ECONOMIC GROWTH IN THE EAST AFRICA COMMUNITY MEMBER COUNTRIES

BY

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DECLARATION

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DEDICATION

To the Father, the Son, and the Holy Spirit,

To my dear wife Caroline, my lovely children Breana, Ryan and Prince for the support and always being there for me,

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ABBREVIATIONS AND ACRONYMS

AAAA	Addis Ababa Action Agenda
ADF	Augmented Dickey–Fuller
AFCFTA	Africa Continental Free Trade Area
AGOA	African Growth and Opportunity Act
AIC	Akaike information criterion
ARDL	Autoregressive Distributed Lag
COMESA	Common Market for Eastern and Southern Africa
COVID-19	Coronavirus Disease of 2019
CPI	Corruption Perception Index
DWS	Durbin-Watson statistic
EAC	East African Community
EEMU	European Economic and Monetary Union
FDI	Foreign Direct Investment
FPE	Final prediction error
GCE	Government Consumption Expenditure
GCF	Gross Capital Formation
GDP	Gross Domestic Product
GLS	Generalized-Least-Squares
GMM	Generalized methods of moments
GNI	Gross National Income
HDI	Human Development Index
HQC	Hannan-Quinn criterion
IGGI	Inclusive Green Growth Index
IMF	International Monetary Fund
KPI	Key Performance Indicator
MDG	Millennium Development Goals
MENA	Middle East and North Africa
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PLS	Panel Least Squares

SD	Standard Deviation
SDGs	Sustainable Development Goals
SEG	Sustainable economic growth
TFP	Total Factor Productivity
UN	United Nations
VIF	Variance Inflation Factor
WB	World Bank
WCED	World Commission on Environment and Development
WDI	World Development Indicators
WEO	World Economic Outlook
WGI	Worldwide Governance Indicators
WTO	Word Trade Organization

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ABSTRACT

In the last decade, the EAC countries have witnessed disparities between sustainable economic growth and rapid increase in the public debt. Consequently, there have been reclassification of these countries from low to medium and high-risk categories, due to the debt distress risk, raising concerns over debt sustainability. The governance indices have declined over the same period, eliciting public debate on the use of the public funds for public good. These unfolding events could potentially limit further borrowing to fund government operations especially due to budget deficits, thereby negatively affecting economic growth. Public and development finance practitioners are yet to agree on the effects of public debt on sustainable economic growth. Some theorists affirm that debt contributes to economic growth through capital accumulation, while other theorists opine that high levels of debt can trigger macroeconomic factors such as high interest rate and inflation rate, which can crowd out private investment leading to low economic growth. The study sought to establish the relationship between public debt and sustainable economic growth in the EAC member countries for the period 2000 to 2019. The study also sought to incorporate the influence of selected macroeconomic factors and governance in the relationships. The study is generally anchored on the Keynesian theory, which proposes that debt adds value than risk to a country's economic growth. The study which adopted a panel longitudinal research design was premised on a positivistic philosophy as it relied on a secondary panel data of the variables. Data analysis in Eviews and SPSS was useful in conducting the analysis and inferring the interpretations thereon. Specifically, the study tested four hypotheses and nineteen sub hypotheses. With a two-year lag, the study established positive effects of public debt on sustainable economic growth levels in EAC member countries. Specifically, total debt and domestic debt have statistically significant positive effects on sustainable economic growth. In considering the mediating effects of specific macro-economic factors, the study established that inflation strengthens the relationship between total debt and sustainable economic growth. Gross capital formation strengthens the link between sustainable economic growth and external debt as well as domestic debt. The levels of government consumption expenditure strengthen the bond between total debt and sustainable economic growth. The study also established that inflation, gross capital formation and government consumption expenditure explains the connection between external debt and sustainable economic growth. The governance indicators for the EAC member countries have notably been not conducive over the years which consequently have affected the productivity of the public debt. Specifically, the study finds that governance strengthens the bond between domestic debt and sustainable economic growth on one hand and diminishes the relationship between total debt and sustainable economic growth on another hand. The study thus recommends that EAC member countries should improve on the governance indicators to attain the beneficial effects of public debt. The policy makers are encouraged to improve the macro-economic framework by improving on the indicators that strengthen the debt sustainable economic growth relationship. The diminishing indicators should also be improved on as well. As a guide to future research direction, the study recommends that an optimal level of debt for the countries be established especially the acceptable public debt threshold. Given that some macroeconomic factors strengthen the relationships while others diminish the relationships, studies can investigate the comfortable levels of the specific macroeconomic indicators for the diverse debt regimes. Lastly, studies can explore the debt covenants and the clauses therein to ascertain the effectiveness of the compliance with the debt covenants for attainment of desired sustainable development goals.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Governments require financial resources for public expenditure. Governments can borrow to bridge the financial resources gap in the event domestic revenues are not adequate. Public and development finance practitioners are yet to agree on the effects of public debt on sustainable economic growth. This study sought to establish the relationship between public debt and sustainable economic growth. The study modeled debt as the independent variable, that accounts for the changes in sustainable economic growth, which is the dependent variable. The main proponent of public debt affirms that debt contributes to sustainable economic growth through capital accumulation (Keynes, 1935).

The study also sought to incorporate the influence of macroeconomic factors (inflation, interest rate, gross capital formation and government consumption expenditure) as the intervening variables. High interest rate and inflation rate can be triggered by high levels of debt, which can crowd out private investment leading to low sustainable economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977). In addition, the governance factors were modeled as the moderating variable in the debt and sustainable economic growth relationship. Governance, in particular corruption and political instability can lead to capital flight, erosion of capital formation, high government consumption, thereby slowing down sustainable economic growth (Alesina & Tabellini, 1989; Anoruo & Braha, 2005; Benfratello, Del Monte, & Pennacchio, 2018; Kim, Ha, & Kim, 2017).

Globally, the sustainable economic growth remained at 3.1% during the 2017 and 2018 period, with an anticipated slowdown in the next two years, largely because of global slack dissipates and the removal of policy accommodations by majority nations (World Bank,

2018). For the year 2020, the economy is projected to close at - 4.9%, approximately 1.9% lower than WEO projections due to COVID-19 pandemic effects (International Monetary Fund, 2020). About 5.4% growth in global economy is projected in 2021 due to anticipated recovery from COVID-19 pandemic effects (International Monetary Fund, 2020). In the last decade, the long-term debt from developed countries to poor countries increased by over 50 % to $309 billion in 2017, due to increase in bond issuance (World Bank, 2018). Inflation has been on the decline up to 2017 with an expectation of increase to 3.83% in 2019 (Statista, 2018). On country governance, donors and international financial institutions have continued to engage emerging economies on reforms in particular, reduction of corruption, encouragement of citizen voice, gender equality as well as accountability (Kaufmann & Kraay, 2018). In the EAC member countries, the GDP and inflation rates remained at an average of 4.2% and 8% respectively, for the last two decades, despite key challenges such as high unemployment rates, insufficient infrastructure and low levels of industrialization (East African Community, 2017; World Bank, 2019). The average interest rates across the region have dropped from 13.4% to 8.65% for the last two decades (World Bank, 2019). In the EAC member countries, the average public debt as a percentage of GDP has risen from 22% in 2010 to 34% in 2017 (World Bank, 2019). Public debt increase has raised concerns over debt sustainability among local policy makers and international lenders (International Monetary Fund, 2018). On country governance, the region has experienced loss of control over corruption, political stability and government effectiveness in the last two decades (World Bank, 2015).

This study was anchored on Keynesian theory of public debt and supported by the crowding out effect theory, agency theory and balanced growth theory. The Keynesian theory of public debt, proposes that debt adds value than risk to a country's economic growth (Keynes, 1935).

The theory affirms that debt contributes to capital formation, which leads to economic growth. In the crowding out effect theory, Musgrave (1959) explained that an increase in public debt, will trigger high interest rates that limits private investment, thus impede sustainable economic growth. According to this theory, the reduction in private investment come into effect because the high public debt pushes up interest rates, crowding out private investment because private sector cannot easily access capital and in the process slows down sustainable economic growth (Musgrave, 1959). On the other hand, the agancy theory stipulates that an agent relationship is a fiduciary and consensual relationship between two parties where one party (agent) acts on behalf of the other party (principal) and where the agent can form legal relationships on behalf of the principal (Ross, 1973; Mitnick, 1973). The political and economic institutions (agents) through which a nation provides public goods, become vulnerable to influences that causes them to serve illegitimate and socially disastrous objectives (English, 2013). Specifically, corruption impedes sustainable economic growth by limiting productivity, investment and pushing up government consumption (Benfratello et al., 2018; Kim et al., 2017). Nurkse (1952), author of balanced growth theory states that, the government should make simultaneous capital investment in multiple sectors, to enlarge the market size, boost productivity, incentivize private investment in order to achieve balanced growth and development.

1.1.1. Public Debt

Sturzu (2014) defines public debt as the borrowing by the central government in any country to fund government expenditure. Governments borrow to fill national budgetary deficit especially where domestic revenue is inadequate. Public debt can be external debt or domestic debt. External debt by a nation is owed to non-residents (World Bank, 2015). Domestic debt is public debt issued under local regulations (Reinhart & Rogoff, 2011).

Beside debt, government can also use domestic revenue, FDI, international trade, foreign aid, and external remittances to finance sustainable economic growth programs. Factors such as budgetary deficit, inflation, current account balance, governance levels, employment levels, economic performance and political stability determine a country's ability to borrow (Sávai and Kiss, 2018).

Public debt improves growth of the economy, mainly through capital accumulation (Poirson, Ricci, & Pattillo, 2014; Schclarek, 2004). Capital accumulation includes a country's assets and infrastructure such as roads, railways, schools, hospitals, buildings, and airports. Acquiring debt for capital development is basic, like foundation of an organization, which will add to a profitable yield henceforth and positive financial development (Keynes, 1935). However, high levels of debt can lead to debt overhang problem, trigger high interest rates and inflation rates which can crowd out private investment leading to low sustainable economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977). In addition, harms of public debt may include factors such as high interest payments, increased taxation to raise funds for loan repayment, diminishing national savings, spending cuts and high inflation rate (Arize, Kallianotis, Liu, Malindretos & Panayides, 2014). With such adverse effects, the highly indebted developing countries would be inclined to seek debt relief as a means of boosting sustainable economic growth.

Debt and capital expenditure as percentages of GDP are used as measures of public debt and capital accumulation respectively (World Bank, 2015). Sustainable economic growth is measured by SEG index (United Nations, 2015). Debt and capital accumulation are the explanatory variables, that accounts for the changes in sustainable economic growth, which is the dependent variable (Georgiev, 2014; Keynes, 1935). It is expected that public debt will

positively impact the economic progress mainly through capital accumulation (Poirson, Ricci, & Pattillo, 2014; Schclarek, 2004).

1.1.2. Selected Macroeconomic Factors

These are factors related to the overall functioning of the economy (World Bank, 2014). Macroeconomic factors can also be defined as the main signposts signaling the current trends in the economy (Ida & Albert, 2014). Interest rates, inflation rates, government consumption expenditure and gross capital formation, were the selected key macroeconomic factors that affect debt-sustainable economic growth relationship, based on theoretical foundation of this study and existing empirical studies (Keynes, 1935; Krugman, 1988; Musgrave, 1959; Myers, 1977; Poirson et al., 2014). Governments roll out financial and economic guidelines to control the numerous macroeconomic variables in an effort to manage the economy (Kashi & Tash, 2014).

The objective of Macroeconomic policies is to minimize uncertainties in making economic decisions (World Bank, 2014). In addition, macroeconomic policies aim at stability and sustainability of the economic development, stability of prices, employment creation, balance of payments, environmental sustainability, equity in dissemination of income and all-encompassing structure to public finances (Keynes, 1935; Dasgupta & Hagger, 1971). Growth in macroeconomic factors such as capital accumulation as a consequence of borrowing, positively supports the sustainable economic growth (Putunoi & Mutuku, 2013; Schclarek, 2004). However, high interest rate and inflation rate can be triggered by high levels of debt, which can crowd out private investment leading to low sustainable economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977).

Inflation is measured by CPI, while the capital formation and government consumption expenditure are estimated as a ratio of GDP (World Bank, 2015). Real interest rate after adjustment for inflation can be used to measure the levels of interest rate in a country (World Bank, 2015). The macroeconomic factors, will be analyzed as the intervening variables that explain the relationship between debt which is independent variable and sustainable economic growth which is the dependent variable (Keynes, 1935; Krugman, 1988; Musgrave, 1959; Myers, 1977; Poirson et al., 2014).

1.1.3. Governance Factors

Governance is the application of power to control the affairs of a country (United Nations, 2006). Governance is a process whereby power is applied in administration for the purpose of developing the economic as well as social aspect of a nation (World Bank, 1992). Tenets of good governance include participation, harmony, responsibility, transparency, responsiveness, effective, efficient, impartiality, inclusivity, and compliance with the law (Gisselquist, 2012). Voice and accountability, absence of violence, political stability, effectiveness of government, the rule of law, corruption and the quality of regulations are the indicators of governance (Kaufmann & Kraay, 2018; World Bank, 2015).

Researchers have noted that low financial growth, wars, poverty, army invasion, environmental dilapidation, and terrorism are effects of political instability (Alesina, Ozler, Roubini, & Swagel, 1996). Political instability can also lead to capital flight, thereby slowing down sustainable economic growth (Alesina & Tabellini, 1989; Benfratello et al., 2018). Governance has also been found to determine a country's ability to borrow externally to finance government programs (Sávai and Kiss, 2018). This is mainly through international financial lenders who may impose stringent governance requirement before advancing debt

specially to developing nations. Corruption on the other hand, slows down sustainable economic growth by limiting productivity and restricting investment (Anoruo & Braha, 2005; Kim et al., 2017). It is from this background that a nation will put in place institution reforms to enhance governance because of its implication on the economy.

Governance indicators were chosen for this study because of their deteriorating trend in the wake of escalating public debt among EAC member states, raising concerns among local and international development stakeholders (Kaufmann & Kraay, 2018; World Bank, 2015). Word Governance Indicators (WGI) are used to measure the levels of governance in any country (World Bank, 2015). From the existing studies, the governance indicators will be analyzed as the moderating variables that affect the debt-sustainable economic growth relationship (Anoruo & Braha, 2005; Kim et al., 2017).

1.1.4. Sustainable Growth

Economic growth is the monetary worth of goods and services created over specific time period (Roser, 2011). Alternatively, it refers to additional worth of goods and services after adjusting for taxes and subsidies, produced by residents in a country over a given period (World Bank, 2015). Human capital, life expectancy, fertility rate, foreign aid, government consumption, FDI, rule of law, fiscal policy, inflation rate, trade, natural resources, monetary policy, public sector reform and political stability are some of the dynamics that influence sustainable economic growth. (Barro, 1996; Chirwa and Odhiambo, 2016). Going forward, the world is now shifting the focus from economic growth to sustainable economic growth which refers to the pursuit of economic growth while putting social and environmental factors under consideration (OECD, 2011).

There exists no consensus among scholars on the nexus between economic growth and human development. Some studies opine that achievement of sustainable economic growth leads to human development, poverty reduction and employment (Ranis, Stewart, & Ramirez, 2000; Rwaski, 1979). This implies that as the economy expands, there is likely to be more jobs creation and more income for families, which contributes to the alleviation of poverty. Other studies have associated sustainable economic growth with income inequalities, which in turn negatively affects health and life expectancy especially for the poor (Garcia-Penalosa and Turnovsky, 2006; Mackenbach, 2002). In additional, economic insecurity, inflation, environmental dilapidation, climate change, mass migration, brain drain, labor mobility, corruption, increased energy consumption has also been associated with rapid sustainable economic growth (Knight, 2016; Chaitanya,2007). Divergence of the views could be influenced by contextual variables, which must be evaluated carefully by individual countries to inform policy direction.

Consideration for social and environmental goals in the pursuit of sustainable economic growth is vital for long term economic stability in a country (Government of Canada, 2018). Sustainable Economic Growth (SEG) index reflecting economic growth, social and environmental dimensions was used as the dependent variable (Shikha, Sonia, & Radtasiri, 2018). The SEG index was chosen because it is simple to compute, convenient, transparent and consistent with expert views (Shikha et al., 2018). The economic, social and environmental factors, will be given equal weight, which is a norm for most of the composite indices (Chowdhury & Squire, 2006).

1.1.5 The East African Community Member Countries

Established in 1967, the EAC is an economic bloc comprising of 6 nations namely Tanzania, Kenya, Rwanda, South Sudan, Uganda and Burundi (East African Community, 2017). EAC countries total land space is approximately, 2.5M square kilometers, with GDP of about US$ 193 billion and a population estimated at 177 million people out of which 22% are in the urban areas (East African Community, 2017). EAC member countries governing structures include the Summit, Council of Ministers, Sectoral Committees, Co-coordinating Committee, Court of Justice, Legislative Assembly and a Secretariat based at its headquarters in Tanzania (East African Community, 2017). The EAC member countries treaty was signed in 1999 and operationalized in 2000, with a vision of seeking growth, competition, safety, steady and politically cohesive community (East African Community, 2017).

In 1994, the COMESA market was formed, to leverage on the huge market size of the region, for better economic and social cohesion (COMESA, 2018). In 2000, the AGOA was signed into law by the USA, to incentivize EAC member countries and rest of the Africa nations to open up their economies, through creation of free markets (USA, 2000). In year 2013, EAC member countries and rest of African nations rolled out a 50-year strategic plan aimed at fostering growth, through social and economic transformation (African Union Commission, 2013). In 2018, the EAC member countries were among the 44 African countries that signed the AFCFTA treaty in Kigali Rwanda, creating a single market to enhance free trade movement and unify the currency (Ernst & Young, 2015). From 2017 to 2021, the EAC member nations focus, is the establishment of distinct customs territory, expansion of infrastructure, mobility of factors of production, industrial development, promotion of good governance and institutional reforms (East African Community, 2017).

Annually, the EAC member countries have recorded an average of 4.2 % GDP growth and an inflation rate of 8% for the last decade, despite key challenges such as high unemployment rate, insufficient infrastructure and low levels of industrialization (East African Community, 2017; World Bank, 2015). Debt as a percentage of GDP has risen from 22% in 2010 to 34% in 2017 (World Bank, 2019). Expansion of government expenditure, inflation, rise in global interest rates have been cited as some of the causes of debt increase in the EAC member countries and Africa at large (Fole, 2003). On country governance, statistics shows loss of control over rule of law, corruption, government effectiveness and political stability (Kaufmann & Kraay, 2018). The EAC member countries were specifically chosen for the study because they carry considerable amount of public debt, yet there still exist few studies on public debt, macroeconomic factors, governance, and sustainable economic growth.

1.2 Research Problem

Nations require financial resources to provide public goods and services. In the event of inadequate government revenue, nations borrow to fill the financial resources gap. The main proponent of public debt affirms that debt contributes to sustainable economic growth (Keynes, 1935). Debt contributes to the sustainable economic growth, mainly through capital accumulation (Poirson et al., 2014; Schclarek, 2004). On the other hand, high levels of debt can trigger macroeconomic factors such as high interest rate and inflation rate, which can crowd out private investment leading to low sustainable economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977). Despite these strong views, the public debt, macroeconomic factors, governance, and sustainable economic growth relationships remains ambiguous.

In the last two decades, the EAC countries have witnessed unexplained disparities between sustainable economic growth and the rise in public debt levels. On average, annual sustainable economic growth remained at 4.2%, against an average rise in public debt levels from 22% in 2010 to 34% in 2017 (East African Community, 2017; World Bank, 2019). Kenya's public debt level is expected to rise to 60.7 % of the GDP by 2019, surpassing the 50% ceiling recommended by the IMF (International Monetary Fund, 2018). Burundi public debt has grown up to 63.7% of the GDP while Uganda's public debt is expected to raise to 50% of GDP by the year 2021 (African Development Bank, 2021; Government of Uganda, 2020). The rapid growth in public debt has led to debt distress risks reclassification of the EAC countries from low to medium and high-risk categories, raising more concerns over debt sustainability (International Monetary Fund, 2018). If these concerns are not addressed, the EAC countries may not be able to obtain more funds from lenders to finance budgetary deficits, thereby affecting government operations.

Coincidentally, the public debt levels in the EAC member countries have increased over the same period that these countries have experienced deterioration in governance indicators in particular corruption and political stability (World Bank, 2015). These countries have continued to score poorly on the corruption perception index in the last two decade (Transparency international, 2020). These trends raise concern, whether huge government borrowings experienced in the last two decades is contributing to economic development or rather is lost through corruption. If these concerns are not addressed, the EAC countries may not be able to attract investors or borrow to fund budgetary deficits, thereby affecting government operations. In addition, corruption can slow down economic growth through limited productivity and restricted investment (Anoruo & Braha, 2005; Kim et al., 2017).

Researchers linking debt and economic growth in EAC countries have arrived at different and conflicting conclusions (Putunoi & Mutuku, 2013; Babu et al. 2014; Were, 2001). These diverse conclusions potentially contribute to conflicting macroeconomic policy recommendations to nations. The diverse conclusions could be attributed to the failure to address the potential effects of governance and macroeconomic factors, creating a conceptual gap. This is because the EAC member countries have experienced deterioration in governance indicators in particular, corruption and political stability which have the potential to generate capital flight, erodes capital formation, thereby slowing down sustainable economic growth (World Bank, 2015; Alesina & Tabellini, 1989; Benfratello et al., 2018).

The world is shifting focus from economic growth (EG) to sustainable economic growth (SEG), which refers to the pursuit of economic growth while putting social and environmental factors under consideration (United Nations, 2015). The existing local and international studies such as Putunoi and Mutuku (2013), Were (2001), Babu et al.(2014), Cooray, Dzhumashev and Schneider (2017), Poirson et al.(2014), Jalles (2011), Alesina and Tabellini (1989) and Pattillo et al.(2002) have adopted GDP as the estimate of economic development. GDP refers to additional worth of goods and services after adjusting for taxes and subsidies, produced by residents in a country over a given period (World Bank, 2015). GDP, therefore, does not measure the social and environmental impact aspect of sustainable economic growth. SEG index captures sustainable economic growth, considers social and environmental facets of sustainable economic growth (Shikha et al., 2018). However, minimal studies have been done on public debt, macroeconomic factors, governance, and sustainable economic growth relationships using the SEG index, creating a conceptual gap.

ARDL plays a critical role in analyzing economic relationships because a change in an economic variable could have an effect immediately as well as in the subsequent period (Pesaran et al., 1999). The main study on public debt and sustainable economic growth relationship in the EAC member countries, done by Babu et al.(2014), used Cobb-Douglas technology model. This analytical model does not capture autoregressive nature of the economic variables in the study. Within the EAC member countries, minimal studies have used the ARDL model to examine the effect of public debt, macroeconomic factors, governance, and sustainable economic growth relationships, creating a methodological gap. The research question remains, what are the effects of public debt, macroeconomic factors, governance factors on the sustainable economic growth?

1.3 Research Objectives

The research sought to accomplish the following broad and explicit objectives.

1.3.1 General Objective

The general objective was to establish the relationships among public debt, selected macroeconomic factors, governance factors, and sustainable economic growth in the EAC member countries.

1.3.2 Specific Objectives

The specific objectives were,

i. To establish the effect of public debt on sustainable economic growth in the EAC member countries.
ii. To determine the effect of macroeconomic factors on the relationship between public debt and sustainable economic growth in the EAC member countries.

iii. To establish the effect of governance factors, on the relationship between public debt and sustainable economic growth in the EAC member countries.

iv. To determine the joint effect of public debt, macroeconomic factors, and governance factors on sustainable economic growth in the EAC member countries.

1.4 Value of the Study

The study provides additional knowledge on the effect of macroeconomic factors and governance on the link between public debt and economic development. The study provides important quantitative information into public debt and adds to the existing body of knowledge from the EAC member countries perspective. The study also enriches the body of knowledge on public debt and sustainable economic growth relationship by identifying existing knowledge gaps and making recommendations for future studies.

The study looked at the combined effect of public debt, macroeconomic factors, and governance, on the achievement of sustainable economic growth. The study therefore sheds light on the importance of public debt, macroeconomic factors, and governance on the achievement of the economic development. It is anticipated that EAC member countries will adopt the deductions and recommendations of this research and put in place appropriate macroeconomic and governance policies to achieve the desired sustainable economic growth.

The research contributes to the theory of finance, by enhancing the understanding and application of the Keynesian theory of public debt, crowding out effect theory, agency theory and balanced growth theory. In addition, the study contributes to practice on finance by linking the literature on public debt and sustainable economic growth by introducing macroeconomic factors as the intervening variable and governance indicators as the

moderating variables. The study highlights the need for the government, finance practitioners and the wider SDG's practitioners to consider economic factors and governance as critical factors to the achievement of the desired sustainable economic growth.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter appraises the current studies on the public debt, macroeconomic factors, governance, and sustainable economic growth. Section 2.2 reviews the theoretical perspectives while section 2.3 reviews the existing studies with a summary of existing gaps. Section 2.4 discusses the study variables and a conceptual framework.

2.2Theoretical Perspective

Constructive collection of theories exists on public debt and economic growth link. This phase essentially analyzes Keynesian theory, crowding out effect theory, agency theory and balanced growth theory, providing their quality, shortcomings and sums up contribution to this research.

2.2.1 Keynesian Theory of Public Debt

The theory was established by Keynes (1935) and recommended that public debt adds value instead of pausing risks to a country's economic development. Acquiring public debt for capital development is basic, like the foundation of an organization, which will add to a profitable yield henceforth and positive financial development (Keynes, 1935). This theory, therefore, encourages developing nations to borrow for purpose of economic development. The implication of this theory is that nations that borrow but do not channel the funds towards capital buildup, may not realize the economic gain.

According to this theory, debt contributes to the sustainable economic growth, mainly through capital accumulation (Poirson et al., 2014; Schclarek, 2004). However, capital formation can also be created with use of domestic revenue, FDI, international trade, foreign

aid, and external remittances for purpose of economic progress. In addition, economic development isn't generally proportionate to the enormous borrowing in view of factors including political agitation and monetary flimsiness (Habib & Zurawicki, 2002)**.** High public debt levels can trigger high interest rates, crowding out private investment leading to low sustainable economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977). In this regard, highly indebted nations, are inclined to seek debt relief as a means of boosting sustainable economic growth, thereby, challenging the application of the Keynesian theory, particularly in the context of developing nations.

Keynesian theory of public debt contributes to this study by elucidating the link between public debt, capital formation and economic progress. Debt and capital expenditure as percentages of GDP are used as measures of public debt and capital accumulation respectively (World Bank, 2015). Sustainable economic growth is measured by SEG index (United Nations, 2015). Debt and capital accumulation are the explanatory variables, that accounts for the changes in sustainable economic growth, which is the dependent variable (Georgiev, 2014; Keynes, 1935)**.**

2.2.2 Crowding out Effects Theory

Musgrave (1959)**,** developed this theory, analyzing the crowding out effect and explains that excess public debt reduces private investment, negatively impacting the sustainable economic growth. The reduction in private investment comes into effect because the high public debt pushes up interest rates, crowding out private investment because private sector cannot easily access capital and in the process slows down sustainable economic growth (Musgrave, 1959).

Empirically, the theory has been tested and concluded that crowding out effect negatively affects investment and sustainable economic growth (Iyoha, 1999). However, Friedman (1970), holds a contrary opinion on the crowding out effect theory, pointing out that, the effect of increased public debt by the government is insignificant to crowd out private investment. The different views on this theory could be attributed to country specific factors that determine debt productivity. This theory, therefore, may not be conclusive and further studies that establish the optimal levels of the inflation and interest rate levels that do not yield negative contributions to the debt sustainable economic growth nexus would be useful.

This theory contributes to this study by enlightening on the relationship between public debt, interest rates and sustainable economic growth. Sustainable economic growth is estimated by SEG index (United Nations, 2015). Public debt is measured as percentage of the GDP (World Bank, 2015). Interest rates is measured by real interest rate (World Bank, 2015). It is expected that low levels of debt will positively contribute to sustainable economic growth, while high levels of debt will trigger interest rates that will negatively affect sustainable economic growth through crowding out effect (Musgrave, 1959).

2.2.3 Agency Theory

The theory stipulates that an agent relationship is a fiduciary and consensual relationship between two parties where one party (agent) acts on behalf of the other party (principal) and where the agent can form legal relationships on behalf of the principal (Ross, 1973; Mitnick, 1973). In public governance, the political and economic institutions (agents) through which a nation provides public (principal) good, become vulnerable to influences that causes them to serve illegitimate and socially disastrous objectives (English, 2013). This may results in use of public institutions and resources in a manner that negates the principle foundation and

purpose of the institution, which can then have negative effects on the a country's development (Thompson, 1995).

Anoruo and Braha (2005), observed that corruption impedes sustainable economic growth by limiting productivity, investment and pushing up government consumption. Mo (2001) added that corruption effects sustainable economic growth by dipping the level of human capital and private investment. Cooray, Dzhumashev and Schneider (2017) established that corruption pushes up public debt, government expenditure, thereby positively affecting the growth of the shadow economy. Aidt (2009) contributed to the debate noting that corruption may have less than average impact on the growth, but it is a potential source of untenable development.

This theory was applied in this study to establish the effect of governance by public insututions (agency) on the use of public resources (public debt) in the achievement of sustainable economic growth for the public (principal) good. Governance factors will be modeled as moderating variable, to establish the effect on the public debt (independent variable) and sustainable economic growth (dependent variable) relationship. The sustainable economic growth is estimated by real SEG index, while debt is estimated by debt to GDP ratio (World Bank, 2015; United Nations, 2015). The government expenditure and capital formation are measured as a percentage of GDP, while governance factors will be measured by Governance Index (World Bank, 2015). Negative governance factors are expexted to results in the use of public resources (debt) in a manner that negates the principle foundation and purpose of the institution, which can then have negative effects on the sustainable economic growth (Thompson, 1995).

2.2.4 Balanced Growth Theory

Nurkse (1952), founded the balanced growth theory stating that in order to achieve balanced growth in any underdeveloped nation, the government needs to make large and simultaneous investment in several industries. The theory operates on the principle of demand and supply which is adversely affected by poverty levels in a nation. Because of the adverse poverty there is minimal saving and investment affecting both supply and demand (Nurkse, 1952). The balanced growth theory therefore links low income and poverty with under development and encourages governments to invest heavily across several sectors of the economy. The theory considers breaking the poverty cycle as key to growth of developing nations (Nurkse, 1952). It is from this background that this theory proposes investment in multiple sectors to enlarge the market size, boost productivity and incentivize the private sector to invest. The theory advocates for internally driven growth, favoring internally generated revenue for the investment (capital creation) as opposed to public debt (Nurkse, 1952). Internally generated capital was given preference perhaps due to high cost of external borrowing.

In discouraging use of public debt, the theory ignores the inadequacy of domestic resources and budgetary deficit faced by some developing economies (Ezinando & Jeroh, 2017). Further, the theory ignores the effects of governance indicators such as political instability and corruption experienced in most of the developing countries, which generates capital flight creating an environment for reliance on public debt to fund sustainable economic growth (Alesina & Tabellini, 1989; Benfratello et al., 2018).

This theory expounds on the link amongst internal funding, investment with economic growth. The explanatory variables include domestically generated revenue, capital realization, estimated as a ratio of GDP (World Bank, 2015). The dependent variable is the

sustainable economic growth estimated by the SEG index (United Nations, 2015). It is expected that capital formation will enlarge the market size, boost productivity and incentivize the private sector to invest, thereby positively contributing to the sustainable economic growth (Nurkse, 1952).

2.3 Empirical Review

A generous assortment of information exists on public debt and economic growth relationship. This section fundamentally analyzes a portion of the past analyses, featuring their quality, shortcomings and sums up existing gaps.

2.3.1 Public debt and Economic Growth

Chowdhury (1994), used OLS regression to study debt and economic growth in Thailand, Bangladesh, Philippines and Sri Lanka between 1970 and 1988. The regression analysis indicated that debt as the independent variable does not affect GDP the dependent variable; instead, it affects the exchange rates. However, the study did not address the impact of the other macroeconomic factors, for example, expansion, loan costs and capital arrangement which have been found to influence the economic growth (Musgrave, 1959). For effective macroeconomic policy recommendation, the study does not expound on short-and long-haul connection among variables. For instance, in the EMU, debt was found to negatively affect economic development in long-term but positive in the short-term (Gomez-Puig & Sosvilla-Rivero, 2015).

Egbetunde (2012) studied the contributing link between debt and the economic growth in Nigeria for the period ranging from 1970 to 2010. The study adopted the Vector Autoregressive (VAR) methodology. The researcher noted that public debt and economic

growth have long-lasting relationship. The results implied that there is a dual causal connection regarding debt and economic growth in the Nigerian context. The investigation concluded that the relationship is affected by the extent to which the government uses the borrowed funds for the purpose of economic development rather than private benefit. However, the study seems to point out at governance as possible moderating variable in the debt-sustainable economic growth relationship. Further studies could be done to identify specific governance indicators significantly affecting the debt-economic growth relationship for clear policy recommendations.

Panizza and Presbitero (2014) examined debt-economic growth relationship in a sample of 17 OECD countries. The study deployed instrumental variable method to arrive at a negative association regarding debt and economic growth. The investigation noted that this relationship wanes once the debt is instrumented with a variable that intervenes in the interaction between foreign currency debt and exchange rate volatility. However, there is possibility that OECD countries have different levels of financial markets development and debt management strategies. Domestic debt market yields could therefore vary amongst the OECD sample countries used in this study. In addition, the current study did not delve in investigating the domestic debt market microstructure and how it may influence the relationships.

Mencinger, Aristovnik and Verbic (2014) focused on the EU countries with high levels of indebtedness and looked at the temporary consequence of debt on economic growth. The study used panel estimation method on a generalized economic growth model on data gathered for the years between 1980 and 2010. The test established a U-shaped debt-sustainable economic growth relationship. The relationship was found to be statistically

significant, changing from positive to negative relationship at 80% to 94% debt ratio for long time EU member states and 53% to 54% for new member states. The existing local studies such as Putunoi and Mutuku (2013), Were (2001), Babu et al.(2014), that have inspected the connection between debt and economic growth in EAC members countries have all assumed a linear connection among variables. Further studies could explore the possibility of an inverted a non-linear and concave debt-economic growth relationship in the EAC context.

Babu et al. (2014), used regression analysis to study domestic debt and economic growth in the EAC member countries between 1991 and 2010. The study showed positive debt-economic growth relationship. Babu et al.(2014) used Cobb-Douglas technology model. This analytical model did not capture autoregressive nature of the economic variables in the study. Pesaran, Shin and Smith (1999) on the other hand, observed that ARDL plays a critical role in analyzing economic relationships because, a change in an economic variable could have an effect immediately as well as in the subsequent period (Pesaran et al., 1999). However, within the EAC member countries, few studies have been done using the ARDL model to examine the effect of public debt, macroeconomic factors, governance, and sustainable economic growth, creating a methodological gap in the existing literature.

Lee and Ng (2015) researched on debt-economic growth relationship in Malaysia covering years between 1991 and 2013, using OLS regression method. The study found high levels of debt having negative relationship on economic growth. In addition, excessive government consumption negatively affected the sustainable economic growth pointing at the need for the government to exercise prudence in management of its financial resources. Among the variables used, was the external debt service, as a measure of the debt burden, which ignores the economic benefits of domestic debt service, which is ploughed back into the economy. In

addition, the study was not clear on whether the negative relationship between variables holds for both short and long-term periods.

In Kenya, public debt and economic growth relationship between 2000 and 2010 was examined by Putunoi and Mutuku (2013) using linear regression model. The study concluded that domestic borrowing contributed to economic growth. The conclusion was contrary to a similar study in Kenya between 1970 and 1995, by Were (2001), who established an adverse association between debt and economic development. Were (2001) observed that public debt, affected private investment negatively, thereby confirming the crowding out effect. In both cases the effect of governance indicators such as corruption and political instability were not considered, creating a conceptual gap. Kenya for example, the governance indicators such as corruption, rule of law ranking and political stability has deteriorated significantly over the last one decade (World Bank, 2015). Corruption and political instability can generate capital flight, erodes capital formation, thereby slowing down economic growth (Alesina & Tabellini, 1989; Benfratello et al., 2018)**.**

Isibor, Babajide, Akinjare, Oladeji and Osuma (2018) opine that every government borrows either from within its territory or from abroad to finance development projects that impact the overall economy. The study focused on the Nigerian government's debt and its impact on economic growth from 1982-2017 using the two-stage least square regression. In the first equation, debt variables and their slacks relapsed against GDP and the results showed that the external debt negatively impacts the economy while internal debt positively impacts the economy. For the second equation, GDP, total savings deposits in the Nigerian deposit money banks and capital expenditure were regressed against the internal debt. The outcome showed that variables have significant relationships with internal debt. The study thus

recommended that foremost; Corruption of borrowed funds should be tackled at all costs and government should minimize external borrowing, since it impacts the economy negatively.

Reinhart and Trebesch (2016) examined the consequences of debt relief on economic growth between 1978 and 2010 in middle income emerging markets. Difference-in-Differences Regressions method was used to analyze the data. The study concluded that the economic outlook improves in terms of growth of the economy and sustainability of debt following debt relief. The study further concluded that debt rearrangement and momentary payment breaks do not results in significant economic growth. With increasing debt levels among the EAC member countries, it remains unclear whether meaningful economic growth will be realized if these countries were to pursue external debt relief.

2.3.2 Public debt, Macroeconomic Factors and Economic Growth

Pattillo et al.(2002) used regression analysis to study the link between debt and economic growth in 93 developing nations between 1969 and 1998. The study noted that a debt-economic growth positive relationship exists where debt was below 35-40% of GDP, while negative relationship exists above these thresholds. Supporting similar conclusion, Reinhart et al.(2003) added that for debt intolerance countries, the safe levels are as low as 15 % debt to GDP levels. In Kenya for instance, debt is expected to rise to 60.7 % GDP by 2019, increasing the risk of distress, and attracting advisory on debt sustainability from lenders (International Monetary Fund, 2018). However, few studies have been done in Kenya and other EAC member countries to establish safe debt levels creating a contextual gap.

Poirson et al.(2014) used OLS regression analysis and causality to study public debt and economic growth relationship in 61 developing countries between 1969 and 1998. The study showed that high debts levels negatively affect capital creation and total production factor growth which affects economic growth. However, short, and lasting link among variables was not analyzed for appropriate macroeconomic policy recommendation. For instance, in the EEMU, it was found out that debt has a undesirable long-term and a constructive short term consequence on the economic growth (Gomez-Puig & Sosvilla-Rivero, 2015). In addition, the study was silent on whether there are any safe debt thresholds, creating a contextual gap.

In Tanzania, debt and economic growth relationship between 1990 and 2015 was examined by Lotto and Mmari (2018), using the OLS regression. Study variables included domestic debt, GDP, inflation, export, gross capital formation and government expenditure. The study found insignificant negative debt-economic growth relationship. The insignificant indirect relationship was established through increased government expenditure, inflation and crowding out effect. In the EAC member countries, governance indicators in particular corruption, rule of law ranking and political stability have deteriorated significantly over the last one decade (World Bank, 2015). However, the Lotto and Mmari (2018) study did not consider the possible effect of these governance factors during the analysis, creating a contextual gap. Corruption and political instability generates capital flight, erodes capital formation, thereby slowing down economic growth (Alesina & Tabellini, 1989; Benfratello et al., 2018).

Guex and Guex (2018) sought to examine the public debt, economic progression, and interest rates in Switzerland for the period between 1894 and 2014. The research used correlation design, VAR, and Granger casualty test to examine the variables. Relationships among variables were tested over different economic phases including growth and recession. It was concluded that debt did not have adverse consequence on the economic progress. The study further concluded that debt did not have consequence on the long-term interest rates. This may be attributed to fact that long term interest rates as a macro factor could be influenced by government policy and is not only a consequence of increasing public debt.

Chudik et al., (2013) studied on the linkage between rising debt, inflation, and economic progress. The researcher used a sample of 40 nations covering the period between 1965 and 2010. Cross-section augmented distributed lag was used to analyze the data. The study concluded with a long-lasting adverse influence of growing debt levels and inflation on the economic progress. The conclusions were true for permanent and increasing debt-GDP ratio. No effect was felt on the economic growth where the rise in the Debt-GDP ratio was momentary. Indirectly, the study alludes to Debt-GDP ratio threshold beyond which negative effects will be felt on the economy. The thresholds could vary depending on country specific factors, and therefore country specific study would be useful in localizing policy recommendations.

Chen, Yao, Hu, and Lin (2017) researched on the peak levels of investment, public debt, and economic growth. The study applied panel regression analytical model to establish the optimal government investment levels on economic growth. Data was collected from 65 countries between 1991 and 2014. The findings showed a decreasing trend in economic growth as the government investment levels increase. At a particular level of investment, the

effect on economic growth changes from positive to negative. This is the similar trend on the impact of borrowing on economic growth. Although ideal level could vary from one country to another, the study emphasized on establishment of an optimal debt threshold, beyond which the economy suffers negative growth.

2.3.3 Public debt, Governance and Economic growth

Alesina and Tabellini (1989) researched on the debt, capital flight and political risk relationship in South America countries between 1968 and 1986. Using the regression model, the study established that political instability causes capital flight, leads to reduced domestic investment and provides an incentive for the government to acquire more debt, slowing down the economic growth. However, the study omitted economic variables such as inflation and currency devaluation which have also been found to generate capital flight creating a conceptual gap (Cuddington, 1986). Further, the study omitted possible effect of corruption which has also been found to increase public borrowing, reduction in capital accumulation leading to slow economic growth (Benfratello et al., 2018).

The influence of governance on debt- economic development relationship was examined by Jalles (2011) in 72 developing countries between 1970 and 2005. Using OLS analyis model, the study established a positive relationship in the medium term and a lasting negative debt impact on economic growth. The study established that countries that are highly corrupt were unable to take the opportunity of borrowing and therefore corrpution had undesirable consequence on economic growth. However, beside inability to borrow, the study did not exploit more ways in which corruption could affact eceonomic growth, for a comprehensive macroeconomic policy recommendations. For instance, in a similar but smaller sample of 18 African countries, corruption was found to impede economic growth by limiting productivity

and investment and increasing government consumption expenditure (Anoruo & Braha, 2005).

Benfratello, Del Monte and Pennacchio (2018) examined the corruption and debt relationship in 166 countries between 1995 and 2015 using regression analysis. The study established that corruption in the public sector increases public debt, government spending and indirectly limits economic growth. Debt can be short- or long-term debt, calling for different policy interventions. However, this study does not expound the effect of corruption on the short and long-term debt for appropriate policy recommendations. In the United State for instance, corruption and public debt relationship exist in long-term debt but not in the short-term public debt (Cheol, Moldogaziev, & Mikesell, 2017).

Kim, Ha and Kim (2017) researched on the 77 countries, between 1990 and 2014, with an objective of understanding corruption, public debt, and economic growth relationship. The study adopted the OLS, fixed effects models and GMM models developed by Arellano-Bond (1991) to examine the relationships. The corruption and economic growth relationship were found to be statistically significant. The findings of the research endorse the hypothesis that public debt and economic development relationship is affected by the level of corruption. Therefore, highly transparent countries are likely to register positive benefits of public borrowing on the economy.

Mallik and Saha (2016) studied the complex connection between corruption and growth in 146 countries between 1984 and 2009 using the GMM analysis. The study findings supported the "greasing-the-wheel" hypothesis whereby medium level corruption fuels economic growth by reducing excessive bureaucracy. Whereas conclusions were based on medium

level corruption, the study fails to explain the conclusion for countries with proliferating corruption levels. In addition, definition or classification of medium and high-level corruption countries is ambiguous. Levels of bureaucracy and corruption vary from country to country subject to levels of institution reforms especially in developing nations. Country specific studies on the link between corruption and growth would be useful in domesticating policy recommendations.

Tanzi and Davoodi (1998) delved into the link between corruption, investment, and growth in 68 developing nations covering the period between 1980 and 1995 using regression analysis. The study concluded that corruption is likely to increase the number of public projects undertaken, expand the scope and intricacy of the projects. The component of the project investment in the GDP goes up, quality and output are compromised, delays in project executions are noted. The study also noted that because of the limitation of public income, the bloated expenditure on projects because of corruption, impacts other budgetary allocation towards other sectors such as health, education with overall adverse impact felt on economic growth. However, this study does not exploit on the use of the proceeds of corruption. Are there possibilities that the proceeds are channeled towards private investment? Could such private investment generate economic multiplier effect, through job creation, rise in consumption and advancing further private development projects that could constructively contribute to sustainable economic growth?

2.3.4 Public Debt, Macroeconomic Factors, Governance and Economic Growth

Shittu, Hassan and Nawaz (2018) examined debt, corruption and economic development link in 5 SSA countries between 1990 and 2015 using OLS analytical method. The study established debt had a negative effect on economy by limiting public investment. Corruption

and interest rates impacted economic growth adversely. Capital formation was positively related to the economic growth. However, the study does not expound on whether the findings hold for both short- and long-term periods. Such analysis is critical input for short and long-haul policy recommendations. For instance, in the EMU, debt negatively affect economic development in long term, but positive in short-term (Gomez-Puig & Sosvilla-Rivero, 2015).

Cooray, Dzhumashev and Schneider (2017) examined corruption, public debt, government expenditure and economic growth relationship in 106 countries between 1996 and 2012. The study used OLS, panel fixed effects, and GMM analytical method. The study established that corruption positively influences public debt, government expenditure and growth of the shadow economy. Due to increased public debt, the interest payment on the debt goes up as well as the inflation rate. However, in the corruption and economic growth regression model, the R^2 is less than 10% indicating there could be other variables such as capital accumulation and interest rates which are critical to the economic growth but were left out in the analysis, creating a conceptual gap (Keynes, 1935; Krugman, 1988; Musgrave, 1959; Myers, 1977).

In India, the impact of public debt on economic growth using key macroeconomic channels for the period 1970–2013 was investigated by Bal and Rath (2018). The findings from 2SLS model indicated that public debt positively affects economic growth in the short run, while it shows a negative impact in the long run. Using nonlinear ARDL approach, the study found out the existence of a nonlinear impact of public debt on economic growth. Public investment and total factor productivity growth were the main channels through which debt impacted the economic growth. The study was however, silent on the impact of governance factors on the public debt and economic growth relationship. Corruption for instance, was found to impede

economic growth by limiting productivity and investment and increasing government consumption expenditure (Anoruo & Braha, 2005).

Ndoricimpa (2020) examined the tthreshold effects of public debt on economic growth for a sample of 39 African countries for the period between 2012 and 2017. The study used the panel smooth transition regression model. The study established a debt threshold in the range of 62–66% for the whole sample. Low public debt was found to be either growth neutral or growth enhancing while high public debt was found to negatively impact the economic growth. However, the threshold cannot be generalized because it doesn't consider country specific factors that could impact on the public debt and economic growth relationship. For instance, different African countries have different levels of financial markets development and debt management strategies. Domestic debt market yields thus vary amongst the countries under study. Therefore, country specific studies incorporating country specific factors would be useful to domesticate the policy recommendations.

The world is shifting focus to sustainable economic growth which refers to the pursuit of sustainable economic growth while putting social and environmental impact under consideration (United Nations, 2015). However, the existing local and international studies such as Putunoi and Mutuku (2013), Were (2001), Babu et al.(2014), Cooray, Dzhumashev and Schneider (2017), Poirson et al.(2014), Jalles (2011), Alesina and Tabellini (1989) and Pattillo et al.(2002) used GDP to measure economic growth. GDP measures sustainable economic growth without regard to social and environmental impact and therefore, it is not a suitable measure for sustainable economic growth in line with United Nations SDGs guideline (Shikha et al., 2018). The SEG index, captures social and environmental aspects of economic growth (Shikha et al., 2018; United Nations, 2015). However, few studies have

been done on public debt, macroeconomic factors, governance, and sustainable economic growth relationship using the SEG index, creating a conceptual gap.

2.3.5 Summary of the Literature Review

The chapter has critically reviewed existing literature on public debt, macroeconomic factors, governance, and economic growth. Despite existence of extensive literature, the relationship among public debt, macroeconomic factors, governance, and sustainable economic growth remains ambiguous. Table 2.1 summarizes the key studies and existing gaps.

Table 2.1: Summary of Research Gaps

Researcher	Study Area	Methodology	Findings	Knowledge Gaps	Recommendations to address identified gaps
Isibor, Babajide, Akinjare, Oladeji and Osuma (2018)	Nigerian government's debt and its impact on economic growth	Two-stage least square regression	External debt negatively impacts the economy while internal debt positively impacts the economy.	The study does not clearly confirm if the debt- economic growth conclusions hold in the short and long term. This is because the medium and long-range link among variables were not analyzed. In the EEMU, for instance, it was found out that debt has a undesirable long-term and a constructive short term on sustainable economic growth (Gomez-Puig & Sosvilla-Rivero, 2015).	Similar analysis should be done in the Nigerian context, establishing both short- and long-term public debt - economic growth relationship, for appropriate macroeconomic policy recommendations.
Reinhart and Trebesch (2016)	Consequences of debt relief	Difference-in-Differences Regressions method	Economic outlook improves in terms of growth of the economy and viability of debt following debt relief. Debt rearrangement and momentary payment breaks do not result in significant economic growth.	With increasing debt levels among the EAC member countries, it remains unclear whether meaningful sustainable economic growth will be realized if these countries were to pursue external debt relief.	Studies simulating debt relief and its effect on sustainable economic growth among the EAC Member countries, will be useful.

Mallik and Saha (2016)	Corruption and Economic growth	GMM Analysis	Study findings supported the "greasing-the-wheel" hypothesis whereby medium level corruption fuels sustainable economic growth by reducing excessive bureaucracy.	Whereas conclusions were based on medium level corruption, the study fails to explain the conclusion for countries with proliferating corruption levels. In addition, definition or classification of medium and high-level corruption countries is ambiguous	Levels of bureaucracy and corruption vary from country-to-country conditional to levels of institution reforms especially in developing nations. Country specific studies on the link between corruption and growth would be useful in domesticating policy recommendations.
Putunoi and Mutuku (2013), Were (2001) and Babu et al.(2014)	Public debt & Economic development in the EAC member countries	Cobb-Douglas technology model and OLS regression Model	Putunoi and Mutuku (2013) and Babu et al.(2014) found a positive relationship while Were (2001) noted a negative debt-economic growth relationship.	The studies used GDP to measure economic growth. However, GDP does not capture social and environmental impact of the economic growth. Minimal studies have been done in EAC member countries using SEG, which captures social and environmental as aspect of economic growth (Shikha et al., 2018; United Nations, 2015).	This study on public debt, macroeconomic factors, governance and sustainable economic growth, will use the SEG index as an estimate of sustainable economic growth. The use of SEG index will enable this study to be aligned with and contribute to the attainment of the United Nations SDG program goals.
Babu et al.(2014)	Debt and economic growth in the EAC	Regression Method, Cobb-Douglas technology model	Positive debt and economic growth relationship	The Cobb-Douglas technology model used, does not consider the autoregressive behavior of the economic variables. In the EAC member countries, few studies have used the Auto Regressive Distribution Lag (ARDL) model to test the outcome of public debt, macroeconomic factors,	This study on public debt, macroeconomic factors, governance and sustainable economic growth, will use the ARDL model in the data analysis to address this methodological gap.

				governance on sustainable economic growth creating a methodological gap	
Poirson et al.(2014)	Public debt and economic growth.	OLS regression analysis	High debt levels negatively affect capital creation and total production factor growth which affects economic growth.	Medium and long-lasting link between variables were not analyzed. This test broadens the analysis and understanding for appropriate policy recommendations.	According to Granger (1969), the causality test can be analyzed for short and long term causality effect. This test should be incorporated in future similar studies.
Panizza and Presbitero (2014)	Public debt and economic growth relationship in a sample of 17 OECD countries.	Instrumental variables estimation	Undesirable debt and economic growth link.	There is a possibility that OECD countries have different levels of financial markets development and debt management strategies. Domestic debt market yields could therefore vary among sampled countries used in the study.	Future studies could investigate the domestic debt market microstructures and how they may influence the debt-economic growth relationships.
Mencinger, Aristovnik and Verbic (2014)	Short-term effect of debt on the economic growth	Panel estimation method	U-shaped debt-economic growth relationship	The existing local studies such as Putunoi and Mutuku (2013), Were (2001), Babu et al.(2014), that have scrutinized the association between borrowing and economic progression in EAC members countries have all assumed a linear bond between variables.	Explore the possibility of an inverted a non-linear and concave debt- economic growth relationship in the EAC context
Chudik, Mohaddes, Pesaran and Raissi (2013)	Debt, inflation, and economic growth.	Cross-section augmented distributed lag	Long lasting adverse effect of growing debt levels and inflation on the economic growth for permanent and increasing debt-GDP	The study alludes to Debt-GDP ratio threshold beyond which negative effects will be felt on the economy. The thresholds could vary depending on country specific factors, and therefore country specific study would be useful in	Country specific studies on the optimal debt-GDP ratio would be useful in localizing policy recommendations

			ratio. No effect on the economy where the rise in the Debt-GDP ratio was momentary	localizing policy recommendations.	
Egbetunde (2012)	Debt and sustainable economic growth in Nigeria	Vector Autoregressive (VAR) method	Dual causal association between debt and economic growth	Debt-economic relationship is impacted by the extent to which the government uses the borrowed funds for the purpose of economic development rather than private benefit. The study seems to point out at governance without specifics as possible moderating variable in the debt-economic growth relationship.	Further studies should be done to identify specific governance indicators that significantly affect the debt-economic growth relationship for clear policy recommendation.
Jalles (2011)	Governance, debt and economic growth.	OLS analysis model	Positive debt-economic growth correlation in medium term and undesirable link in long-term.	The study does not explain how curruption negates economic growth, to recommend and enact effective macroeconomic policies. In a similar study in a sample of 18 countries, corruption was found to impede economic growth by limiting productivity and investment (Anoruo & Braha, 2005)	In this study, governance will be analysed as the moderating factor to establish the effect on the public debt and economic growth relationship. This analysis will bring out the importance and need for policy intevention on governance in order to achieve the desired economic growth.

Pattillo et al.(2002)	Debt and economic growth	Regression analysis	Debt-growth positive relationship exists where debt was below 35-40% of GDP, while negative relationship takes effect above these thresholds	Reinhart et al.(2003) observed that for debt intolerance countries, the safe levels are as low as 15 % debt to GDP levels. Kenya for instance, debt is expected to rise to 60.7 % GDP by 2019, attracting criticism and caution on debt sustainability from local and international stakeholders (International Monetary Fund, 2018) However, few studies have been done in EAC member countries to establish safe debt levels.	Future studies in the EAC member countries, should identify and recommend safe debt threshold beyond which undesirable consequences are recorded in the economy.
Tanzi and Davoodi (1998)	Corruption, public debt, and economic growth	OLS analysis model.	Corruption affects the number, size, complexity, quality, execution timelines, of public projects. The bloated expenditure on projects because of corruption, impacts other budgetary allocation to other critical sectors such as health, education, with overall adverse impact on economic growth	The study does not exploit on the use of the proceeds of corruption. Are there possibilities that the proceeds are channeled towards private investment? Could such private investment generate economic multiplier effect through job creation, rise in consumption and advancing further private development projects that could constructively contribute to economic growth?	Replication of the Tanzi and Davoodi (1998) study, exploiting channels through which corruption proceeds are spend, impact on private investment and overall contribution of the economic growth. The aim is not to encourage corruption but to eradicate such practices through identification of official channels to boost economic growth through private investment.

Alesina and Tabellini (1989)	Debt, Capital flight and Political Risk	Regression analysis	Political instability causes capital flight, minimizes domestic investment, and provides an incentive for the government to acquire more debt, slowing down the economic growth	Inflation and currency devaluation factors which have also been found to generate capital flight were not considered (Cuddington, 1986). Further, the study omitted possible effect of corruption which has also been found to lead to debt accumulation, increased interest rates, low capital accumulation leading to slow sustainable economic growth (Benfratello et al., 2018)	This study will replicate the Alesina and Tabellini (1989) study model but expand macroeconomic factors to include inflation. This study will also include governance indicators in the analysis. The study is expected to elucidate on the importance of these factors in the achievement of the desired economic growth.

2.4 Conceptual Model

Figure 2.1 below, summarizes the conceptual model, that formed the basis of this study on the relationships between public debt, macroeconomic factors, governance, and sustainable economic growth. The framework includes independent, intervening, moderating and dependent variables all drawn from the literature review.

Sustainable economic growth is the dependent variable and was measured by the Sustainable Economic Growth (SEG) Index. This index was chosen because the world is shifting focus to sustainable economic growth, which refers to the pursuit of economic growth while putting social and environmental factors under consideration (United Nations, 2015). Secondly, the existing studies have traditionally measured economic growth using GDP. GDP is the additional worth of goods and services after adjusting for taxes and subsidies, produced by residents in a nation over specific time (World Bank, 2015). Therefore, GDP does not measure the social and environmental aspect of economic growth, creating a conceptual gap in the existing literature. Therefore, the sustainable economic growth (SEG) index was adopted in this study to address this gap.

Public debt is the independent variable, measured by total debt, domestic debt, and external debt as a percentage of GDP. From the literature review, it is expected that public debt will affect sustainable economic growth through capital formation, interest rates, inflation rates and government consumption (Putunoi & Mutuku, 2013; Schclarek, 2004).

The macroeconomic factors are the intervening variables and include the interest rate, inflation rate, government expenditure and capital formation. Public debt advances growth mainly through capital accumulation (Poirson et al., 2014; Schclarek, 2004). However, high

levels of debt can lead to debt overhang problem, trigger high interest rate and inflation rate which can crowd out private investment leading to low economic growth (Krugman, 1988; Musgrave, 1959; Myers, 1977).

The governance indicators are the moderating factors that impact on the public debt and economic growth relationship (Alesina & Tabellini, 1989; Benfratello et al., 2018). In addition, these indicators were chosen because of their deteriorating trend with EAC member countries, raising concerns among local and international development stakeholders (Kaufmann & Kraay, 2018; World Bank, 2015). From the literature review, corruption and political instability is expected to generate capital flight, erodes capital formation, thereby slowing down sustainable economic growth (Alesina & Tabellini, 1989; Benfratello et al., 2018)

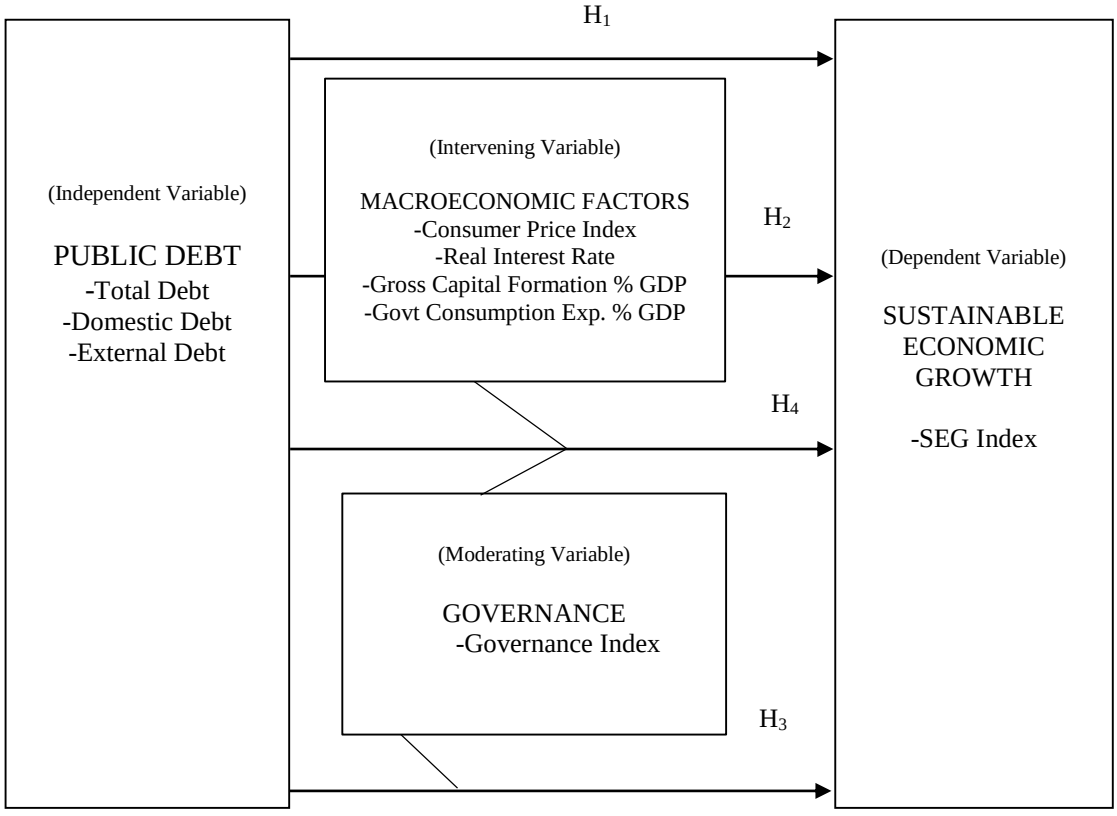

Figure 2.1: Conceptual Model

2.5 Research Hypotheses

Guided by the conceptual framework and research objectives, the study sought to test the following null hypotheses:

$H_{01:}$ Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries

H_{1a}: Total Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries

H_{1b}: Domestic Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries

H_{1c}: External Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries

$H_{02:}$ Macroeconomic factors do not significantly affect the relationship between public debt and sustainable economic growth among EAC member countries.

H_{2a}: Real interest rates do not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.

H_{2b}: Real interest rates do not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

H_{2c}: Real interest rates do not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

H_{2d}: Inflation does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.

H_{2e}: Inflation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

H_{2f}: Inflation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

H_{2g}: Gross capital formation does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.

H_{2h}: Gross capital formation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

H_{2i}: Gross capital formation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

H_{2j}: Government consumption expenditure does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.

H_{2k}: Government consumption expenditure does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

H_{2l}: Government consumption expenditure does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

H_{03}: The influence of Governance on the relationship between public debt and sustainable economic growth among EAC member countries is not significant.

H_{03a}: The influence of Governance on the relationship between total public debt and sustainable economic growth among EAC member countries is not significant.

H_{03b}: The influence of Governance on the relationship between domestic public debt and sustainable economic growth among EAC member countries is not significant.

$H_{03c:}$ The influence of Governance on the relationship between external public debt and sustainable economic growth among EAC member countries is not significant.

$H_{04:}$ The joint effect of public debt, macroeconomic factors, and governance on sustainable economic growth among EAC member countries is not significant.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Research philosophy is discussed in section 3.2, study design in section 3.3, the target population and sampling in section 3.4, data and collection form is explained in section 3.5, and operationalization of variables is deliberated in section 3.6, data examination in section 3.7.

3.2 Research Philosophy

This is a comprehensive framework of beliefs, values and assumptions that governs the behavior of a researcher (Leedy & Ormrod, 2005). As a research strategy, the framework should be anchored on appropriate research philosophy. The research philosophy can be positivism, interpretivism, pragmatisms or realism (Saunders, Lewis, & Thornhill, 2009). These philosophies are guided by assumptions concerning ontology, epistemology, human nature and methodology (Orlikowski & Baroudi, 1991). The two key philosophies that guide social sciences research are the positivist and phenomenological paradigms. The study adopted a positivistic philosophy since it makes use of the following theories that exist. First is the Keynesian theory, which proposes that debt adds value than risk to a country's economic growth (Keynes, 1935). Second is the crowding out effect theory, which explains that excessive borrowing triggers high interest rates that limits private investment, thus impede sustainable economic growth (Musgrave, 1959). Third is the agency theory which refers to the use of public institutions and resources in a manner that negates the principal foundation and purpose of the institution, which can then have negative effects on sustainable economic growth (Ross, 1973; Mitnick, 1973). Fourth is the balanced growth theory which states that, the government should make simultaneous capital investment in multiple sectors,

to enlarge the market size, boost productivity, and incentivize private investment to attain balanced growth (Nurkse, 1952).

The positivistic philosophy affirms that facts or knowledge gathered through measurement is trustworthy (Maylor, Blackmon, & Huemann, 2016). With positivism, the researcher does not derive conclusions using subjective methods, feelings, or emotions, instead it is based on an existing theory. Since it is based on rules, there is little room for variance. The researcher is usually independent and limited to collection of quantifiable data and interpretation (Orlikowski & Baroudi, 1991). The research was limited to collection of data relating to public debt, macroeconomic variables, governance, and economic progress in the EAC member countries, analysis and interpretation of outcomes as guided by the anchoring theory.

The study formulated quantitative hypotheses to be tested before accepting or failing to accept the null hypothesis. During the data analysis, the positivist paradigm enabled the researcher to apply statistical methods and generalize the observations in finding the relationship among variables. In addition, positivism philosophy was adopted because it relied on quantitative data that the researcher believed is more reliable than qualitative research and it follows a well-defined structure. Besides, the positivist philosophy was adopted because it is easier to reproduce and will enable other researchers to test the conclusions arrived at in the study. Similarly with adoption of the positivist philosophy, this study sort to compare the outcome with existing studies to identify gaps, enhance knowledge on the relationship among variables and inform policy decision by stakeholders.

3.3 Research Design

It is a master scheme for action detailing specific methods and procedures for the research (Zikmund, 2000). The correlational, longitudinal, exploratory, descriptive, experimental, survey, causal, cross-sectional, experimental designs, or quasi-experimental designs, are examples of research designs. A research design helps in making a decision regarding what, where, when, how much and by what means during the research (Zikmund, 2000). Research design was critical to enable smooth navigation of the various steps of the study. The design was relied upon to ensure efficiency as possibly can to achieve maximum output, while minimizing cost, effort, and time.

The study embraced a panel longitudinal research design. The longitudinal research design was assumed because the study variables namely the public debt, macroeconomic factors, governance indicators and sustainable economic growth change over time. This design, therefore, allowed the collection of data on the same study variables repeatedly over a long period to establish the trend and relationship. Since data was collected across EAC member countries, panel longitudinal research design enabled the researcher to analyze and establish trends among variables in individual countries. Such trend analysis was useful in helping each of the EAC member countries to draw conclusion and inform policy formulation relevant to its context. Panel longitudinal design was also chosen because it gave the researcher more data points which reduces collinearity and increases the degree of freedom among the explanatory variables (Hsiao, 2007).

The study assumed the correlation research design to test the expected link among the variables. EAC Member countries like other nations borrow mainly to support government economic development programs. However, despite existence of extensive literature, the

relationship among public debt, macroeconomic factors, governance, and sustainable economic growth remains ambiguous. Therefore, the correlation design was chosen to establish if there exists a relationship between public debt, macroeconomic factors, governance indicators and sustainable economic growth in EAC member countries. This design enabled the researcher to generate a model for prediction among the variables. With the prediction model, the EAC member countries can estimate the debt levels required to support the desired sustainable economic growth levels. This will help the EAC Member countries to avoid over borrowing which has an implication of diverting government resources otherwise available to fund government program to finance external debt. Correlational research designs served two purposes namely measuring the nature and magnitude of the relationships among variables (Fraenkel & Wallen, 2009)**.**

3.4 Study Population

The target population of the study was the five member countries in the EAC namely Kenya, Uganda, Tanzania, Rwanda, and Burundi. The study excluded the sixth member country namely the Southern Sudan that gained its independence from the Republic of Sudan in 2011, and therefore lacks data on the study variables. Because of the small dimension of the population, no sampling was done. The EAC member countries were chosen because of the unexplained disparities among the study variables. Specifically, the EAC member countries have recorded an average of 4.2 % GDP growth and an inflation rate of 8% for the last decade, despite key challenges such as high unemployment rate, insufficient infrastructure and low levels of industrialization (East African Community, 2017; World Bank, 2015). Debt-GDP % has risen from 22% in 2010 to 34% in 2017 (World Bank, 2019). Expansion of government expenditure, inflation, rise in global interest rates have been cited as some of the causes of debt increase in the EAC member countries and Africa at large (Fole, 2003). On

country governance, statistics shows loss of control over rule of law, corruption, government effectiveness and political stability (Kaufmann & Kraay, 2018). The EAC member countries were specifically chosen for the study because they carry considerable amount of public debt, yet there still exist few studies on public debt, macroeconomic factors, governance, and sustainable economic growth. The research objective was therefore to understand the interaction among public debt, macroeconomic variables, governance, and sustainable economic growth in the EAC member states, to contribute to the policy formulation.

3.5 Data Collection

The study utilized secondary panel data on the variables namely, public debt, macroeconomic factors, governance factors, and sustainable economic growth in the EAC member countries, for the period between 2000 and 2019. This period was chosen to align the study with the United Nations Sustainable Development Goals (SDGs) framework. The initial framework by the United Nations namely the Millennium Development Goals (MDGs) was first put in place in the year 2000 and since then countries have consistently captured the appropriate data and submitted to the World Bank of which this study relied upon.

Appendix 1 presents the research data collection form that was used to collect and summarize the secondary research data. Data on public debt, SEG, interest rate, inflation rate, capital formation, government consumption expenditure and governance indicators, were downloaded from the WDI on the World Bank website. World Bank database was chosen, because it is an official institution, internationally accredited, reliable, and easy to access through various electronic platforms.

3.6 Operationalization of the Study Variables

Operationalization of variables entails describing the concepts or variables in order to make them measurable (Zikmund, 2000). Operationalization entails definition of the study variables and the measurement criteria. References have been made to previous studies to enable the researcher to compare the outcome of this study with conclusions arrived at in previous studies. With clear definition and measurement of study variables, the researcher sought to avoid ambiguity in the analysis and interpretation of the study outcome. The study variables namely public debt, macroeconomic factors, governance, and sustainable economic growth were operationalized as summed up in the following Table 3.1.

Table 3.1: Study Variables, Measurement and Comparison with Previous Studies

Variable	Indicator	Operation Definition	Measurement	Scale	Comparable study
Total Debt	Total Debt	Government domestic borrowing plus Government external borrowing	Total Debt to GDP ratio	Ratio	Babu et al.(2014), Putunoi and Mutuku (2013)
Domestic Debt	Domestic Debt	Government domestic borrowing	Domestic debt / GDP ratio	Ratio	Babu et al.(2014), Putunoi and Mutuku (2013)
External Debt	External Debt	Government external borrowing	External debt / GDP ratio	Ratio	Babu et al.(2014), Putunoi and Mutuku (2013)
Sustainable economic growth	Sustainable economic growth	Sustainable economic growth with social and environmental consideration	SEG Index	Ratio	Shikha et al. (2018), World Bank (2015)
Governance Factors	Governance Index	Application of power to control the affairs of a country	Governance Index	Ratio	Kaufmann and Kraay (2018)
Macroeconomic-mic Factors	Interest Rates	Lending interest	Real Interest Rate (%)	Ratio	Musgrave (1959)
	Inflation Rate	Annual % change in price of goods and services.	Consumer Price Index	Ratio	Zelga (2017), Barro (1991)
	Government Consumption expenditure	Government current expenditure	Government Consumption expenditure % GDP	Ratio	World Bank (2015)
	Capital Formation	Fixed assets of the economy together with inventories net changes.	Gross capital formation to GDP ratio.	Ratio	Schclarek (2004)

Source: Author, 2020

3.7 Data Analysis

Data analysis in Eviews and SPSS was useful in conducting the analysis and inferring the interpretations thereon. Regression enquiry was used to find the connection between the variables. Country comparative analysis was also undertaken to inform country specific conclusions and recommendations.

3.7.1 Descriptive Analysis

To determine the statistical properties of the model before running any estimation, descriptive statistics for all the variables were conducted. Descriptive statistics are the numerical and graphical techniques used to organize, present, and analyze data (Fisher and Marshall, 2009). Common statistical measures include the Mean, Standard Deviation, Minimum, Maximum, Skewness and Kurtosis for the specific variable data for the five EAC members countries.

3.7.2 Trend Analysis

Trend analysis is the process of gathering and attempting to identify patterns in time series data (Baheti and Toshniwal, 2014). Trend analysis is useful in imparting knowledge about what has taken place in the past and what will take place in time to come among the study variables (Baheti and Toshniwal, 2014). The analysis was used to evaluate hypothesized linear and nonlinear relationships among variables.

3.7.3 Diagnostic Tests

The diagnostic tests were conducted to establish the suitability of data for inferential analysis. Table 3.2 below summarizes the diagnostic tests that were conducted.

Table 3.2: Diagnostic Test Summary

Assumption	Description	Test	Interpretation	Treatment
Normality	The test is done to establish normal distribution.	Jarque – Bera	Reject the null hypothesis if the p-values are statistically significant (P < .05),	Use of square roots or logs to address non-normality
Linearity Test	Linearity exists the relationship between variables is linear.	ANOVA test	A linear relationship exists where the alpha values are < 0.05	Use of the reciprocal method
Multicollinearity	Multicollinearity phenomenon is where correlation among variables results in standard errors distorting the regression analysis.	VIF Test	Multicollinearities exist where the VIF > 10	Eliminate highly correlated variables.
Heteroscedasticity	To establish if the variance of errors is not the same for all observations.	Likelihood Ratio (LR) tests	Heteroscedasticities exist where the p-value p<0.05)	Use Natural log of variables
Autocorrelation	To establish of values of the same variable is based on related objects.	Breusch-Godfrey test.	Autocorrelation exists if p-values are less than 0.05.	Hildreth-Lu Procedure

3.7.4 VAR Lag Order Selection Criteria

A lag is the value of a variable in a previous period (Ivanov and Kilian, 2005). The six VAR Lag Order Selection Criteria include the Schwarz Information Criterion (SIC), the Hannan-Quinn Criterion (HQC), the Akaike Information Criterion (AIC), the general-to-specific sequential Likelihood Ratio test (LR), a small-sample correction to that test (SLR) proposed by Sims (1980), and the specific-to-general sequential Portmanteau test. As indicated in Gujarati (2013), the criterion with the smallest value is preferred for model estimation to have more degrees of freedom.

3.7.5 Correlation Analysis

Correlation or dependence is any statistical relationship, whether causal or not, between two random variables or bivariate data (Croxton and Cowden, 1939). The research embraced correlation analysis to explain the association between the study variables. Correlations are useful because they can indicate a predictive relationship that can be exploited in practice. In addition, the analysis was useful to find the direction and strength of relationships among variables.

3.7.6 Granger Causality Tests

Dual Causality link among sustainable economic growth and public debt components were tested on a granger causality test. The Null hypothesis was that debt component do not granger cause sustainable economic growth. If the probability value is greater than any 0.05, then the null hypothesis was rejected at that level (Granger,1969).

3.7.7 Vector Auto Regression Analysis

Vector autoregression (VAR) is a statistical model for describe the relationship between multiple variables as they change over time and are useful as a forecasting technique. (Sims,1980). It was used to establish the changes in the current period sustainable economic growth that can be is attributed to changes in the previous period sustainable economic growth and debt levels.

3. 8 Model Specification and Variables Definition

ARDL plays a critical role in analyzing economic relationships because a change in an economic variable could have an effect immediately, as well as in the subsequent period (Pesaran et al., 1999). The study adopted the ARDL model because it provides impartial estimates of the long-run model, has no restrictive assumptions and allows use of varied lags

for the explanatory variables (Kharusi & Ada, 2018; Pegkas, 2018; Pesaran et al., 1999). The ARDL approach was analyzed as follows:

$$y_{it} = \sum_{j=1}^{p} \lambda_{ijYi,t-j} + \sum_{j=0}^{q} \delta'_{ilXi,t} - j + \mu i + \varepsilon_{it}\,, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(1)$$

Where,

y_{it} is the dependent variable (sustainable economic growth) for country i and x ij (k × 1) are the vector explanatory variables (Total debt, Interest rate, Inflation, Government Consumption Expenditure, Gross Capital Formation, Governance levels) for country i, δij are (k × 1) coefficient vectors, p and q are the optimal lag for the dependent and independent variables correspondingly, countries are represented by i = 1, 2… N, time by t = 1, 2… T, while μi denotes the fixed effects, ε_{it} is the error term. A vector autoregressive (VAR) estimate was run to establish the optimal lag for each variable based on the AIC.

3.9 Cointegration Test

Kao Residual Cointegration test was conducted using the ARDL test developed by Pesaran, Hashem, & Richard (1999). The ARDL was chosen because it offers dispassionate approximations of the long-run equation, has no restrictive assumptions and allows use of different optimal lags for the different variables (Kharusi & Ada, 2018; Pegkas, 2018).

3.10 Stationarity Test

Unit root test was conducted to establish if a time series variable is non-stationary and holds a unit root. This is to avoid running a nonstationary series which could lead to false results (Gujarati & Porter, 2008). The ADF test was done to test the unit root. The null hypothesis in the study variables followed a unit root process. The null hypothesis should be rejected of the

p-values are below or equivalent to a specified level of significance, often 0.05, 0.01 or 0.1 (Dickey & Fuller, 1979)**.**

3.11 Reverse Causality Test

This study modeled debt as one of the explanatory variables for sustainable economic growth. Literature exist that supports debt-economic growth a bidirectional relationship (Tica, Arčabić, Lee, & Sonora, 2014). The Granger causality analysis was undertaken to detect the occurrence of this reverse phenomenon. The null hypothesis is that there is no Granger causality effect. The null hypothesis was not rejected if no lagged values of the explanatory variable had been kept in the regression (Granger, 1969)**.**

3.12Testing Relationships among Variables

Regression exploration was undertaken to discover the direction and forte of the association among variables. Moderation attributes causal association among the variables as a function of a moderator variable (Baron & Kenny, 1986). The study used hierarchical regression to test for the moderating effects. A variable is considered as intervening if it explains the interaction between two variables (Baron & Kenny, 1986). The panel path causal procedure was used to test the intervening effects in the variables. To test for the joint effect, the study adopted a regression analysis. The regression coefficients were used to estimate the mean variation in the dependent value given one unit change in the independent or predictor value. Table 3.3 below, summarizes the research objectives, hypotheses and the analytical methods that were used in the analysis.

Table 3.3: Research Objective, Hypotheses, Analytical Method, and Interpretation

Objective	Hypothesis	Analytical methods	Interpretation
To establish the effect of public debt on the sustainable economic growth in the EAC member countries.	H_0: Public debt does not significantly affect sustainable economic growth	Regression Analysis (Alexopoulos, 2010) $y_{it} = \sum_{j=1}^{p} \lambda_{ijYi,t-j} + \sum_{j=0}^{q} \delta'_{ilXi,t-j} + \mu_i + \varepsilon_{it,}$ Where, yit - sustainable economic growth, x - explanatory variable (public debt) δ - coefficient of the explanatory variable, p - optimal lag for the dependent q - optimal lag for the independent variables Countries are represented by i = 1, 2… N, Time periods by t = 1, 2… T μi - fixed effects Eit -error term.	Relationship exists if δ_{ij} is statistically Significant
To determine the effect of macroeconomic factors on the relationship between public debt and sustainable economic growth in the EAC member countries.	H_0: macroeconomic factors do not significantly mediate the relationship between public debt and sustainable economic growth	Stepwise Regression Analysis (Baron & Kenny, 1986) $y_{it} = \sum_{j=1}^{p} \lambda_{ijYi,t-j} + \sum_{j=0}^{q} \delta'_{ilXi,t-j} + \mu_i + \varepsilon_{it,}$ Were, yit - sustainable economic growth, x - Explanatory variables (public debt and macroeconomic factors) δ - coefficient of the explanatory variable, p - optimal lag for the dependent q - optimal lag for the independent variables Countries are denoted by i = 1, 2… N, Time periods by t = 1, 2… T μi - fixed effects, Eit -error term.	Connection exists if δ_{ij} is statistically Significant

To establish the effect of governance on the relationship between public debt and sustainable economic growth in the EAC member countries.	$H_{0:}$ Governance does not significantly moderate the relationship between public debt and sustainable economic growth.	Moderation Regression Equation (MacKinnon, 2011) $y_{it} = \sum_{j=1}^{p} \lambda_{ijYi,t-j} + \sum_{j=0}^{q} \delta'_{ilXi,t-j} + \mu_i + \varepsilon_{it,}$ Where, yit - sustainable economic growth, x - is the explanatory variables (public debt is independent variable, while governance indicators are the Moderating Variables δ - coefficient of the explanatory variable, p - optimal lag for the dependent q - optimal lag for the independent variables Countries are represented by i = 1, 2… N, Time periods by t = 1, 2… T μi - fixed effects Eit - error term.	Relationship exists if δ_{ij} is statistically Significant
To determine the joint effect of public debt, macroeconomic factors, and governance on the sustainable economic growth in the EAC member countries.	$H_{0:}$ Public debt, macroeconomic factors and governance do not have significant joint effect on sustainable economic growth.	Regression analysis (Alexopoulos, 2010) $y_{it} = \sum_{j=1}^{p} \lambda_{ijYi,t-j} + \sum_{j=0}^{q} \delta'_{ilXi,t-j} + \mu_i + \varepsilon_{it,}$ y_{it} is the dependent variables (sustainable economic growth) for country i and x ij (k × 1) are the explanatory variables (public debt, macroeconomic factors and governance indicators) for country i, δij are (k × 1) coefficient vectors, p and q are the optimal lag for the dependent and independent variables respectively, countries are represented by i = 1, 2… N, time periods by t = 1, 2… T, whereas μi denotes the fixed effects, ε_{it} is the error term	Relationship exists if δ_{ij} is statistically Significant

CHAPTER FOUR: DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter displays the descriptive statistics of the research variables. The study variables include public debt, macroeconomic factors, governance, and sustainable economic growth. The analysis presented in this chapter involved the use of descriptive analysis such as the mean, standard deviation, minimum, maximum, skewness, kurtosis, and country specific time series line graphs. The chapter also presents diagnostic tests for normality, linearity, multicollinearity, heteroscedasticity, and homoscedasticity. It also highlights model specification framework and correlation analysis. Diagnostic tests and tests of assumptions were conducted to measure the suitability of the variables for subsequent inferential analysis.

4.2 Descriptive Analysis

To determine the statistical properties of the model before running any estimation, descriptive statistics for all the variables were conducted. The summary of statistics in Table 4.1 below presents the measures of central tendency and dispersal. The summary of statistics includes the Mean, Standard Deviation, Minimum, Maximum, Skewness and Kurtosis for the specific variable data for the five East African Community countries.

From the findings in table 4.1 below, the mean index of sustainable economic growth (SEG) was 507.9 with a standard deviation of 247.2 with a minimum and a maximum value of 200.7 and 1075.4 respectively. The high levels of standard deviation show that the SEG exhibited high levels of variability. The data presents a positive skewness at 0.614 and negative levels of peakedness at -0.607.

Table 4.1: Summary of Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Standard. Error	Statistic	Standard. Error
SEG	100	200.73	1075.46	507.9036	247.24373	.614	.241	-.607	.478
LNTD	100	19.64	24.76	22.2965	1.34497	-.230	.241	-.949	.478
LNDD	100	17.61	23.98	20.7433	1.44528	.226	.241	-.682	.478
LNED	100	19.92	24.18	22.0648	1.13091	-.172	.241	-1.095	.478
CPI	100	.30	25.50	7.3360	4.49652	1.585	.241	3.548	.478
RIR	100	-16.68	23.00	8.6693	7.06928	-.614	.241	1.119	.478
GCF	100	2.78	37.65	21.0834	7.28532	.100	.241	.179	.478
GCE	100	7.50	26.21	14.5754	4.32045	.651	.241	.269	.478
PS	100	-2.52	.12	-.9600	.59231	-.158	.241	-.437	.478
CCOR	100	-1.45	.76	-.6818	.50961	1.334	.241	1.251	.478
GOV	100	-1.46	.01	-.6675	.34290	-.559	.241	-.059	.478
LNGDP	100	20.48	25.21	23.0608	1.29342	-.312	.241	-.969	.478
Valid N (listwise)	100								

The mean natural log of gross domestic product (GDP) was 23.06 with a standard deviation of 1.29 and minimum and maximum values of 20.48 and 25.21 correspondingly. The high levels of standard deviation show that the GDP did exhibit high levels of variability. The data presents a negative skewness at -0.312 and negative levels of peakedness at -0.969.

Debt variable is segregated between Total debt (TD), external debt (ED) and domestic debt (DD). As presented in Table 4.1 above, the mean natural log of Total debt is 22.29 with a minimum of 19.64 and a maximum of 24.76. The low standard deviation of 1.34 implies that total debt exhibits lower levels of variability. The data presents a negative skewness at -0.230 and negative levels of peakedness at -0.949. The mean natural log of Domestic debt is 20.74 with a minimum of 17.61 and a maximum of 23.98. The low standard deviation of 1.44 implies that domestic debt exhibits lower levels of variability. The data presents a positive skewness at 0.226 and negative peakedness at -.682. Mean natural log of External debt is 22.06 with a minimum of 19.92 and a maximum of 24.18. A low standard deviation of 1.13 infers low variability of external debt with a negative skewness of -0.17 and a negative peakedness of -1.09.

Table 4.1 above shows that the mean rate of inflation is 7.33 with a minimum of 0.3 and a maximum of 25.50. With a standard deviation of 4.49 infers some levels of variability on the inflation rates over the years. The data has a positive skewness at 1.58 and a positive peakedness at 3.54. The mean real interest rate is 8.66 with a minimum of -16.68 and a maximum of 23.00. A standard deviation of 7.06 implies variability of the real interest rates. The data presents a negative skewness at -0.61 and a positive skewness at 1.11.

In table 4.1 above, data of Gross capital formation (GCF) has a mean rate of 21.08 with a minimum of 2.78 and a maximum of 37.65. The standard deviation of 7.28 is an indicator of variability of the GCF data over time. The data has positive skewness of 0.100 and peakedness of 0.179. The Government Consumption Expenditure (GCE) has a mean rate of 14.57 with a minimum of 7.50 and a maximum of 26.21. The data has standard deviation of 4.32 indicating variability of the GCE data. The data has positive skewness at 0.65 and peakedness of 0.26.

Governance variable is operationalized in terms of Political Stability and Control of Corruption. Governance has a mean of -0.66 with a minimum of -1.46 and a maximum of 0.01. At a standard deviation of 0.34, data on Governance exhibit low levels of variability with negative skeweness of -0.55 and peakedness of -0.05. Political stability has a negative mean at -0.96 with a minimum of -2.52 and a maximum of 0.12. With a standard deviation of 0.59, the data exhibit negative skewness at -0.15 and peakedness at -0.43. Control of Corruption has a negative mean at -0.68 with a minimum of -1.45 and a maximum of 0.76. The standard deviation of 0.50 implies low variability of control of corruption data with a positive skewness of 1.33 and a positive peakedness of 1.25.

4.2.1 Total Debt Trend

The study sought to establish the trend movement of total debt amount the EAC member countries. The time series trend movement for natural log for the five countries is presented in figure 4.1 below.

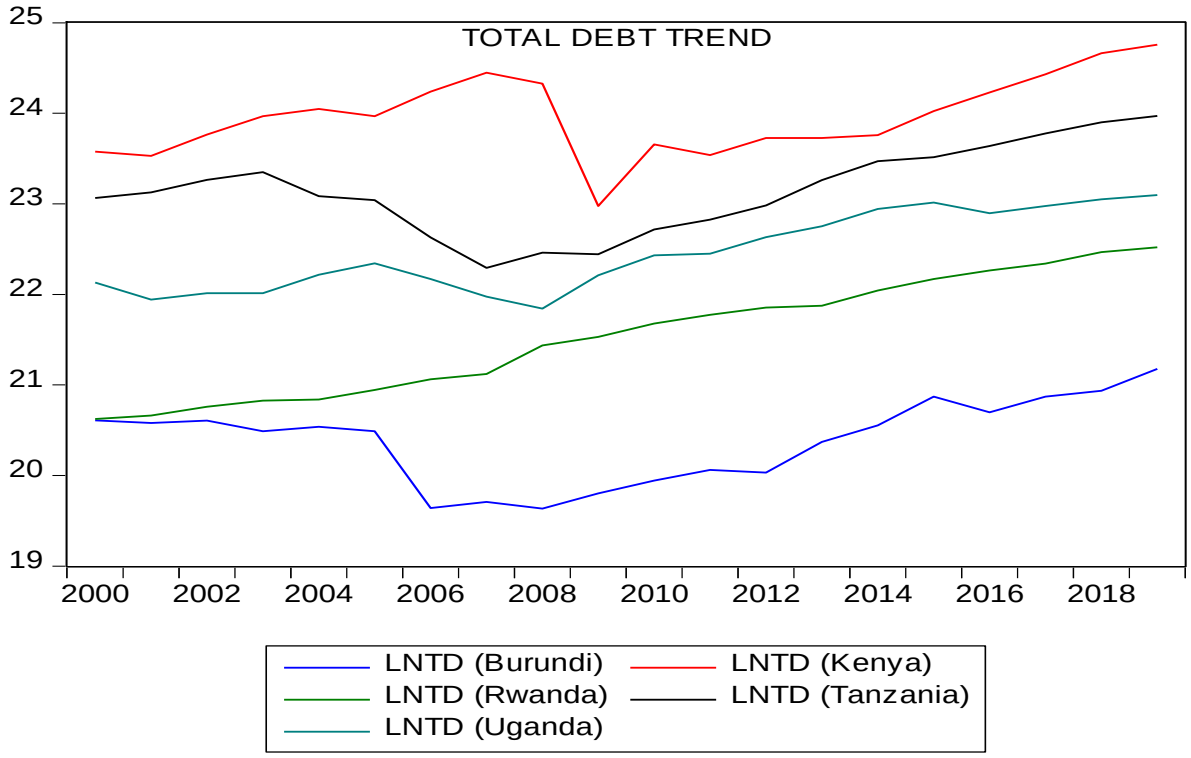

Figure 4.1: Movement of Total Debt

As presented in figure 4.1, Kenya leads the region in Total debt level, followed by Tanzania, Uganda, Rwanda, and Burundi respectively. Kenya's Total Debt exhibited an increasing trend between years 2000 to 2007 when it declined slightly up to year 2009 after which it earnestly maintained an increasing trend to date. Tanzania total debt level increased between years 2000 to 2003 after which it declined up to year 2007. Thereafter, it has maintained an increasing trend to date. Uganda total debt level has an increasing trend over the years save for year 2001 and 2008 when it declined but earnestly picked an increasing trend. Rwanda total debt levels has been on an increasing trend throughout the period. Burundi debt levels declined between years 2000 to 2007 where after it has been on an increasing trend to date.

4.2.2 Domestic Debt Trend

Generally, the levels of domestic debt for Kenya have exceeded the other EAC countries domestic debt levels except for year 2011 when it was lower than Tanzania domestic debt

level and year 2012 when it was lower than both Tanzania and Uganda Debt levels. From the year 2000, domestic debt level for Rwanda and Burundi exhibited an increasing trend.

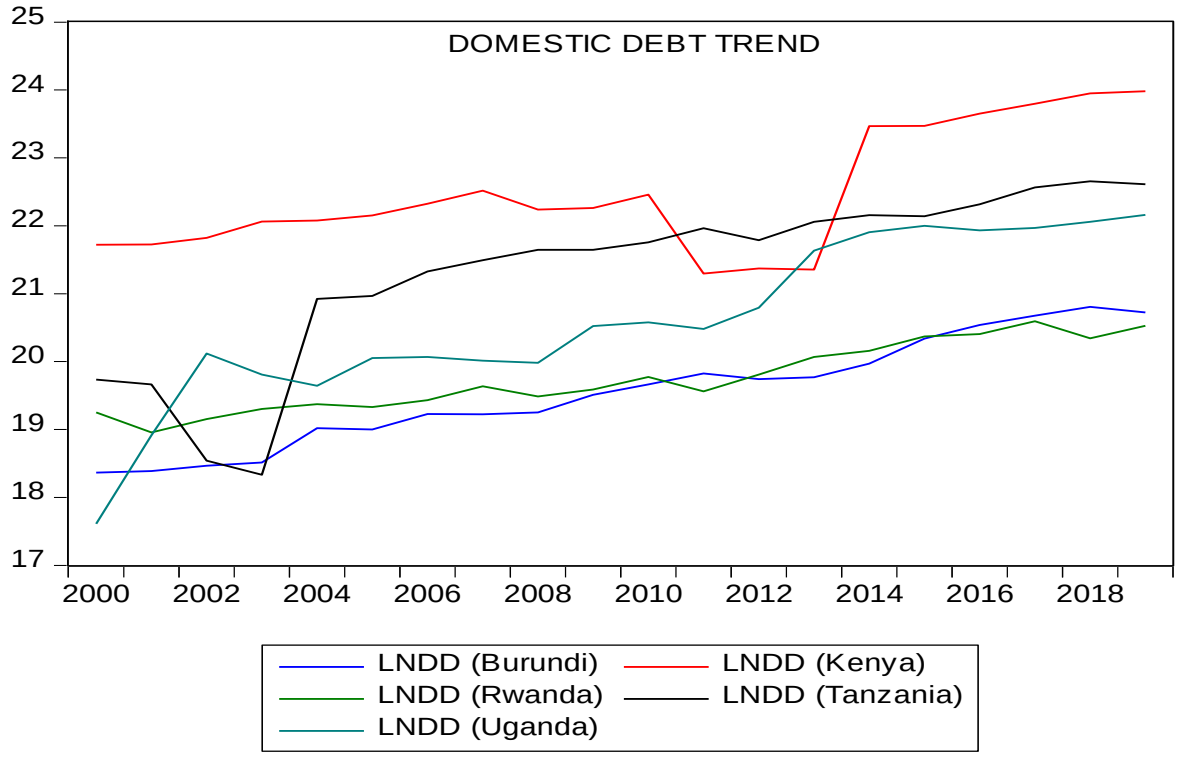

Figure 4.2: Movement of Domestic Debt

As presented in Figure 4.2, Kenya domestic debt level increased slightly between year 2000 and 2011. It then decreased between year 2011 and 2013 and thereafter increased after 2013 to date. Tanzania domestic borrowing declined between year 2000 and 2003 after which it increased to date. Uganda domestic debt level recorded an increase over the period with a steep increase between 2000 and 2002.

4.2.3 External Debt Trend

As presented in Figure 4.3 below, the external debt for Kenya has been on an increasing trend from year 2000 to 2018 when it declined slightly. Tanzania, Uganda, and Rwanda external debt levels declined between the years 2006 and 2007 mostly due to the global financial crisis

after which its levels have exhibited an increasing trend. External debt trend for Burundi has declined since year 2008.

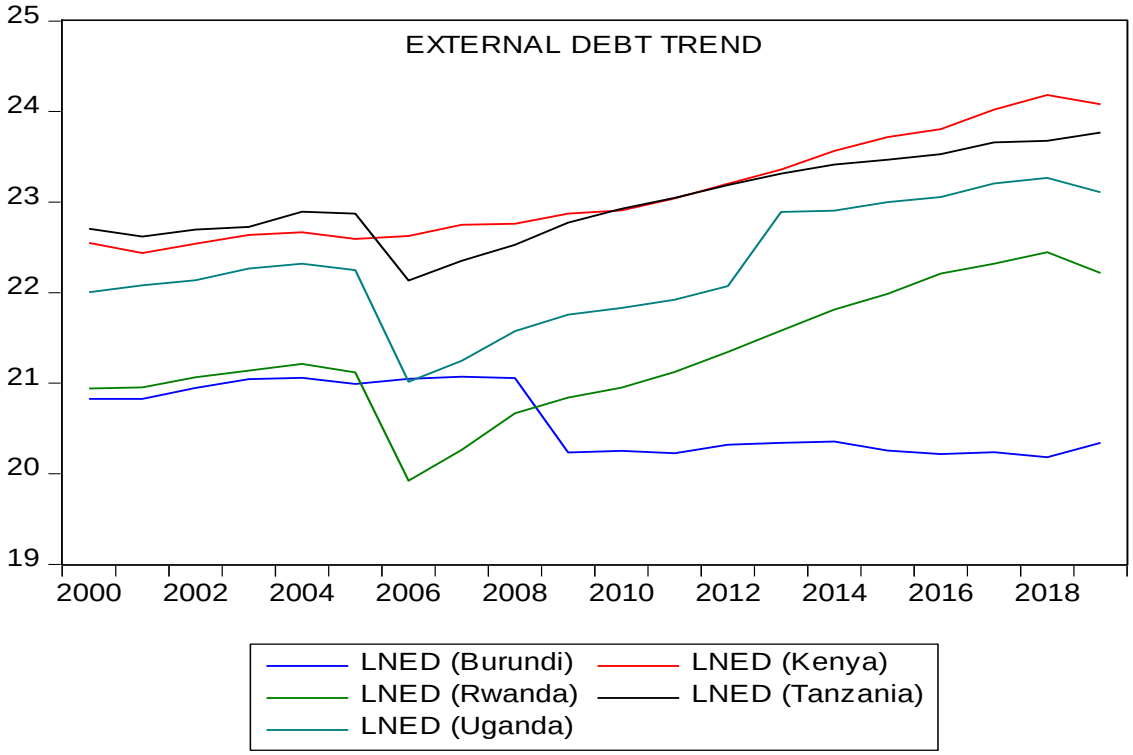

Figure 4.3: Movement of External Debt

4.2.4 Sustainable economic growth Trend

Generally, regional countries' sustainable economic growth has been on an increasing trend save for Burundi where the sustainable economic growth levels exhibit a near stagnation trend over the period. Kenya sustainable economic growth index leads the regional pack followed by Tanzania, Uganda, Rwanda, and Burundi respectively. In figure 4.4 below, the sustainable economic growth for Kenya, Tanzania, Uganda, and Rwanda declined in year 2009 when compared to the general increasing trend exhibited in earlier years.

Since sustainable economic growth is traditionally estimated by change in GDP, Figure 4.5 below presents the GDP trends of the EAC member countries. Kenya leads the region in Gross domestic product followed respectively by Tanzania, Uganda, Rwanda, and Burundi economies.

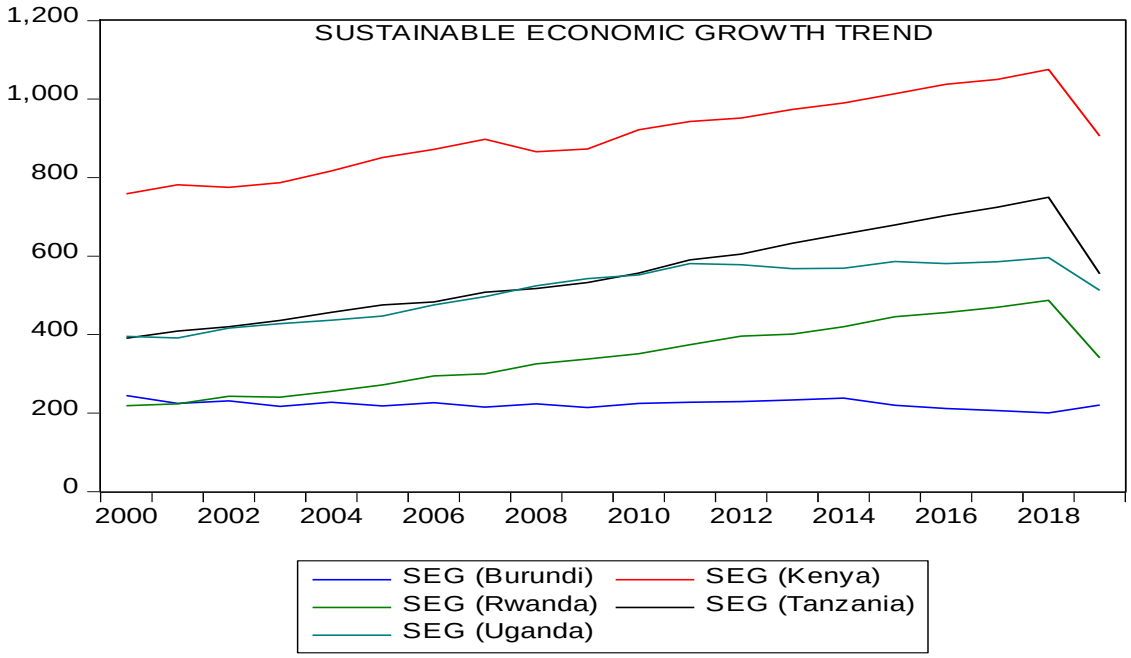

Figure 4.4: Movement of Sustainable economic growth

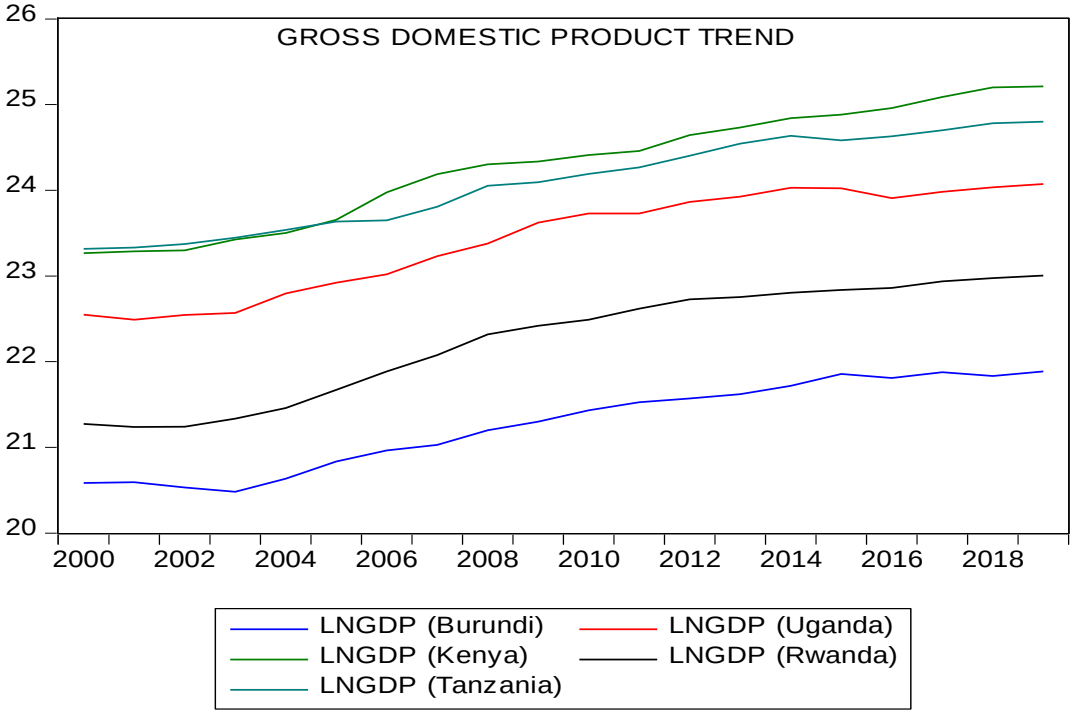

Figure 4.5: Gross Domestic Product Trend

4.2.5 Inflation Rates Trend

Figure 4.6 shows the time trend for inflation for the five EAC countries. Between 2000 and 2019, the inflation rates for all the five EAC countries have been exhibiting great fluctuations. There are higher variations in the rates of inflation for Burundi. Since 2012, inflation has been exhibiting a declining trend for Tanzania, Kenya, Uganda, and Rwanda. The rate of inflation in Rwanda is generally lower than the other EAC member countries rates of inflation.

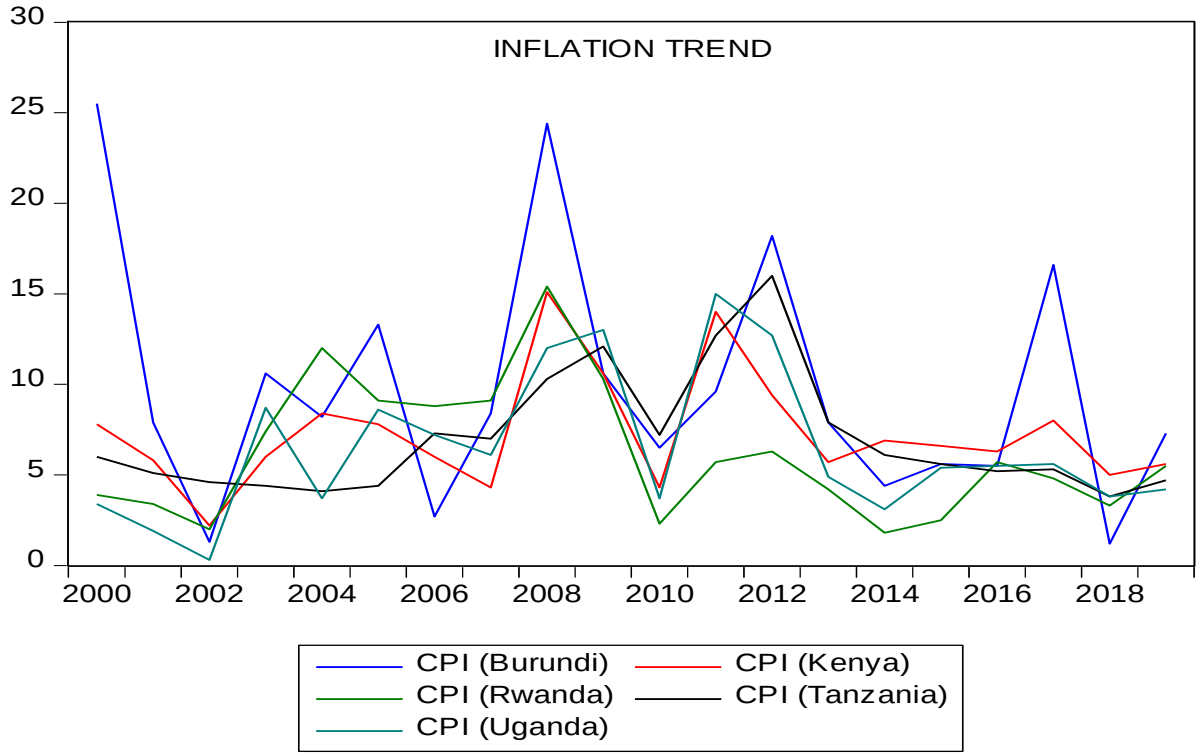

Figure 4.6: Inflation Rates Trend

4.2.6 Interest Rates Trend

Figure 4.7 shows the time trend for interest rates for the five EAC member countries. Between 2000 and 2019, the interest rates for all the five EAC member countries have been exhibiting great fluctuations. Over the years, Uganda has generally had higher interest rates while Tanzania had lower levels of Interest rates in the region. Though with fluctuations, the

regional interest rates over time seem to be converging towards a range with minimal variations.

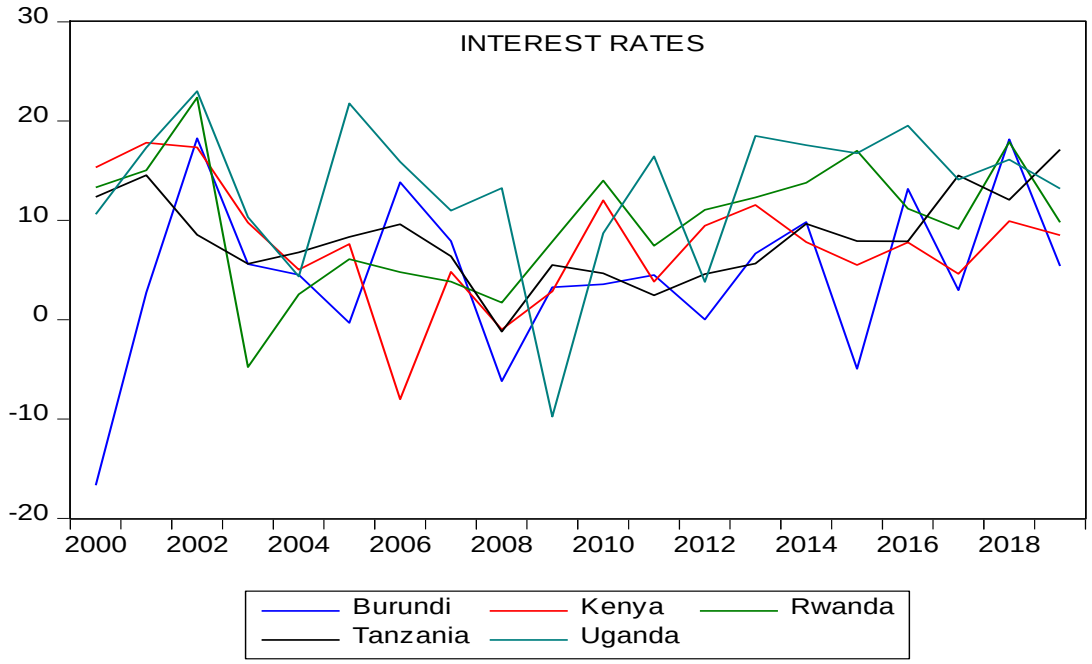

Figure 4.7: Interest Rates Trend

4.2.7 Gross Capital Formation Trend

Figure 4.8 below presents the Gross Capital Formation trend wherein Tanzania has led the EAC countries in GCF since year 2003.

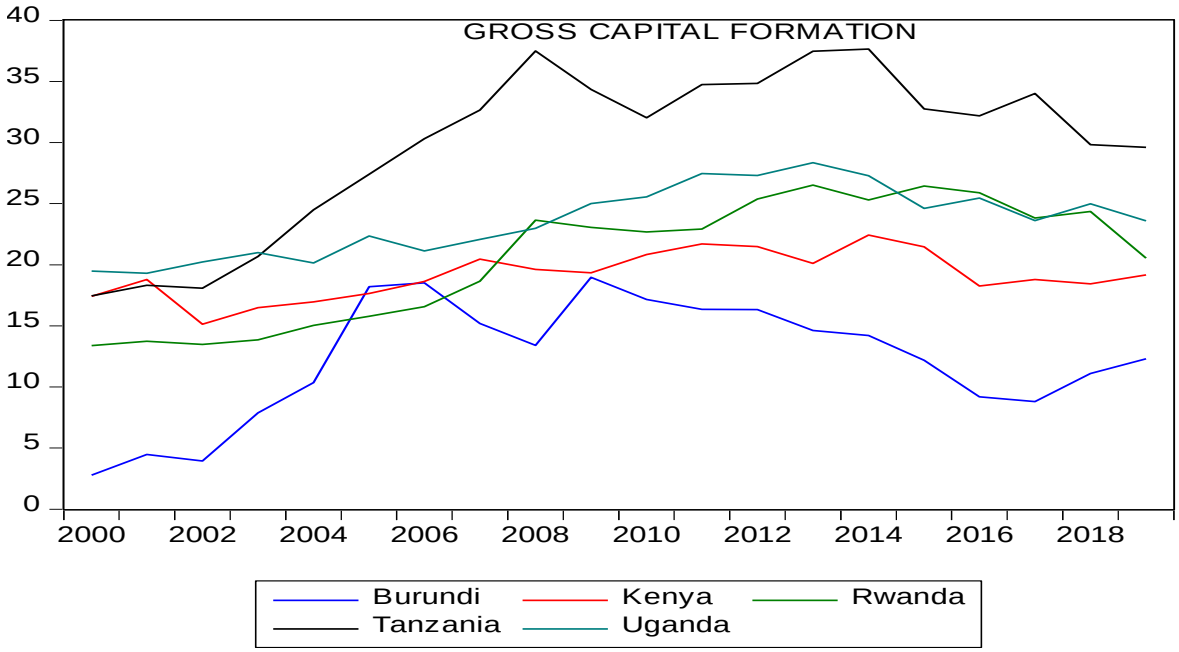

Figure 4.8: Gross Capital Formation Trend

As presented in Figure 4.8, the GCF trend has increased in Kenya, Uganda, Tanzania, and Rwanda until year 2015 when there has been a slight decline. GCF in Burundi increased up to year 2006 and declined up to year 2016.

4.2.8 Government Consumption Expenditure Trend

As presented in Figure 4.9 below, the Government Consumption Expenditure (GCE) for Burundi has been higher than the other EAC member countries since year 2007. Tanzania, Kenya, Rwanda, and Uganda GCE ratios have been declining since year 2003 and 2004.

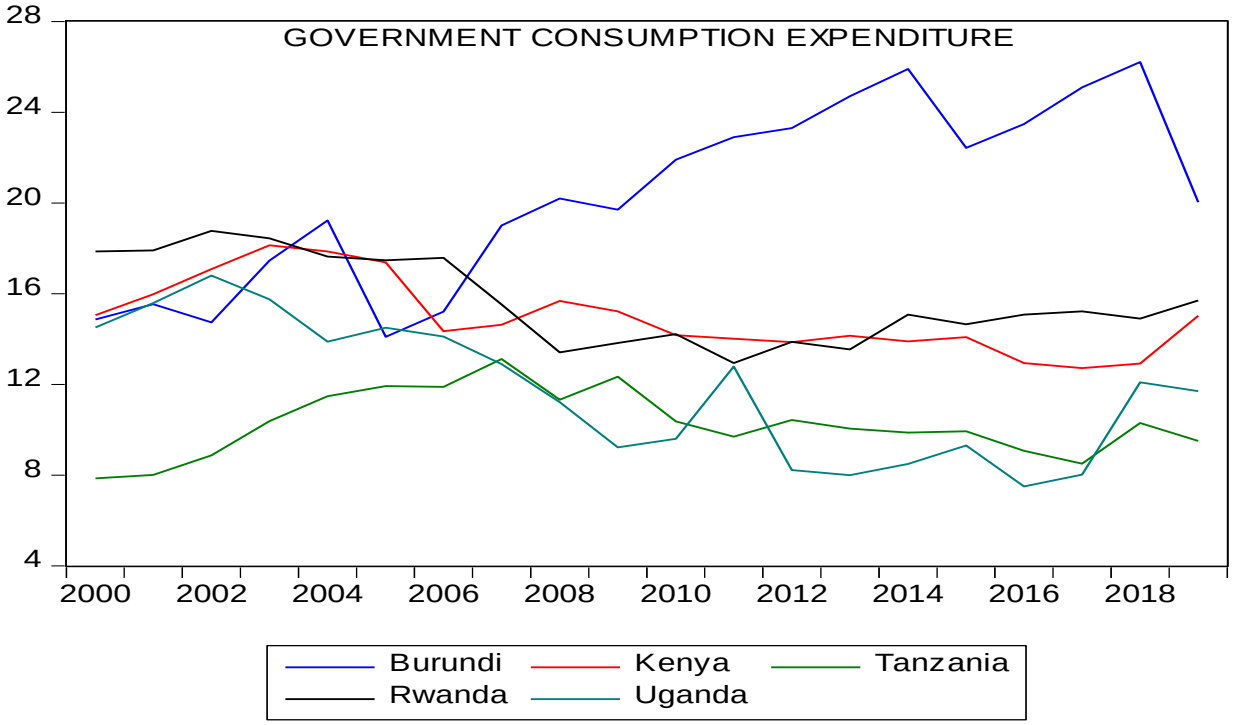

Figure 4.9: Government Consumption Expenditure Trend

4.2.9 Governance Index Trend

Prior to 2008, Tanzania had higher governance indicators in the region as compared to the other member countries. Rwanda has had an increasing Governance indicator since 2000 has led the region in good governance. Over the years, the levels of Governance indicators for Kenya and Uganda have been improving though at relatively lower rates. For Burundi, the

governance indicators have fluctuated over the years but have not improved over time as compared to the other EAC member countries.

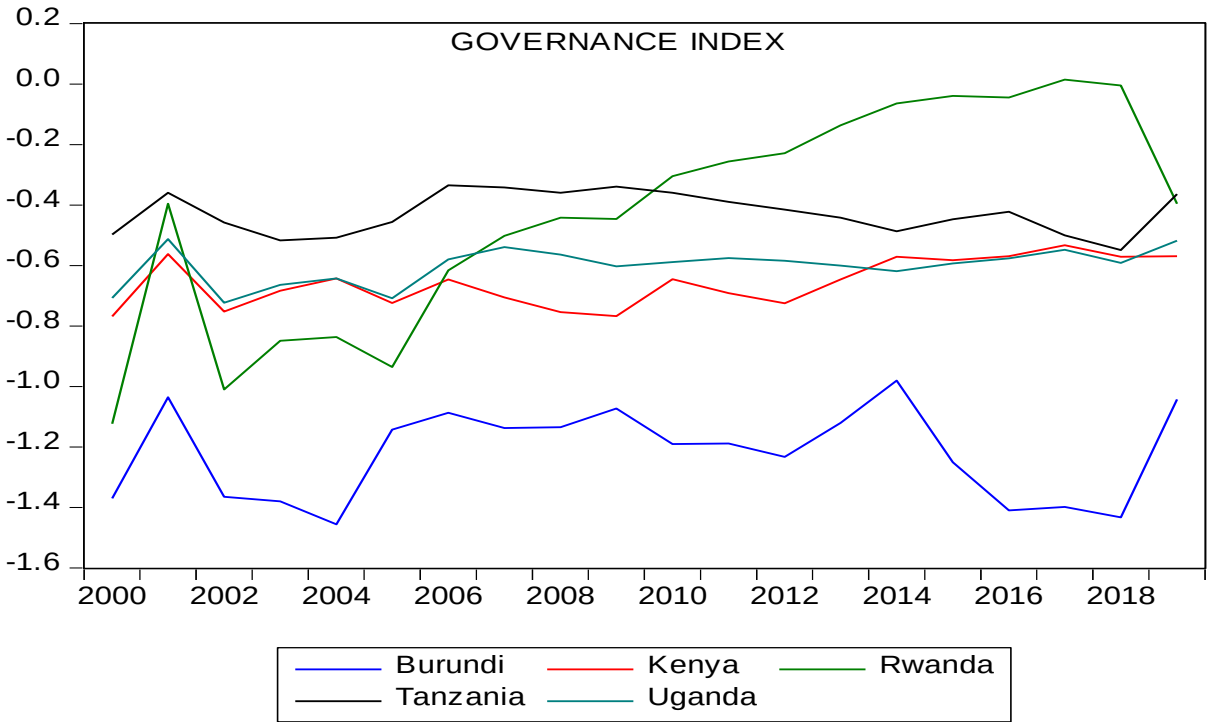

Figure 4.10: Governance Index Trend

4.3 Diagnostic Tests

To prepare the data for further analysis, diagnostic tests were conducted specifically normality, multicollinearity, heteroscedasticity tests, auto correlation tests, co-integration, unit root and optimal lag tests.

4.3.1 Normality Tests

The Jarque – Bera test was used to test for the Normality of the data. The test null hypothesis stated that residuals are normally distributed, and the alternative hypothesis stated that residuals are not normally distributed. The decision criterion was to reject the null hypothesis if the p-values were statistically significant ($P < .05$), or otherwise fail to reject the null hypothesis if the p-value were insignificant ($P > .05$) in each case.

As presented in Figure 4.11 below, P = 0.365. Since P > 0.05, we fail to reject the null hypothesis thus confirming that the data is normally distributed.

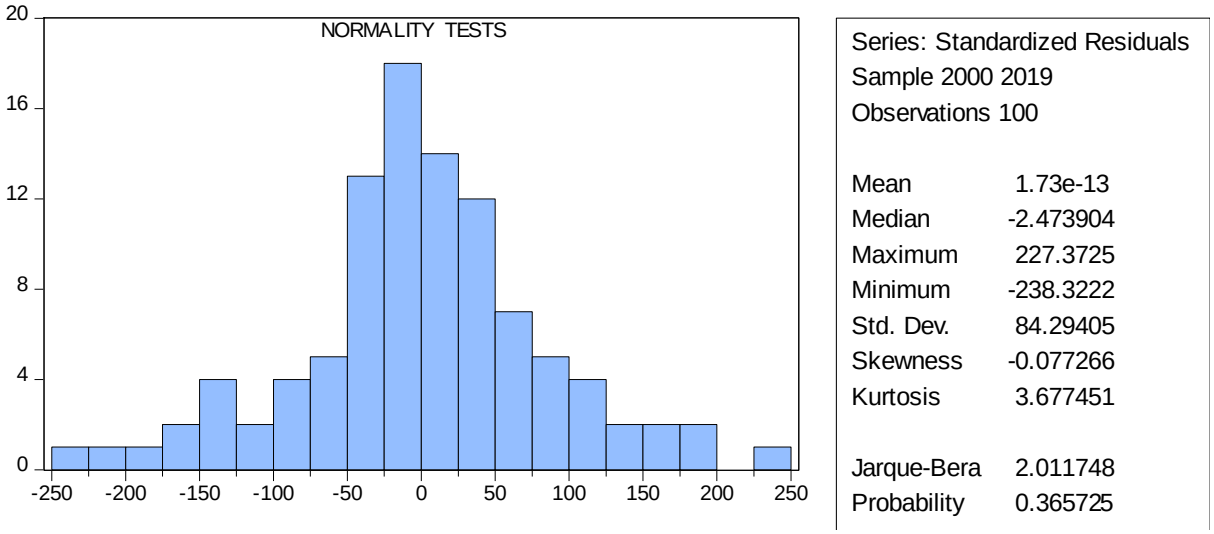

Figure 4.11: Data Normality Test

4.3.2 Linearity Tests

Based on the ANOVA output table 4.2, value sig. deviation from linearity of 0.301> 0.05, it is concluded that there is a linear relationship between sustainable economic growth and the other study variables.

Table 4.2: ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
SEG * CPI	Between Groups	(Combined)	4429502.593	69	64195.690	1.187	.307
		Linearity	40309.355	1	40309.355	.745	.395
		Deviation from Linearity	4389193.239	68	64546.959	1.194	.301
	Within Groups		1622324.655	30	54077.488		
	Total		6051827.248	99			

4.3.3 Heteroscedasticity Tests

Data heteroscedasticity was tested using the Likelihood Ratio (LR) tests in Rutemiller and Bowers (1968) and in Harvey's (1976) groupwise heteroscedasticity papers. As presented in Tables 4.3 and 4.4 below, the data exhibits homoscedasticity in the data as the p-value = 0.00. Since p-value $p<0.05$, we fail reject the null hypothesis as the residuals are homoscedastic. The analysis was therefore carried out using the natural log of the study variables.

Table 4.3: Panel Cross-section Heteroscedasticity LR Test.

Specification: SEG LNDD LNED LNTD			
	Value	df	Prob.
Likelihood ratio	71.94886	5	0.0000
LR test summary:			
	Value	df	
Restricted Log L	-667.4678	97	
Unrestricted Log L	-631.4934	97	

Table 4.4: Panel Period Heteroscedasticity LR Test

Specification: SEG LNDD LNED LNTD			
	Value	df	Probability
Likelihood ratio	52.95062	5	0.0000
LR test summary:			
	Value	df	
Restricted LogL	-667.4678	97	
Unrestricted LogL	-640.9925	97	

4.3.4 Unit Root and Stationarity Tests

Considering that the study used time series data, unit root tests were done to establish if the variables are non-stationary and takes unit root or not. As explained in Gujarati and Porter (2008), this was tested to avoid running a non-stationary series which eventually leads to spurious results. The ADF test that was conducted to test the unit root is displayed in table 4.5 below. The null hypothesis in the foregoing study was that the variables followed a unit root process. The null hypothesis is rejected if the p-values are below or equal to a specified level of significance, often 0.05, 0.01 or 0.1 (Dickey & Fuller, 1979**).**

Table 4.5: ADF Unit Root Test

Null Hypothesis: the variable has a unit root									
	At Level								
		SEG	LNDD	LNED	LNTD	CPI	GCF	GCE	GOV
With Constant	t-Statistic	0.4981	0.9149	0.8303	0.9608	0.1813	0.5088	0.5530	0.1602
	Prob.	0.4704	0.5944	0.8993	0.8122	0.2902	0.2752	0.2364	0.0934
		n0	n0	n0	n0	n0	n0	n0	*
With Constant & Trend	t-Statistic	0.9063	0.0365	0.6841	0.3049	0.1770	0.9952	0.9233	0.0544
	Prob.	0.6896	0.3454	0.5533	0.9466	0.6268	0.9611	0.4503	0.2571
		n0	n0	n0	n0	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	0.7770	0.9725	0.8850	1.0000	0.5519	0.8215	0.4081	0.0441
	Prob.	0.7996	0.8960	0.9305	0.8375	0.3233	0.8318	0.7309	0.3685
		n0	n0	n0	n0	n0	n0	n0	n0
	At First Difference								
		d(SEG)	d(LNDD)	d(LNED)	d(LNTD)	d(CPI)	d(GCF)	d(GCE)	d(GOV)
With Constant	t-Statistic	0.5331	0.0000	0.0126	0.0014	0.0008	0.0585	0.0077	0.0000
	Prob.	0.5497	0.0028	0.0064	0.1131	0.0038	0.0235	0.0013	0.0184
		n0	***	***	n0	***	**	***	**
With Constant & Trend	t-Statistic	0.9082	0.0003	0.0499	0.0092	0.0028	0.0743	0.0225	0.9533
	Prob.	0.9578	0.0228	0.0263	0.1748	0.0110	0.0485	0.0025	0.0840
		n0	**	**	n0	**	**	***	*
Without Constant & Trend	t-Statistic	0.1271	0.0000	0.0009	0.3370	0.0000	0.0052	0.0004	0.0000
	Prob.	0.1533	0.0009	0.0007	0.0137	0.0001	0.0020	0.0001	0.0008
		n0	***	***	**	***	***	***	***

Notes:

a: (*)Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

As presented in Table 4.5 above, at level, all the variables namely, sustainable economic growth, domestic debt, external debt, total debt, inflation, gross capital formation, gross capital expenditure and governance exhibited unit root tests. At first difference, sustainable economic growth data has unit roots as the predictor variables namely, domestic debt, external debt, total debt, inflation, gross capital formation, gross capital expenditure and governance exhibit stationarity as P <0.05.

4.3.5 Cointegration Tests

As presented in tables 4.6 and 4.7 below, the data was tested for Cointegration. The ADF statistic value is -3.045 and the related one-sided p-value (for a test with 100 observations) is .001. Since P<0.05, the data we fail to reject the null hypothesis that the data has no cointegration.

Table 4.6: Kao Residual Cointegration Test

Series: SEG LNDD LNED LNTD CPI GCF GCE GOV				
Included observations: 100				
Null Hypothesis: No cointegration				
Trend assumption: No deterministic trend				
Automatic lag length selection based on SIC with a max lag of 4				
Newey-West automatic bandwidth selection and Bartlett kernel				

Table 4.7: ADF Cointegration Test				
Dependent Variable: D(RESID)				
Method: Least Squares				
Included observations: 95 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.521901	0.097723	-5.340603	0.0000
R-squared	0.229010	Mean dependent var		-2.892143
Adjusted R-squared	0.229010	S.D. dependent var		41.41406
S.E. of regression	36.36405	Akaike info criterion		10.03551
Sum squared resid	124300.4	Schwarz criterion		10.06239
Log likelihood	-475.6867	Hannan-Quinn criter.		10.04637
Durbin-Watson stat	1.700457			

4.3.6 Multicollinearity Tests

The study applied the VIF to test for the occurrence or lack of multicollinearity amongst the independent variables. VIF shows how the variation of the coefficient estimates of a regressor inflates due to its collinearity with other regressors. The multicollinearity tests relied on the generated results from the data for all the independent variables. VIF estimates the influence of collinearity among the variables in the regression model and all the time greater than or equal to one. As noted in Myers (1990), A VIF for all the independent and dependent variables when less than 3 ($VIF \leq 3$) indicated no multicollinearity while a VIF of ≥ 3 points to collinearity and more than 10 indicated a problem with multicollinearity. In Menard (1995), Tolerance Statistics values below 0.1 indicate a significant problem while those below 0.2 point out to a potential problem, (Menard, 1995). The results as shown in Table 4.8 below are within the acceptable VIF ranges between one and ten ($1 < VIF < 10$) as presented in the coefficients table with collinearity statistics made up of tolerance and variance inflation factors. The findings imply no multicollinearity problems with the variables.

Table 4.8: VIF Test

Model		Collinearity Statistics	
		Tolerance	VIF
1	LNTD	.120	8.351
	LNDD	.225	4.441
	LNED	.125	8.007
	CPI	.509	1.963
	RIR	.531	1.885
	GCF	.274	3.651
	GCE	.288	3.470
	GOV	.305	3.278

a. Dependent Variable: SEG

4.3.7 Optimum Lag length Selection

The lags chosen critically influences estimate interpretation especially when the differences are large enough. This study assessed the appropriate optimal level that can generate the most

efficient estimates efficiencies. Table 4.9 below presents the minimum and appropriate VAR lag order selected criteria from each column criterion.

Table 4.9: VAR Lag Order Selection Criteria

Endogenous variables: ED DD TD SEG						
Exogenous variables: C						
Sample: 1 100						
Observations: 60						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1008.344	NA	5.31e+09	33.74480	33.88442	33.79941
1	-903.5197	192.1778	2.75e+08	30.78399	31.48211	31.05706
2	-849.1102	92.49615*	77152155*	29.50367*	30.76028*	29.99520*
* Indicates lag order selected by the criterion						
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						

From the outcomes in table 4.9, LR, FPE, AIC, SC and HQ indicate results up to lag two (2). It depicts that the optimal VAR lag order was appropriate for estimation at second lag (lag = 2) as indicated by (*) for all the criteria. As indicated in Gujarati (2013), the criterion with the smallest value is preferred for model estimation to have more degrees of freedom. Thus, based on the AIC criterion which exhibited the smallest values (AIC = 29.50367*) the study estimated the models at optimal second lag (2) henceforth.

4.4 Correlation Analysis

The research embraced correlation analysis to explain the association between the study variables. As presented in table 4.10 below, there are statistically significant strong positive relationships between total debt and sustainable economic growth ($r=0.904$, $P<0.05$),

domestic debt and sustainable economic development (r=0.839, P<0.05), external debt and sustainable economic development (r=0.834, P<0.05), gross domestic product and sustainable economic growth (r=0.872, P<0.05), domestic debt and total debt (r=0.789, P<0.05), external debt and total debt (r=0.902, P<0.05), domestic debt and external debt (r=0.759, P<0.05), governance and total debt (r=0.561, P<0.05), governance and external debt (r=0.544, P<0.05), gross domestic product and external debt (r=0.919, P<0.05), gross domestic product and domestic debt (r=0.846, P<0.05), gross domestic product and external debt (r=0.892, P<0.05). There are also statistically significant strong constructive associations among gross capital formation and external debt (r=0.575, P<0.05), governance and external debt (r=0.544, P<0.05), political stability and gross capital formation (r=0.756, P<0.05), governance and gross capital formation (r=0.730, P<0.05), gross capital formation and gross domestic product (r=0.690, P<0.05), governance and gross domestic product (r=0.608, P<0.05), control of corruption and political stability (r=0.669, P<0.05), governance and political stability (r=0.897, P<0.05), governance and control of corruption (r=0.701, P<0.05).

In table 4.10 below, weak statistically significant positive relationships are noted between gross capital formation and sustainable economic growth (r=0.377, P<0.05), governance and sustainable economic growth (r=0.397, P<0.05), total debt and gross capital formation (r=0.483, P<0.05), total debt and political stability (r=0.356, P<0.05), domestic debt and gross capital formation (r=0.469, P<0.05), domestic debt and political stability (r=0.215, P<0.05) and domestic debt and governance (r=0.324, P<0.05).

Table 4.10: Correlation Analysis

	SEG	LNTD	LNDD	LNED	CPI	RIR	GCF	GCE	PS	CCOR	GOV	LNGDP
SEG	1											
LNTD	.904**	1										
LNDD	.839**	.789**	1									
LNED	.834**	.902**	.759**	1								
CPI	-.090	-.233*	-.111	-.210*	1							
RIR	.063	.170	.083	.199*	-.669**	1						
GCF	.377**	.483**	.469**	.575**	-.093	.152	1					
GCE	-.437**	-.595**	-.326**	-.692**	.117	-.160	-.672**	1				
PS	.163	.356**	.215*	.371**	-.191	.182	.756**	-.567**	1			
CCOR	-.136	.009	-.164	-.014	-.210*	.144	.317**	-.226*	.669**	1		
GOV	.397**	.561**	.324**	.544**	-.282**	.258**	.730**	-.646**	.897**	.701**	1	
LNGDP	.872**	.919**	.846**	.892**	-.149	.145	.690**	-.645**	.465**	-.015	.608**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.10 above illustration a statistically significant weak positive relationships between external debt and real interest rates (r=0.199, P<0.05), external debt and political stability (r=0.371, P<0.05), control of corruption and gross capital formation (r=0.317, P<0.05). Weak positive relationships which are not statistically significant are established between real interest rate and sustainable economic growth (r=0.063, P>0.05), political stability and sustainable economic growth (r=0.163, P>0.05), real interest rate and total debt (r=0.170, P>0.05), control of corruption and total debt (r=0.009, P>0.05), real interest rate and domestic debt (r=0.083, P>0.05), gross capital expenditure and inflation (r=0.117, P>0.05), gross capital formation and real interest rate (r=0.152, P>0.05), political stability and real interest rate (r=0.182, P>0.05), control of corruption and real interest rate (r=0.144, P>0.05)and gross domestic product and real interest rate (r=0.145, P>0.05).

In table 4.10 above, non-statistically significant weak negative relationships are presented between control of corruption and gross domestic product (r= -0.015, P>0.05), gross domestic product and inflation (r=-0.149, P>0.05), political stability and inflation (r=-0.191, P>0.05), gross capital formation and inflation (r=-0.093, P>0.05), external debt and control of corruption (r=-0.014, P>0.05), control of corruption and domestic debt (r=-0.164, P>0.05), control of corruption and sustainable economic growth (r=-0.136, P>0.05), inflation and domestic debt (r=-0.111, P>0.05), inflation and sustainable economic growth (r=-0.090, P>0.05).

Statistically significant weak negative relationships presented in table 4.10 are between gross capital expenditure and sustainable economic growth (r=-0.437, P<0.05), inflation and total debt (r=-0.233, P<0.05), gross capital expenditure and domestic debt (r=-0.326, P<0.05),

control of corruption and inflation (r=-0.210, P>0.05), control of corruption and gross capital expenditure (r=-0.226, P>0.05) and governance and inflation (r=-0.282, P>0.05).

Statistically significant strong negative relationships as presented in table 4.10 above. The relationships are between gross capital expenditure and total debt (r=-0.595, P>0.05), gross capital expenditure and external debt (r=-0.692, P>0.05), inflation and real interest rate (r=-0.669, P>0.05), gross capital expenditure and gross capital formation (r=-0.672, P>0.05), governance and gross capital expenditure (r=-0.646, P>0.05), gross domestic product and gross capital expenditure (r=-0.645, P>0.05).

4.5 Granger Causality Tests

Dual Causality link among sustainable economic growth and public debt components were tested on a granger causality test within a two-year period lag.

Table 4.11: Pairwise Granger Causality Tests

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNTD does not Granger Cause SEG	90	0.44144	0.6446
SEG does not Granger Cause LNTD		7.70205	0.0008
LNED does not Granger Cause SEG	90	0.52293	0.5947
SEG does not Granger Cause LNED		3.19648	0.0459
LNDD does not Granger Cause SEG	90	1.46630	0.2366
SEG does not Granger Cause LNDD		5.80504	0.0043
LNED does not Granger Cause LNTD	90	2.71944	0.0716
LNTD does not Granger Cause LNED		3.98857	0.0221
LNDD does not Granger Cause LNTD	90	2.49015	0.0889
LNTD does not Granger Cause LNDD		3.56811	0.0325
LNDD does not Granger Cause LNED	90	1.10998	0.3343
LNED does not Granger Cause LNDD		3.02597	0.0538

As presented in table 4.11 above, the Null hypothesis that total debt does not granger cause sustainable economic growth is rejected (F = 0.441, P>0.05) thus confirming that total debt affects the EAC countries sustainable economic growth. The hypothesis that sustainable economic growth doesn't cause total debt is confirmed by the study (F = 7.702, P<0.05).

The dual causality between external debt and sustainable economic growth as presented in table 4.10 above, confirms the null hypothesis that sustainable economic growth does not cause external debt (F = 3.196, P<0.05). The hypothesis that external debt does not cause sustainable economic growth is not confirmed in the foregoing study (F = 0.523, P>0.05) thus inferring that sustainable economic growth in the region is caused by external debts as well.

Table 4.11 above also summarizes the dual causality bond between domestic debt and sustainable economic growth. As indicated, the null hypothesis that domestic debt does not cause sustainable economic growth is rejected (F = 1.466, P>0.05) confirming that domestic debt also influences sustainable economic growth. Sustainable economic growth however does not cause domestic debt (F = 5.805, P<0.05).

Since Total debt is a sum of domestic debt and external debt, the study in table 10 confirms the hypothesis that total debt does not granger cause external debt (F = 3.988, P<0.05) and total debt does not granger cause domestic debt (F = 3.568, P<0.05). The study rejects the null hypotheses that external debt does not cause total debt (F = 2.719, P>0.05) as well as domestic debt does not cause total debt (F = 2.490, P>0.05). For the link between domestic debt and external debt, the study fails to reject the hypotheses that domestic debt does not cause external debt (F = 1.109, P>0.05) and external debt does not cause domestic debt (F = 3.025, P>0.05).

4.6 Autoregressive Distributed Lag Models

Table 4.12 below presents the ADRL estimates for the short run and long run associations among sustainable economic growth and total debt.

Table 4.12: ADRL Estimates Total Debt

Dependent Variable: D(SEG)				
Method: ARDL				
Included observations: 95				
Maximum dependent lags: 2 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (2 lags, automatic): LNTD				
Fixed regressors: C				
Number of models evaluated: 4				
Selected Model: ARDL(1, 1)				
][‘;				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
	Long Run Equation			
LNTD	-8.617573	6.800830	-1.267136	0.2086
	Short Run Equation			
COINTEQ01	-0.262312	0.100679	-2.605439	0.0109
D(LNTD)	48.98674	31.46163	1.557031	0.1232
C	157.3462	35.77393	4.398350	0.0000
Mean dependent variable	5.547509	S.D. Dep variable		36.13461
S.E. of regression	34.48704	AIC		9.160527
Sum squared residual	99905.91	Schwarz criterion		9.577355
Log likelihood	-442.0264	HQC		9.329225
*Note: p-values and any subsequent tests do not account for model				
selection.				

As presented in table 4.12 above, both the long run and short run equations are not statistically significant but are expressed as:

SEG = -8.617573 (LNTD)…… (Long run)

SEG = 157.3462 - 0.262312(LNTD)…….…… (Short run)

The short run equations infers that a unit rise in Total debt causes a decline in sustainable economic growth by up to 8.617 units. Similarly, for long run equation, a unit rise in Total debt decreases sustainable economic growth by up to 0.262 units. The relationships are however not statistically significant.

Table 4.13: ADRL Estimates External Debt and Domestic Debt

Dependent Variable: D(SEG)				
Method: ARDL				
Included observations: 95				
Maximum dependent lags: 2 (Automatic selection)				
Model selection method: AIC				
Dynamic regressors (2 lags, automatic): LNED LNDD				
Fixed regressors: C				
Number of models evaluated: 4				
Selected Model: ARDL(1, 1, 1)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
LNED	-101.7589	62.34519	-1.632185	0.1067
LNDD	57.47140	27.57670	2.084056	0.0404
		Short Run Equation		
COINTEQ01	-0.160112	0.038324	-4.177859	0.0001
D(LNED)	85.52415	60.88946	1.404581	0.1641
D(LNDD)	-9.069763	6.703756	-1.352938	0.1800
C	267.9490	73.25259	3.657878	0.0005
Mean dependent variable	5.547509	S.D. Dep variable		36.13461
S.E. of regression	33.36286	AIC		9.217632
Sum squared residual	86820.27	Schwarz criterion		9.790770
Log likelihood	-438.8816	HQC		9.449591
*Note: p-values and any subsequent tests do not account for model selection.				

Table 4.13 above presents the ADRL estimates for the short run and long run relationships between sustainable economic growth and both external debt and domestic debt. As presented, both the long run and short run equations are expressed as:

SEG = 57.4714 (LNDD) -101.7589 (LNED) …… (Long run)

SEG = 267.949 - 9.0697 (LNDD) + 85.5241 (LNED)…… (Short run)

As presented in the equations, in the long run, a unit rise in domestic debt increases the sustainable economic growth by up to 57.471 units and the relationship is statistically significant while a unit rise in external debt decreases the sustainable economic growth by up to 101.758 units. In the long run, domestic investors benefit from earnings from the domestic debts while external debts are repaid with longer tenors to foreign institutions.

In the short run however, a unit upsurge in external debt results in upsurge in sustainable economic growth by up to 85.534 units while a unit rise in domestic debt declines sustainable economic growth by up to 9.069 units though the relationships are not statistically significant. A possible explanation of the short run explanation is the government crowding out the private sector from capital through domestic borrowing in the short run.

4.7 Vector Auto Regression Analysis Models

In table 4.14, the VAR infer that 97.73% change in sustainable economic growth is attributed to changes in the previous period sustainable economic growth and debt levels. As indicated herein, sustainable economic growth is positively influenced by sustainable economic growth in the previous periods. Levels of previous year total debt and external debt negatively influence the levels of sustainable economic growth. The year after previous year external debt and domestic debt also negatively influence the levels of sustainable economic growth. Previous year domestic debt and year after previous year total debt positively influence the levels of sustainable growth.

Table 4.14: Vector Auto Regression Estimates

Sample (adjusted): 2002 2019				
Included observations: 90 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
	SEG	LNTD	LNED	LNDD
SEG(-1)	1.011787	0.007182	-0.000268	-0.005517
	(0.32838)	(0.00189)	(0.00232)	(0.00368)
	[3.08111]	[3.80536]	[-0.11568]	[-1.49767]
SEG(-2)	0.015322	-0.006997	0.000520	0.006405
	(0.33098)	(0.00190)	(0.00233)	(0.00371)
	[0.04629]	[-3.67817]	[0.22300]	[1.72515]
LNTD(-1)	-9.000261	0.776581	0.040904	-0.102576
	(17.9131)	(0.10296)	(0.12629)	(0.20094)
	[-0.50244]	[7.54280]	[0.32389]	[-0.51048]
LNTD(-2)	16.81369	0.109985	0.058063	0.114005
	(17.7414)	(0.10197)	(0.12508)	(0.19901)
	[0.94771]	[1.07861]	[0.46421]	[0.57285]
LNED(-1)	-4.904832	0.235355	0.955239	0.100687
	(15.9373)	(0.09160)	(0.11236)	(0.17878)
	[-0.30776]	[2.56937]	[8.50159]	[0.56320]
LNED(-2)	-5.643407	-0.251615	-0.107516	-0.014607
	(16.3958)	(0.09424)	(0.11559)	(0.18392)
	[-0.34420]	[-2.67006]	[-0.93012]	[-0.07942]
LNDD(-1)	1.197450	0.048123	0.010782	0.836385
	(9.47794)	(0.05447)	(0.06682)	(0.10632)
	[0.12634]	[0.88341]	[0.16136]	[7.86679]
LNDD(-2)	-8.685083	0.012144	-0.009486	-0.067428
	(9.08303)	(0.05221)	(0.06404)	(0.10189)
	[-0.95619]	[0.23263]	[-0.14813]	[-0.66178]
C	205.1509	1.510699	1.049885	2.397581
	(186.036)	(1.06925)	(1.31158)	(2.08686)
	[1.10275]	[1.41286]	[0.80047]	[1.14890]
R-squared	0.979404	0.976902	0.952706	0.916061
Adj. R-squared	0.977370	0.974621	0.948035	0.907771
Sum sq. residuals	114059.5	3.767872	5.669273	14.35230
S.E. equation	37.52522	0.215678	0.264558	0.420938
F-statistic	481.4833	428.2322	203.9634	110.4984
Log likelihood	-449.2144	15.09400	-3.290777	-45.08899
AIC	10.18254	-0.135422	0.273128	1.201978
Schwarz SC	10.43252	0.114559	0.523109	1.451959
Mean dependent	519.4749	22.33123	22.09480	20.88901
S.D. dependent	249.4496	1.353847	1.160560	1.386066
Determinant residual covariance (dof adj.)		0.782670		
Determinant residual covariance		0.513510		
Log likelihood		-480.8260		
AIC		11.48502		
Schwarz criterion		12.48495		
Number of coefficients		36		

The foregoing relationships are expressed in the equation:

$$SEGt = 205.1509 + 1.01178SEG_{t-1}+0.01532SEG_{t-2}-9.0002LNTD_{t-1}+16.8136LNTD_{t-2} - 4.9048LNED_{t-1} - 5.6434LNED_{t-2} +1.1974LNDD_{t-1} - 8.6850LNED_{t-2}$$

Where: SEG –Sustainable economic growth

LNTD – Natural log of Total debt

LNED – Natural log of External debt

LNDD – Natural log of Domestic debt

4.8 Chapter Summary

This chapter has presented a summary of the descriptive statistics of the data that constitute the study variables. Mean, Standard deviation, Minimum, Maximum, Skewness and Kurtosis were computed and presented for the indicators namely total public debt, domestic public debt, external public debt, real interest rate, inflation rate, gross capital formation, government consumption expenditure, political stability, control of corruption, governance index and sustainable economic growth index.

Diagnostic tests for multicollinearity were conducted using variance inflation factor and was established that all the variables had VIF values of less than 10 leading to the conclusion that there was absence of multicollinearity. Jarque – Bera test was used to test for the normality of the data which confirmed that the data is normally distributed. Heteroscedasticity tests using the Likelihood Ratio confirmed that the residuals are homoscedastic which thus informed the decision to conduct hypothesis tests in the natural log of the respective study variables. The ADF test confirmed that the data exhibited no co - integration though the variables had unit root at level. The Akaike information criterion (AIC) was used in the vector auto regression (VAR) optimal lag selection to estimate the models at an optimal lag of two periods.

Correlation analysis results presents statistically significant strong positive relationships between; total debt and sustainable economic growth, domestic debt and sustainable economic growth, external debt and sustainable economic growth, gross domestic product and sustainable economic growth, domestic debt and total debt, external debt and total debt, domestic debt and external debt, governance and total debt, governance and external debt, gross domestic product and external debt, gross domestic product and domestic debt, gross domestic product and external debt, gross capital formation and external debt, governance and external debt, political stability and gross capital formation, governance and gross capital formation, gross capital formation and gross domestic product, governance and gross domestic product, control of corruption and political stability, governance and political stability and governance and control of corruption.

The correlation analysis also presents weak statistically significant positive relationships between; gross capital formation and sustainable economic growth, governance and sustainable economic growth, total debt and gross capital formation, total debt and political stability, domestic debt and gross capital formation, domestic debt and political stability, domestic debt and governance, external debt and real interest rates, external debt and political stability, control of corruption and gross capital formation.

Noted weak positive relationships which were not statistically significant were between; real interest rate and sustainable economic growth, political stability and sustainable economic growth, real interest rate and total debt, control of corruption and total debt, real interest rate and domestic debt, gross capital expenditure and inflation, gross capital formation and real interest rate, political stability and real interest rate, control of corruption and real interest rate and gross domestic product and real interest rate.

Weak negative relationships which are not statistically significant are between, control of corruption and gross domestic product, gross domestic product and inflation, political stability and inflation, gross capital formation and inflation, external debt and control of corruption, control of corruption and domestic debt, control of corruption and sustainable economic growth, inflation and domestic debt, inflation, and sustainable economic growth. Statistically significant weak negative relationships are between, gross capital expenditure and sustainable economic growth, inflation and total debt, gross capital expenditure and domestic debt, control of corruption and inflation, control of corruption and gross capital expenditure and governance and inflation.

The statistically significant strong negative relationships were between, gross capital expenditure and total debt, gross capital expenditure and external debt, inflation and real interest rate, gross capital expenditure and gross capital formation, governance and gross capital expenditure, gross domestic product, and gross capital expenditure. Granger causality tests confirm that total debt, external debt, and domestic debt causes the EAC member countries sustainable economic growth.

CHAPTER FIVE: HYPOTHESIS TESTING AND DISCUSSION OF FINDINGS

5.1 Introduction

This chapter presents the outcomes of the null hypotheses testing that guided the research and its interpretation. The study was guided by four specific objectives from which four hypotheses were derived. The four hypotheses and their respective sub hypotheses were tested and interpreted using adjusted coefficient of determination (R^2) , Standardized beta coefficients (β) and levels of significance (P values).

5.2 Relationship between Public debt and Sustainable Economic Growth

The first objective of this study was to determine the connections between public debt and sustainable economic growth among EAC member countries. The study hypothesized that there is a statistically significant link concerning public debt components namely domestic debt, external debt and total debt and sustainable economic growth among the EAC member countries. A two-year lag multiple linear regression analysis was done to test of the first hypothesis and its sub hypotheses that are shown herein:

> ***Hypothesis One:*** *Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries*

The prediction equation as shown was given as:

$$SEG_t = \alpha + \beta_1 TD_2 + \beta_2 DD_2 + \beta_3 ED_2 + \varepsilon$$

The outcome of the regression model is displayed in Table 5.1 below. The multiple regression model generated Adjusted $R^2 = 0.8968$, $F = 258.815$, $p<0.05$. The outcome of the regression analysis thus infer that 89.68% of changes in sustainable economic growth may be

attributed to variations in public debt practices amongst the EAC member countries. The relationship as per the model is statistically significant ($p<0.05$).

Table 5.1: Public debt and Sustainable Economic Growth

Dependent Variable: LNSEG				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNED	0.015817	0.036153	0.437500	0.6628
LNDD	0.064943	0.019696	3.297253	0.0014
LNTD	0.293019	0.030639	9.563583	0.0000
C	-2.061933	0.356290	-5.787228	0.0000
R-squared	0.900284	Mean Dep variable		6.132769
Adjusted R-squared	0.896805	S.D. Dep variable		0.503761
S.E. of regression	0.161828	AIC		-0.761137
Sum squared resid	2.252198	Schwarz criterion		-0.650035
Log likelihood	38.25118	HQC		-0.716334
F-statistic	258.8153	DWS		0.453360
Prob(F-statistic)	0.000000			

The first hypothesis was then presented and in three sub hypotheses as:

H_{1a}: *Total Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries*

H_{1b}: *Domestic Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries*

H_{1c}: *External Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries*

First, as presented in Table 5.1 above, the regression model shows a signifucant contructive link between total debt and sustainable economic growth (β=0.293, t =9.563, p<0.05) meaning for every unit increase in total public debt, there is an expected increase in sustainable economic growth by 0.293 units. These findings therefore leads to a rejection of sub hypotheses one (a) (H_{1a}) as there exists a significant association among total public debt and sustainable economic growth.

Secondly, the regression model in table 5.1 shows a positive connection regarding domestic debt and sustainable economic growth and is statistically significant (β=0.064, t =3.297, p<0.05) meaning for every unit increase in domestic debt, there is an expected increase in sustainable economic growth by 0.064 units. The findings therefore leads to a rejection of sub hypotheses one (b) (H_{1b}) as there is a significant connection between domestic debt and sustainable economic growth.

Thirdly, the positive relationship between external debt and sustainable economic growth presented in table 5.1 above is not statistically significant (β=0.015, t =0.437, p>0.05) inferring that for every unit increase in external debt, there is an expected increase in sustainable economic growth by 0.015 units. These findings therefore leads to failure to reject sub hypotheses one (c) (H_{1c}) as there is no significant relationship between external debt and sustainable economic growth.

5.3 Relationship between Public debt, Macroeconomic Factors and Sustainable Economic Growth

The second objective of the study was to determine the effect of macroeconomic factors on the link between public debt and sustainable economic growth in the EAC member countries. This was presented in hypothesis two as:

Hypothesis Two: *Macroeconomic factors do not significantly affect the relationship between public debt and sustainable economic growth among EAC member countries.*

The Baron and Kenny (1986) four steps were useful to test the mediation effects of the specific macro-economic variables (real interest rates, inflation rates, gross capital formation and government consumption expenditure) on the relationships between the public debt components (total debt, external debt, and domestic debt) and sustainable economic growth.

In the first step, sustainable economic growth was regressed against the public debt attributes as presented in Table 5.1 above. The regression model in Table 5.1 presents Adjusted R^2= 0.8968, F = 258.815, $p<0.05$. The regression outcome therefore shows that 89.68% of variation in sustainable economic growth may be attributed to changes in public debt choices amongst the EAC member countries and the relationship is statistically significant ($p<0.05$).

As presented in Table 5.1 statistically significant constructive link exist between total public debt and sustainable economic growth ($\beta=0.293$, $t=9.563$, $p<0.05$) on one hand and domestic public debt and sustainable economic growth ($\beta=0.064$, $t=3.297$, $p<0.05$) on another hand. The positive link among external public debt and sustainable economic growth variables is however non statistically significant ($\beta=0.015$, $t=0.437$, $p>0.05$).

5.3.1 Relationship between Public debt, Real Interest Rates and Sustainable Sustainable Economic Growth

As a second step in testing the intervening effect of real interest rates on the relationship, real interest rate as an intervenor was regressed against the public debt variables namely total debt, external debt and domestic debt and the findings are presented in Table 5.2 below.

Table 5.2: Public debt and Real Interest Rate

Dependent Variable: RIR				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD	-1.264160	0.802538	-1.575203	0.1189
LNED	1.628856	1.473085	1.105745	0.2719
LNTD	0.534133	1.248417	0.427849	0.6698
C	-13.14139	14.51736	-0.905219	0.3679
R-squared	0.053322	Mean Dep variable		8.494588
Adjusted R-squared	0.020298	S.D. Dep variable		6.661788
S.E. of regression	6.593830	AIC		6.653572
Sum squared residual	3739.159	Schwarz criterion		6.764675
Log likelihood	-295.4108	HQC		6.698375
F-statistic	1.614657	DWS		1.640274
Prob(F-statistic)	0.191888			

As presented in Table 5.2 above, 2.02% of variation in real interest rates are explained by variation in country public debt though the relationship is non-statistically significant (Adjusted R^2 = 0.020, F = 1.614, P>0.05). As presented in the Table 5.2, domestic debt has a non-statistically significant adverse link with real interest rates (β=-1.264, t =-1.575, P>0.05) implying that a unit surge in domestic debt decreases real interest rates by 1.26 units. External debt has a non-statistically significant positive relationship with real interest rates (β=1.628, t =1.105, P>0.05) implying that unit surge in external debt increases real interest rates by 1.62 units. Total debt has a non-statistically significant positive relationship with real interest rates (β=0.534, t =0.427, P>0.05) pointing at possibility that a unit surge in total debt increases real interest rates by 0.53 units.

In the third step, the intervening variables proxied by real interest rates are regressed against the dependent variable, in this case, sustainable economic growth. The findings are presented in Table 5.3 below.

Table 5.3: Real Interest Rates and Sustainable Economic Growth

Dependent Variable: LNSEG
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RIR	0.007157	0.008025	0.891862	0.3749
C	6.071973	0.086447	70.23911	0.0000

R-squared	0.008958	Mean Dep variable	6.132769
Adjusted R-squared	0.002304	S.D. Dep variable	0.503761
S.E. of regression	0.504341	AIC	1.490845
Sum squared residual	22.38370	Schwarz criterion	1.546396
Log likelihood	-65.08802	HQC	1.513247
F-statistic	0.795418	DWS	0.030615
Prob(F-statistic)	0.374899		

As presented in Table 5.3 above the 0.23% of changes in sustainable economic growth is justified by changes in real interest rate but the relationship is not statistically significant (Adjusted R^2 = 0.0020, F = 0.795, P>0.05). In Table 5.3, a progressive connection is presented between real interest rate and sustainable economic growth, which is not statistically significant (β=0.007, t =0.891, P>0.05).

In the fourth step, the interaction term of the independent and intervening variable is regressed against the dependent variable and the outcomes are displayed in Table 5.4 below. A non-statistically significant relationship is established between the interaction term of public debt components, real interest rates and sustainable economic growth as 2.3% of

movement in sustainable economic growth is justified by variation in the public debt components and real interest rate (Adjusted $R^2 = 0.023$, $F = 0.795$, $P>0.05$).

Table 5.4: Public debt, Real Interest Rate and Sustainable Economic Growth

Dependent Variable: LNSEG				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD_RIR_	0.002715	0.005260	0.516212	0.6070
LNED_RIR_	0.000396	0.000736	0.537469	0.5923
LNTD_RIR_	-0.001837	0.004860	-0.378013	0.7064
C	5.942615	0.189915	31.29086	0.0000
R-squared	0.028802	Mean Dep variable		6.132769
Adjusted R-squared	0.005077	S.D. Dep variable		0.503761
S.E. of regression	0.505039	AIC		1.515062
Sum squared residual	21.93549	Schwarz criterion		1.626165
Log likelihood	-64.17781	HQC		1.559866
F-statistic	0.850154	DWS		0.063435
Prob(F-statistic)	0.470273			

From table 5.4 above, we can test the sub hypotheses two (a,b and c) given as.

H_{2a}: *Real interest rates do not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.*

The interaction term between total debt and real interest rate has an adverse connection with sustainable economic growth which is not statistically significant ($\beta=-0.001$, $t=-0.378$, $P>0.05$). The non-statistically significant relationship leads to failure to reject sub hypothesis two (a).

H_{2b}: *Real interest rates do not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.*

The interaction term between domestic debt and real interest rate has a progressive link with sustainable economic growth which is not statistically significant (β=0.002, t = 0.516, P>0.05). The non-statistically significant relationship leads to failure to reject sub hypothesis two (b).

H_{2c}: Real interest rates do not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

The interaction term between external debt and real interest rate has a progressive bond with sustainable economic growth which is non-statistically significant (β=0.0003, t = 0.537, P>0.05). The non-statistically significant relationship leads to failure to reject sub hypothesis two (c).

5.3.2 Relationship between Public debt, Inflation and Sustainable Economic Growth

As a second step in testing the intervening effect of inflation rates on the relationship, inflation as an intervenor was regressed against the public debt variables namely total debt, external debt and domestic debt and the findings are presented in table 5.5 below.

It is inferred that 7.55% of variation in inflation are explained by variation in public debt components as the model is statistically significant (Adjusted R^2 = 0.0755, F = 3.423, P<0.05). As presented, the positive link regarding domestic debt and inflation is statistically significant (β=1.203, t = 2.397, P<0.05). This result implies a unit surge in domestic debt leads to an increase in inflation by up to 1.23 units.

There is a negative connection among external debt and inflation which is not statistically significant (β=-0.584, t = -0.634, P>0.05) suggesting that a unit surge in external debt leads to a decrease in inflation by up to 0.584 units. Additionally, there is also a negative link concerning total debt and inflation which is not statistically significant (β=-1.249, t = -1.601, P>0.05) inferring that a unit decrease in total debt leads to decrease in inflation by up to 1.249 units.

Table 5.5: Public debt and Inflation

Dependent Variable: CPI				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD	1.203205	0.501836	2.397608	0.0187
LNED	-0.584163	0.921135	-0.634177	0.5276
LNTD	-1.249842	0.780648	-1.601032	0.1130
C	23.14557	9.077860	2.549672	0.0126
R-squared	0.106674	Mean Dep variable		7.330000
Adjusted R-squared	0.075511	S.D. Dep variable		4.288276
S.E. of regression	4.123192	AIC		5.714559
Sum squared residual	1462.061	Schwarz criterion		5.825661
Log likelihood	-253.1551	HQC		5.759362
F-statistic	3.423149	DWS		1.765074
Prob(F-statistic)	0.020751			

In the third step, the intervening variables proxied by inflation rates are regressed against the dependent variable, in this case, sustainable economic growth. The findings are presented in Table 5.6 below. As presented herein, 0.173% of changes in sustainable economic growth is justified by changes in inflation though the model is non-statistically significant (Adjusted R^2 = 0.0017, F = 1.154, P>0.05). The non-statistically significant adverse link concerning inflation and sustainable economic growth shows that a unit upsurge in inflation results in a decline in the sustainable economic growth by up to 0.0133 units (β=-0.013, t = -1.074, P>0.05).

Table 5.6: Inflation and Sustainable Economic Growth

Dependent Variable: LNSEG
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.013369	0.012441	-1.074538	0.2855
C	6.230763	0.105506	59.05608	0.0000

R-squared	0.012951	Mean Dep variable	6.132769
Adjusted R-squared	0.001734	S.D. Dep variable	0.503761
S.E. of regression	0.503324	AIC	1.486808
Sum squared residual	22.29352	Schwarz criterion	1.542359
Log likelihood	-64.90635	HQC	1.509209
F-statistic	1.154632	DWS	0.038877
Prob(F-statistic)	0.285519		

In the fourth step, the interaction term of the independent and intervening variable is regressed against the dependent variable and outcomes are displayed in Table 5.7 below. In Table 5.7, a statistically significant relationship is established between the interaction term of public debt components, inflation, and sustainable economic growth as 16.4% of movement in sustainable economic growth are justified by changes in the public debt and inflation (Adjusted $R^2 = 0.164$, $F = 6.822$, $P<0.05$).

The findings in Table 5.7 are useful in testing the respective sub hypothesis:

H_{2d}: *Inflation does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.*

In Table 5.7 below, a constructive link is evidenced between sustainable economic growth and the interaction term between total term debt and inflation which is statistically significant (β=0.029, t = 3.328, P<0.05). The relationship suggests that a surge by one unit of inflation strengthens the bond between total debt and sustainable economic growth. The interaction between total debt and inflation leads to an upsurge in sustainable economic growth by up to 0.029 units. The significant relationship established leads to rejection of sub hypothesis two (d).

Table 5.7: Public debt, Inflation and Sustainable Economic Growth

Dependent Variable: LNSEG
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD_CPI_	0.005142	0.008939	0.575301	0.5666
LNED_CPI_	-0.034738	0.008055	-4.312819	0.0000
LNTD_CPI_	0.029799	0.008953	3.328305	0.0013
C	6.108809	0.103221	59.18193	0.0000

R-squared	0.192251	Mean Dep variable	6.132769
Adjusted R-squared	0.164073	S.D. Dep variable	0.503761
S.E. of regression	0.460584	AIC	1.330784
Sum squared residual	18.24385	Schwarz criterion	1.441887
Log likelihood	-55.88528	HQC	1.375587
F-statistic	6.822894	DWS	0.224663
Prob(F-statistic)	0.000353		

H_{2e}: Inflation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

As presented in Table 5.7 above, a non-statistically significant positive relationship is evidenced between sustainable economic growth and the interaction term between domestic

debt and inflation (β=0.005, t = 0.575, P>0.05). The interaction relationship suggests that inflation strengthens the association among domestic debt and sustainable economic growth. A unit increase in the interaction between domestic debt and inflation results in upward movement in sustainable economic growth by up to 0.005 units. The non-significant relationship established leads to failure to reject sub hypothesis two (e).

H_{2f}: Inflation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.

In Table 5.7 above, an adverse link is evidenced with sustainable economic growth and interaction term between external debt and inflation which is statistically significant (β=-0.034, t = -4.312, P<0.05). The relationship suggests that inflation diminishes the affiliation among external debt and sustainable economic growth variables. A unit increase in the interaction between external debt and inflation decreases the sustainable economic progress by up to 0.034 units. The significant relationship established leads to rejection of sub hypothesis two (f).

5.3.3 Relationship between Public debt, Gross Capital Formation and Sustainable Economic Growth

As a second step in testing the intervening effect of gross capital formation on the relationship, gross capital formation as an intervenor was regressed against the public debt variables namely total debt, external debt and domestic debt and the findings are presented in Table 5.8 below.

As presented in Table 5.8, 25.41% of variation in gross capital formation are explained by variation in public debt in a model that was statistically significant (Adjusted $R^2 = 0.254$, F = 11.106, P<0.05). The negative link amongst domestic debt and gross capital formation is not statistically significant (β=-0.180, t = -0.243, P>0.05) implying that an increase in domestic debt by one unit, results in decline in gross capital formation by up to 0.180 units. The adverse link between total debt and gross capital formation is also not statistically significant (β=-0.266, t = -0.230, P>0.05) inferring that a unit upsurge in total debt, declines the gross capital formation by up to 0.266 units. The positive relationship between external debt and gross capital formation is statistically significant (β=3.929, t = 2.884, P<0.05) inferring a unit upsurge in external debt leads to increase in gross capital formation by up to 3.929 units.

Table 5.8: Public debt and Gross Capital Formation

Dependent Variable: GCF
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD	-0.180888	0.742167	-0.243730	0.8080
LNED	3.929806	1.362271	2.884745	0.0049
LNTD	-0.266003	1.154504	-0.230405	0.8183
C	-54.97159	13.42529	-4.094630	0.0001

R-squared	0.279245	Mean Dep variable	21.81365
Adjusted R-squared	0.254103	S.D. Dependent variable	7.060480
S.E. of regression	6.097808	AIC	6.497162
Sum squared residual	3197.760	Schwarz criterion	6.608265
Log likelihood	-288.3723	HQC	6.541965
F-statistic	11.10646	DWS	0.198457
Prob(F-statistic)	0.000003		

In the third step, the intervening variables proxied by gross capital formation are regressed against the dependent variable, in this case, sustainable economic growth. The findings are

presented in Table 5.9 below which shows that 23.65% of changes in sustainable economic growth are accounted for by variation in gross capital formation and the model is statistically significant (Adjusted R^2 = 0.236, F = 28.578, P<0.05). From the model, we establish a statistically significant progressive link between sustainable economic growth and gross capital formation (β=0.035, t = 5.345, P<0.05) implying that a unit rise in gross capital formation leads increases the sustainable economic growth by up to 0.035 units.

Table 5.9: Gross Capital Formation and Sustainable Economic Growth

Dependent Variable: LNSEG				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCF	0.035327	0.006608	5.345927	0.0000
C	5.362164	0.151431	35.40995	0.0000
R-squared	0.245147	Mean Dependent variable		6.132769
Adjusted R-squared	0.236569	S.D. Dep variable		0.503761
S.E. of regression	0.440159	AIC		1.218611
Sum squared residual	17.04914	Schwarz criterion		1.274163
Log likelihood	-52.83751	HQC		1.241013
F-statistic	28.57894	DWS		0.045580
Prob(F-statistic)	0.000001			

In the fourth step, the interaction term of the independent variable (public debt elements) and intervening variable (Gross capital formation) is regressed against the dependent variable (Sustainable economic growth) and the outcomes are displayed in Table 5.10 below. As presented in the table, 53.05% of changes in sustainable economic growth are attributed to changes in public debt and gross capital formation and the model is statistically significant (Adjusted R^2 = 0.530, F = 34.530, P<0.05). The findings of the table lead to the testing of sub hypotheses two (g, h, i) herein.

H_{2g}: *Gross capital formation does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.*

As presented in Table 5.10 below, there is a statistically significant progressive bond between the interaction term of total public debt, gross capital formation and sustainable economic growth (β=0.017, t = 5.683, P<0.05) implying that gross capital formation strengthens the link between total public debt and sustainable economic growth. A unit increase in the interaction between total public debt with gross capital formation increases the sustainable economic growth by up to 0.017 units. The finding leads to rejection of sub hypothesis two (g).

Table 5.10: Public debt, Gross Capital Formation and Sustainable Economic Growth

Dependent Variable: LNSEG
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNED_GCF_	-0.020358	0.003297	-6.173975	0.0000
LNDD_GCF_	0.004416	0.001959	2.253646	0.0268
LNTD_GCF_	0.017777	0.003128	5.683269	0.0000
C	5.289373	0.111802	47.30999	0.0000

R-squared	0.546392	Mean Dep variable	6.132769
Adjusted R-squared	0.530569	S.D. Dep variable	0.503761
S.E. of regression	0.345152	AIC	0.753766
Sum squared residual	10.24520	Schwarz criterion	0.864868
Log likelihood	-29.91945	HQC	0.798569
F-statistic	34.53036	DWS	0.284671
Prob(F-statistic)	0.000000		

H_{2h}: *Gross capital formation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.*

A statistically significant constructive link between sustainable economic growth and the interaction of gross capital formation and domestic public debt is noted in Table 10 above (β=0.004, t = 2.253, P<0.05) implying that gross capital formation strengthens the bond between domestic public debt and sustainable economic growth. A unit increase in the interaction term of domestic debt and gross capital formation increases sustainable economic growth by up to 0.004 units. Considering this finding, the study rejects sub hypothesis two (h).

H_{2i}: *Gross capital formation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.*

The statistically significant negative relationship between the interaction terms of external public debt with gross capital formation and sustainable economic growth as presented in table 10 (β=-0.020, t = -6.173, P<0.05) implies that gross capital formation diminishes the bond between external public debt and sustainable economic growth. A unit increase in the interaction between external public debt and gross capital formation leads to a decline in sustainable economic growth by up to 0.02 units. The study therefore rejects sub hypothesis two (i).

5.3.4 Relationship between Public debt, Government Consumption Expenditure and Sustainable Economic Growth

As a second step in testing the intervening effect of government consumption expenditure on the relationship, government consumption expenditure as an intervenor was regressed against the public debt variables namely total debt, external debt and domestic debt and the findings are presented in Table 5.11 below. The findings indicate that 45.12% of movement in government consumption expenditure can be attributed to changes in public debt components.

In Table 5.11, a non statistically significant negative relationship is established between total public debt and government consumption expenditure (β=-1.151, t = -1.860, P>0.05) inferring that a unit increment in total public debt decreases government consumption expenditure by up to 1.151 units. A statistically significant negative relationship is established between external debt and government consumption expenditure (β=-2.429, t = -3.325, P<0.05) implying that a unit upsurge in external public debt decreases government consumption expenditure by up to 2.429 units. A statistically significant positive relationship exists between domestic debt and government consumption expenditure (β=1.079, t = 2.712, P<0.05) which confirms that a unit increment in domestic public debt increases government consumption expenditure by up to 1.079 units.

Table 5.11: Public debt and Government Consumption Expenditure

Dependent Variable: GCE
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDD	1.079307	0.397908	2.712450	0.0081
LNED	-2.429206	0.730374	-3.325976	0.0013
LNTD	-1.151690	0.618981	-1.860624	0.0662
C	71.36775	7.197890	9.915093	0.0000

R-squared	0.469727	Mean Dep variable	14.60467
Adjusted R-squared	0.451229	S.D. Dep variable	4.413262
S.E. of regression	3.269304	AIC	5.250458
Sum squared residual	919.1979	Schwarz criterion	5.361560
Log likelihood	-232.2706	HQC	5.295261
F-statistic	25.39352	DWS	0.382743
Prob(F-statistic)	0.000000		

In the third step, the intervening variables proxied by government consumption expenditure are regressed against the dependent variable, in this case, sustainable economic growth. The findings are presented in Table 5.12 below.

As indicated in Table 5.12 below, 36.29% of changes in sustainable economic growth are attributed to changes in government consumption expenditure and the model is statistically significant (Adjusted R^2 = 0.3629, F = 51.716, P<0.05). The model presents a statistically significant negative link between government consumption expenditure and sustainable economic growth (β=-0.069, t = -7.191, P<0.05) which suggest unit surge in government consumption expenditure decreases sustainable economic growth by up to 0.069 units.

Table 5.12: Government Consumption Expenditure and Sustainable Economic Growth

Dependent Variable: LNSEG
Method: Panel Least Squares
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCE	-0.069447	0.009657	-7.191400	0.0000
C	7.147024	0.147267	48.53095	0.0000

R-squared	0.370152	Mean Dep variable	6.132769
Adjusted R-squared	0.362995	S.D. Dep variable	0.503761
S.E. of regression	0.402065	AIC	1.037567
Sum squared residual	14.22576	Schwarz criterion	1.093118
Log likelihood	-44.69050	HQC	1.059968
F-statistic	51.71624	DWS	0.105355
Prob(F-statistic)	0.000000		

In the fourth step, the interaction term of the independent and intervening variable is regressed against the dependent variable and outcomes are displayed in Table 5.13 below. As presented in Table 5.13, 47.2% of changes in sustainable economic growth are attributed to changes in the interaction between public debt and government consumption expenditure (Adjusted R^2 = 0.472, F = 27.521, P<0.05) and the model is statistically significant. The findings in Table 5.13 are used herein to test sub hypothesis two (j, k, and l).

H_{2j}: *Government consumption expenditure does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.*

As presented in Table 5.13, there is a statistically significant constructive bond among sustainable economic growth and the interaction term of total debt with government consumption expenditure (β=0.020, t = 4.648, P<0.05) which infers that government consumption expenditure strengthen the relationship between total public debt and sustainable economic growth. An increment in total public debt and government consumption expenditure increases sustainable economic growth by up to 0.020 units. Since the relationship is statistically significant, the study rejects hypotheses two (j).

Table 5.13: Public debt, Government Consumption Expenditure and Sustainable economic growth

Dependent Variable: LNSEG				
Method: Panel Least Squares				
Periods included: 18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std Error	t-Statistic	Prob.
LNDD_GCE	0.004509	0.003094	1.457291	0.1487
LNTD_GCE	0.020376	0.004383	4.648337	0.0000
LNED_GCE	-0.027522	0.003955	-6.959300	0.0000
C	7.004238	0.163487	42.84268	0.0000
R-squared	0.489810	Mean Dep variable		6.132769
Adjusted R-squared	0.472012	S.D. Dep variable		0.503761
S.E. of regression	0.366047	AIC		0.871316
Sum squared residual	11.52317	Schwarz criterion		0.982419
Log likelihood	-35.20924	HQC		0.916119
F statistic	27.52151	DWS		0.269300
Prob(F-statistic)	0.000000			

H_{2k}: Government consumption expenditure does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.

In Table 5.13 above, a constructive connection between sustainable economic growth and the interaction term between government consumption expenditure with domestic debt which is not statistically significant is recognized (β=0.004, t = 1.457, P>0.05). The finding infers that for every unit increase in government consumption expenditure and domestic debt, there is anticipated increase in sustainable economic growth by up to 0.004 units. The finding of a non-statistically significant relationship leads to failure to reject sub hypotheses two (k).

H_{2l}: *Government consumption expenditure does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.*

Table 5.13 above also presents a statistically significant harmful link between sustainable economic growth and the interaction term between external public debt with government consumption expenditure. From the findings that (β=-0.027, t = -6.959, P<0.05) implies that government consumption expenditure weakens the relationship between external public debt and sustainable economic growth. A unit rise in external debt with government consumption expenditure decreases sustainable economic growth by 0.027 units. The finding thus leads the study rejects sub hypotheses two (l).

5.4 Relationship between Public debt, Governance and Sustainable Economic Growth

The third objective of the study was to establish the effect of governance on the connection between public debt and sustainable economic growth amongst EAC members countries. Multiple regression analysis was done to test of the third hypothesis presented as:

Hypothesis Three: *The influence of Governance on the relationship between public debt and sustainable economic growth among EAC member countries is not significant.*

Table 5.14 below presents the findings for testing sub hypothesis three (a) presented as:

H_{03a}: *The influence of Governance on the relationship between total public debt and sustainable economic growth among EAC member countries is not significant.*

As presented in Table 5.14 below, 89.06% of changes in sustainable economic growth are attributed to changes in total public debt and governance (Adjusted $R^2 = 0.8906$, $F = 242.598$, $P<0.05$). The model as presented is statistically significant.

Table 5.14: Total Debt, Governance and Sustainable Economic Growth

Dependent Variable: LNSEG				
Method: Panel Least Squares				
Period include: 18				
Cross sections included: 5				
Total panel (balanced) observation - 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTD	0.230468	0.059392	3.880452	0.0002
GOV	3.310803	1.634063	2.026117	0.0459
LNTD_GOV_	-0.150559	0.076574	-1.966195	0.0525
C	1.028055	1.300557	0.790472	0.4314
R-squared	0.894322	Mean Dep variable		6.132769
Adjusted-R-squared	0.890636	S.D. Dep variable		0.503761
S.E regression	0.166595	AIC		-0.703075
Sum squared residual	2.386837	Schwarz criterion		-0.591972
Log likelihood	35.63836	HQC		-0.658272
Fstatistic	242.5987	DWS		0.452836
Prob(F-statistic)	0.000000			

As presented in Table 5.14, the study points to a statistically significant positive link relating to total debt and sustainable economic growth ($\beta=0.230$, $t = 3.880$, $P<0.05$) implying that a unit rise in total debt increases sustainable economic growth by 0.230 units. The Table above

also presents a statistically significant positive link concerning governance and sustainable economic growth (β=3.310, t = 2.026, P<0.05) implying a unit surge in governance increases sustainable economic growth by 3.310 units. The interaction term between total debt and governance has a non-statistically significant negative relationship with sustainable economic growth (β=-0.150, t = -1.966, P >0.05). A unit increase in the interaction between total debt and governance leads to a decline in levels of sustainable economic growth by up to 0.150 units. The negative finding is explained by the negative index scores in the region. The finding of non-significant relationship leads failure to reject sub hypothesis three (a).

Table 5.15 below presents the results for testing sub hypothesis three (b) as:

H_{03b}: The influence of Governance on the relationship between domestic public debt and sustainable economic growth among EAC member countries is not significant.

In Table 5.15, it is presented that 73.78% of movement in sustainable economic growth are attributed to movement in domestic debt and governance and the model is statistically significant (Adjusted R^2 = 0.7378, F = 84.489, P<0.05).

Table 5.15: Domestic Debt, Governance and Sustainable economic growth

Dep Variable: LNSEG				
Method: PLS				
Periods included: 18				
Cross sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Standard Error	t-Statistic	Prob.
LNDD	0.173088	0.063586	2.722120	0.0079
GOV	2.850218	1.833519	1.554507	0.1237
LNDD_GOV_	-0.119315	0.092568	-1.288945	0.2009
C	2.842861	1.283527	2.214881	0.0294
R squared	0.746664	Mean Dep variable		6.132769
Adjusted R-squared	0.737827	S.D Dep variable		0.503761
S.E of regression	0.257940	AIC		0.171249
Sum squared residual	5.721856	Schwarz criterion		0.282352
Log likelihood	-3.706227	HQC		0.216053
F-statistic	84.48999	DWS		0.297827
Prob(F-statistic)	0.000000			

Table 5.15 illustrate a statistically significant positive association among domestic debt and sustainable economic growth variable (β=0.173, t = 2.722, P<0.05). The finding infers that a unit rise in domestic debt increases sustainable economic growth by up to 0.173 units. There is also a non-statistically significant positive connection relating to governance and sustainable economic growth (β=2.850, t = 1.544, P>0.05) inferring that a unit increase in governance necessitates increase in sustainable economic growth by up to 2.85 units. The interaction term between governance and domestic debt has a negative link with sustainable economic growth which is not statistically significant (β=-0.119, t = -1.288, P>0.05). This suggests that for every increment in levels of the interaction term between governance and domestic debt, there is a decline in sustainable economic growth by up to 0.119 units. The negative finding is explained by the negative index scores in the region. The finding of a non-statistically significant relationship on the interaction term leads to failure to reject sub hypothesis three (b). Table 5.16 below presents the results for testing sub hypothesis three (c) as:

$H_{03c:}$ *The influence of Governance on the relationship between external public debt and sustainable economic growth among EAC member countries is not significant.*

As presented in Table 5.16, 80.70% of movement in sustainable economic growth are attributed to movement in levels of external debt and governance index and the relationship model is statistically significant (Adjusted R^2 = 0.8070, F = 125.054, P<0.05). As presented in Table 5.16 below, the connection between external debt and sustainable economic growth is positive but not statistically significant (β=-0.043, t = 0.635, P>0.05) thus implying that a unit increase in external debt necessitates increase in sustainable economic growth by up to 0.043 units.

The link between governance and sustainable economic growth is positive and statistically significant (β=11.000, t = 5.146, P<0.05). The presented finding in Table 5.16 below therefore infers that a unit increase in governance rises sustainable economic growth by up to 11 units. Also, the interaction term between governance and external debt exhibits a statistically significant relationship with sustainable economic growth which is however negative due to the negative governance indices in the region. The coefficients (β=-0.509, t = -5.030, P<0.05) imply that a unit surge in external debt and governance decreases sustainable economic growth by up to 0.509 units. The significant relationship in the model leads the study to reject sub hypothesis three (c).

Table 5.16: External Debt, Governance and Sustainable Economic Growth

Dependent Variable LNSEG				
Method_ Panel Least Squares				
Periods_included_18				
Cross-sections included: 5				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std_ Error	t_Statistic	Prob.
LNED	0.043259	0.068039	0.635789	0.5266
GOV	11.00004	2.137246	5.146829	0.0000
LNED_GOV_	-0.509520	0.101283	-5.030635	0.0000
C	5.138344	1.467946	3.500363	0.0007
R_squared	0.813515	Mean Dep variable		6.132769
Adjusted_R-squared	0.807009	S.D Dep variable		0.503761
S.E of regression	0.221306	AIC		-0.135114
Sum squared residual	4.211966	Schwarz_criterion		-0.024011
Log likelihood	10.08014	HQC		-0.090311
F statistic	125.0540	DWS		0.340434
Prob(F-statistic)	0.000000			

5.5 Relationship between Public debt, Macroeconomic Factors, Governance and Sustainable Economic Growth

The fourth objective of the study was to analyse the joint effect of public debt, macroeconomic factors and governance on sustainable economic growth among EAC

member countries. Stepwise regression analysis was applied in testing the relationships hypothesized as:

Hypothesis Four: *The joint effect of public debt, macroeconomic factors and governance on sustainable economic growth among EAC member countries is not significant.*

The four multiple regression models are presented in Tables 5.17, 5.18 and 5.19 below. In model one, Adjusted $R^2 = 0.885$, $F(1, 88) = 685.571$, $p<0.05$ infers that 88.5% of changes in sustainable economic growth are justified by changes in total public debt. The introduction of domestic debt leads to a change in coefficient of determination by 1.4% and a resultant F change of 12.031. Model two, Adjusted $R^2 = 0.898$, $F(2, 87) = 391.768$, $p<0.05$ infers that 89.8% of changes in sustainable economic growth are attributed to changes in total debt and domestic debt. The introduction of governance leads to a change in coefficient of determination by 0.6% and a resultant F change of 5.923.

Model three, Adjusted $R^2 = 0.903$, $F(3, 86) = 277.931$, $p<0.05$ infers that 90.3% of variations in sustainable economic growth are explained by variations in total debt, domestic debt, and governance. Introduction of inflation in the fourth model leads to a change in the coefficient of determination by 0.5% and a resultant F change of 4.820. Model four, Adjusted $R^2 = 0.907$, $F(4, 85) = 218.913$, $p<0.05$ infers that 90.7% of variations in sustainable economic growth are explained by variations in total debt, domestic debt, governance, and inflation proxied by consumer price index.

As presented in Table 5.19 below, model one shows a statistically significant positive link with total debt and sustainable economic growth implying that a unit increase in total debt results into an increment in sustainable economic growth by 0.941 units (β=0.941, t=26.183, P<0.05). Model two shows statistically significant positive relation with total debt and sustainable economic growth on one hand and domestic debt and sustainable economic growth on another side as presented.

Table 5.17: Model Goodness of fit for Total debt, Domestic Debt, Governance, Inflation and Sustainable Economic Growth

Model	R	R_ Square	Adjusted R-Square	Std. Error of the_ Estimate	Change-Statistics				
					R_ Square Change	F_ Change	df1	df2	Sig. F Change
1	.941[a]	.886	.885	.17087	.886	685.571	1	88	.000
2	.949[b]	.900	.898	.16107	.014	12.031	1	87	.001
3	.952[c]	.907	.903	.15670	.006	5.923	1	86	.017
4	.955[d]	.912	.907	.15333	.005	4.820	1	85	.031

a. Predictors_(Constant), LNTD
b. Predictors_(Constant), LNTD, LNDD
c. Predictors_(Constant), LNTD, LNDD, GOV
d. Predictors_(Constant), LNTD, LNDD, GOV, CPI

Table 5.18: Model Overall Significance for Total debt, Domestic Debt, Governance, Inflation and Sustainable economic growth

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.017	1	20.017	685.571	.000[b]
	Residual	2.569	88	.029		
	Total	22.586	89			
2	Regression	20.329	2	10.164	391.768	.000[c]
	Residual	2.257	87	.026		
	Total	22.586	89			
3	Regression	20.474	3	6.825	277.931	.000[d]
	Residual	2.112	86	.025		
	Total	22.586	89			
4	Regression	20.588	4	5.147	218.913	.000[e]
	Residual	1.998	85	.024		
	Total	22.586	89			

a. Dependent Variable: LNSEG
b. Predictors(Constant), LNTD
c. Predictors(Constant), LNTD, LNDD
d. Predictors(Constant), LNTD, LNDD, GOV
e. Predictors(Constant), LNTD, LNDD, GOV, CPI

Table 5.19: Model Regression Coefficients for Total debt, Domestic Debt, Governance, Inflation and Sustainable economic growth

Model		Unstandardized-Coefficients		Standardized-Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.798	.303		-5.926	.000
	LNTD	.357	.014	.941	26.183	.000
2	(Constant)	-1.972	.290		-6.792	.000
	LNTD	.303	.020	.799	15.015	.000
	LNDD	.067	.019	.185	3.469	.001
3	(Constant)	-1.461	.352		-4.150	.000
	LNTD	.277	.022	.729	12.309	.000
	LNDD	.075	.019	.208	3.946	.000
	GOV	.142	.058	.097	2.434	.017
4	(Constant)	-1.605	.351		-4.578	.000
	LNTD	.289	.023	.763	12.724	.000
	LNDD	.065	.019	.181	3.427	.001
	GOV	.150	.057	.103	2.629	.010
	CPI	.009	.004	.075	2.196	.031

a. Dependent Variable: LNSEG

In Table 5.19, for total debt (β=0.799, t=15.015, P<0.05), it is established that a unit increment in total debt leads to 0.799 units increment in sustainable economic growth. For domestic debt (β=0.185, t=3.469, P<0.05), it is interpreted that a unit increment in domestic debt results in 0.185 units increment in sustainable economic growth.

Model three in Table 5.19 above presents the relationship between sustainable economic growth and total debt, domestic debt as well as governance. In the model, total debt (β=0.729, t=12.309, P<0.05) imply that a unit increment in total debt results in increment in sustainable economic growth by up to 0.729 units. Domestic debt (β=0.208, t=3.946, P<0.05) infer that a unit increment in domestic debt increases the sustainable economic growth by up to 0.208 units. Governance (β=0.097, t=2.434, P<0.05) indicate that a unit increase in governance

increases sustainable economic growth by up to 0.097 units. Since the other attribute of public debt namely external debt is not statistically significant in the explained relationships alongside other macro-economic factors namely real interest rates, gross capital formation and government consumption expenditure, the findings as presented leads to failure to reject hypothesis four (H_4).

5.6 Discussion of Findings

Table 5.20 presents a summary of the research objectives, hypothesis, and findings thereon. The general objective of the study was to establish the relationship among public debt, macroeconomic factors, governance, and sustainable economic growth in the EAC member countries. The first specific objective was to establish the effect of public debt on sustainable economic growth in the EAC member countries which was hypothesized that public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries. Public debt was operationalized in terms of domestic debt, external debt, and total debt.

In line with the operationalization of public debt in three indicators, the first hypothesis was split into three sub hypotheses. The first sub hypothesis was presented that total public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries. Multiple regression analysis confirms a positive link between Total debt and sustainable economic growth. The finding confirms the propositions in Keynesian theory of public debt by Keynes (1935) that postulated the benefits of debt as opposed to its liabilities for economic growth of a nation. The findings are consistent with earlier arguments in Egbetunde (2012), Babu et al. (2014) and Pesaran, et al. (1999) that debt necessitates sustainable economic growth in a distributed lag framework. However, the findings are a

departure from Lee and Ng (2015) in Malaysia who found high levels of debt having negative relationship on sustainable economic growth. In addition, the findings diverge from the Crowding out effect theory by Musgrave (1959) which presupposes that debt crowds out private investment leading to diminishing sustainable economic growth. The differences could be credited to differences in country specific factors such as governance that could impact the relationship.

The second sub hypothesis stated that domestic public debt does not significantly affect sustainable economic growth of EAC member countries. The study finds as presented in table 5.20 a statistically significant positive link among domestic debt and sustainable economic growth. The outcome confirms the arguments in Keynesian theory of public debt by Keynes (1935) and empirical study findings by Isibor, et al. (2018), Babu et al. (2014) and Putunoi and Mutuku (2013) who demonstrated that domestic borrowing contributes to sustainable economic growth. Such findings are a departure in arguments in Were (2001) which argued that domestic public debt negatively affects private investments and crowds out the private sector.

The third sub hypothesis presented that external public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries. The study finds a non-statistically significant positive link among external debt and sustainable economic growth. The outcomes agree with balanced growth theory which advocates for internally driven growth, favoring internally generated revenue for the investment (capital creation) as opposed to external public debt (Nurkse, 1952). Contrary to the beneficial arguments for debt in Keynes (1935), the positive but not significant relationship points to the costs attributable to external borrowing which may not be beneficial as demonstrated by Alesina

and Tabellini (1989) and Benfratello et al. (2018). The differences could also be attributed to negative governance indicators in the EAC region pointing to possibility of diversion of external government borrowing meant for development to individuals.

In the second objective, the study sought to determine the effect of macroeconomic factors on the link among public debt and sustainable economic growth in the EAC member countries. This objective was hypothesized as Macroeconomic factors do not significantly impact the link among public debt and sustainable economic growth among EAC member countries. The hypothesis was then divided into twelve sub hypotheses.

The first, second and third sub hypotheses under the second objective was presented that real interest rates do not significantly affect the relationship between public debt components (total debt, domestic debt, and external debt) and sustainable economic growth among EAC member countries. The study confirms that real interest rates do not moderate the relationships between total debt, domestic debt, external debt, and sustainable economic growth. Though Musgrave (1959) argued the crowding out effect of excess public debt that reduces private investment and negatively impacts on sustainable economic growth by pushing up interest rates, the foregoing study had real interest rates as a macro factor influenced by government policy and is not only a consequence of increasing debt levels as argued by Guex and Guex (2018).

The fourth, fifth and sixth sub hypotheses under the second objective was presented that inflation rates do not significantly affect the relationship between public debt components (total debt, domestic debt, and external debt) and sustainable economic growth among EAC member countries. The study establishes that the influence of inflation on the correlation

among sustainable economic growth and both total debt and external debt are statistically significant. For domestic debt, the influence is not statistically significant. The statistically significant relationship is consistent with arguments in Iyoha (1999) for crowding out theory that excessive public debt crowds out the private sector and thus negatively affect sustainable economic growth. The findings are a departure from the documentation in Lotto and Mmari (2018) of an insignificant negative debt-sustainable economic growth relationship through inflation. This could be attributed to differences in inflation levels which have increased significantly over the current study period.

The seventh, eighth and ninth sub hypotheses under the second objective was presented that gross capital formation does not significantly affect the relationship between public debt components (total debt, domestic debt, and external debt) and sustainable economic growth among EAC member countries. The study establishes that the influence of gross capital formation on the link among sustainable economic growth and debt finance components are statistically significant. The study findings are consistent with arguments in Keynesian theory of public debt attributed to Keynes (1935) which proposed that borrowing for capital formation is necessary just like setting up public enterprises, which contributes to a productive output and subsequently a positive sustainable economic growth as demonstrated by Yakita (2008). However, the findings are a departure from that of Lotto and Mmari (2018) of an insignificant negative debt-sustainable economic growth relationship through gross capital formation. The differences could be attributed to differences in country specific factors such as governance that could impact the relationship.

The tenth, eleventh and twelfth sub hypotheses under the second objective was presented that government consumption expenditure do not significantly affect the relationship between public debt components (total debt, domestic debt, and external debt) and sustainable economic growth among EAC member nations. The study establishes that the influence of government consumption expenditure on the correlation among sustainable economic growth and both total debt and external debt are statistically significant. For domestic debt, the influence is not statistically significant. The findings are a departure from Lotto and Mmari (2018) who noted insignificant negative debt-sustainable economic growth relationship through government expenditures. The findings confirm the assertions in Chen, Yao, Hu, and Lin (2017) alluding to positive effects of government consumption expenditure (investment) on the debt sustainable economic growth nexus.

The third objective sought to find the effect of governance on the correlation among public debt and sustainable economic growth in the EAC member countries, whose hypothesis was presented that the influence of Governance on the correlation among public debt and sustainable economic growth among EAC member nations is not significant. The study finds statistically significant relationships between interaction terms of governance with external debt which confirms the arguments presented in agency theory by Anoruo and Braha (2005) who asserts that corruption impedes sustainable economic growth by limiting productivity, investment and pushing up government consumption. In Cooray, Dzhumashev and Schneider (2017), its is observed that corruption which is one of the indicators of governance pushes up public debt, government expenditure, thereby affecting the growth of the economy. The finding are consitent with propositions of Alesina and Tabellini (1989), Jalles (2011) and Kim, Ha and Kim (2017). Specifically, the effect of corruption on productivity of external debt is elucidated in Isibor et al. (2018). The findings are a departure from Mallik and Saha

(2016) observations that medium level corruption fuels sustainable economic growth by reducing excessive bureaucracy. The differences could be attributed to other country specific factors that could impact on sustainable economic growth.

The fourth objective of the study was to determine the joint effect of public debt, macroeconomic factors, and governance on sustainable economic growth in the EAC member countries, hypothesized as the joint effect of public debt, macro factors and governance on sustainable economic growth among EAC member countries is not significant. The study finds that there is no statistically significant connection among sustainable economic growth and external debt, real interest rates, government consumption expenditure and gross capital formation. There is however a statistically significant connection amongst sustainable economic growth and total debt, domestic debt, inflation, and governance. Anoruo and Braha (2005) observed that corruption impedes sustainable economic growth by limiting productivity, investment and pushing up government consumption.

Table 5.20: Summary of Statistical Tests of Hypotheses and Interpretation of Results

Research Objectives	**Hypothesis/ Sub Hypothesis**	**Results**	**Implication**
To establish the effect of public debt on sustainable economic growth in the EAC member countries	H_{01}: Public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries		
	H_{1a}: Total public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries	A statistically significant positive relationship between total debt and sustainable economic growth (β=0.293, t =9.563, $p<0.05$)	Rejected Sub hypothesis
	H_{1b}: Domestic public debt does not significantly affect sustainable economic	A statistically significant positive relationship between domestic debt and	Rejected Sub hypothesis

	growth of East Africa Community Member Countries	sustainable economic growth (β=0.064, t =3.297, p<0.05)	
	H_{1c}: External public debt does not significantly affect sustainable economic growth of East Africa Community Member Countries	A positive relationship between external debt and sustainable economic growth (β=0.015, t =0.437, p>0.05), not statistically significant.	Failed to reject Sub hypothesis
To determine the effect of macroeconomic factors on the relationship between public debt and sustainable economic growth in the EAC member countries	H_{02}: Macroeconomic factors do not significantly affect the relationship between public debt and sustainable economic growth among EAC member countries.		
	H_{2a}: Real interest rates do not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.	Negative relationship between SEG and interaction term of TD and RIR (β=-0.001, t =-0.378, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{2b}: Real interest rates do not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.	Positive relationship between SEG and interaction term of DD and RIR (β=0.002, t = 0.516, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{2c}: Real interest rates do not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.	Positive relationship between SEG and interaction term of ED and RIR (β=0.0003, t = 0.537, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{2d}: Inflation does not significantly affect the	A statistically significant positive	Rejected Sub hypothesis

	relationship between total public debt and sustainable economic growth among EAC member countries.	relationship between SEG and interaction of Inflation and TD (β=0.029, t = 3.328, P<0.05)	
	H_{2e}: Inflation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.	Positive relationship between SEG and interaction term of DD and inflation (β=0.005, t = 0.575, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{2f}: Inflation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.	A statistically significant negative relationship between SEG and interaction of Inflation and ED (β=-0.034, t = -4.312, P<0.05)	Rejected Sub hypothesis
	H_{2g}: Gross capital formation does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.	A statistically significant positive relationship between SEG and interaction of GCF and TD (β=0.017, t = 5.683, P<0.05)	Rejected Sub hypothesis
	H_{2h}: Gross capital formation does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.	A statistically significant positive relationship between SEG and interaction of GCF and DD (β=0.004, t = 2.253, P<0.05)	Rejected Sub hypothesis
	H_{2i}: Gross capital formation does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.	A statistically significant negative relationship between SEG and interaction of GCF and ED (β=-0.020, t = -6.173, P<0.05)	Rejected Sub hypothesis
	H_{2j}: Government consumption expenditure	A statistically significant positive	Rejected Sub hypothesis

	does not significantly affect the relationship between total public debt and sustainable economic growth among EAC member countries.	relationship between SEG and interaction of GCE and TD (β=0.020, t = 4.648, P<0.05)	
	H_{2k}: Government consumption expenditure does not significantly affect the relationship between domestic public debt and sustainable economic growth among EAC member countries.	Positive relationship between SEG and interaction term of GCE and DD (β=0.004, t = 1.457, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{2l}: Government consumption expenditure does not significantly affect the relationship between external public debt and sustainable economic growth among EAC member countries.	A statistically significant negative relationship between SEG and interaction of GCE and ED (β=-0.027, t = -6.959, P<0.05)	Rejected Sub hypothesis
To establish the effect of governance on the relationship between public debt and sustainable economic growth in the EAC member countries	H_{03}: The influence of Governance on the relationship between public debt and sustainable economic growth among EAC member countries is not significant		
	H_{03a}: The influence of Governance on the relationship between total public debt and sustainable economic growth among EAC member countries is not significant	Negative relationship between SEG and interaction term of Gov and TD (β=-0.150, t = -1.966, P>0.05), Not statistically significant	Failed to reject Sub hypothesis
	H_{03b}: The influence of Governance on the relationship between domestic public debt and sustainable economic growth among EAC member countries is not significant	A not statistically significant negative relationship between SEG and interaction of Gov and DD (β=-0.119, t = -1.288, P>0.05).	Failed to reject Sub hypothesis

	$H_{03c:}$ The influence of Governance on the relationship between external public debt and sustainable economic growth among EAC member countries is not significant	A statistically significant negative relationship between SEG and interaction of Gov and ED (β=-0.509, t = -5.030, P<0.05)	Rejected Sub hypothesis
To determine the joint effect of public debt, macroeconomic factors, and governance on sustainable economic growth in the EAC member countries	$H_{04:}$ The joint effect of public debt, macro factors and governance on sustainable economic growth among EAC member countries is not significant.	There are no statistically significant relationships between SEG and ED, RIR, GCE and GCF. Statistical relationships are for TD, DD, Inflation and Governance	Failed to reject Sub hypothesis

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter gives the summary of the study findings, conclusions, recommendations inclusive of policy issues and the contribution of the study to the body of knowledge, limitations, and suggestions for further research. These are presented relative to the findings of the previous chapter evaluating the influence of public finance, macro-economic factors, and governance on sustainable economic growth among East Africa Community member countries.

6.2 Summary of Findings

The study sought to establish the relationships among public debt, macroeconomic factors, governance, and sustainable economic growth in the EAC member countries. For this purpose, the study adopted a panel longitudinal research design because the study variables namely public debt, macroeconomic factors, governance indicators and sustainable economic growth change over time across the five EAC member countries. The study spanned the period between 2000 and 2019 and hypotheses were tested and rejected or failed to reject.

The first objective of the study was to establish the effect of public debt on sustainable economic growth in the EAC member countries. The public debt attributes considered in the study were total debt, external debt and domestic debt measured in their natural log form. Sustainable economic growth was considered using the specific country sustainable economic growth index. Using a multiple regression analysis model, the study established a statistically significant constructive association between total debt and sustainable economic growth, a statistically significant positive link among domestic debt and sustainable economic growth

and a non-statistically significant positive link among external debt and sustainable economic growth.

The second objective of the study was to determine the effect of macroeconomic factors on the relationship between public debt and sustainable economic growth in the EAC member countries. The macroeconomic factors considered in the study included interest rates, inflation rates, gross capital formation and government consumption expenditure. On the effect of real interest rates, the study establishes a negative connection between sustainable economic growth and the interaction of total debt and real interest rates. The study also establishes positive relationships between sustainable economic growth on one hand and the interaction between real interest rate and both domestic debt and external debt.

On the effect of inflation, the study establishes a statistically significant positive link among sustainable economic growth and the interaction variable of Inflation and total debt which implies that inflation reinforces the relationship. The study also establishes a statistically significant negative link between sustainable economic growth and interaction of inflation and external debt which infers that inflation diminishes the relationship. For domestic debt and inflation rates interaction term and sustainable economic growth, the relationship established is positive but not significant.

On the effect of gross capital formation, the study establishes statistically significant positive relationships between sustainable economic growth on one hand and the interaction variable of gross capital formation and total debt as well as the interaction variable of gross capital formation and domestic debt on another hand. The findings infer that gross capital formation reinforces the relationships between sustainable economic growth and total public debt and domestic public debt respectively. The study also establishes a statistically significant adverse

link regarding sustainable economic growth and the interaction term of gross capital formation and external debt which implies that gross capital formation diminishes the link concerning external debt and sustainable economic growth.

On the effect of government consumption expenditure, the study establishes a statistically significant positive link concerning sustainable economic growth and interaction of government consumption expenditure and total debt which imply that government consumption expenditure strengthens the relationship. There is also a statistically significant negative relationship between sustainable economic growth and the interaction of government consumption expenditure and external debt which implies that government consumption expenditure diminishes the relationship. A positive nexus exists between sustainable economic growth and interaction term of government consumption expenditure and domestic debt but is not statistically significant.

The third objective of the study was to establish the effect of governance on the connection amongst public debt and sustainable economic growth in the EAC member countries. The study finds a statistically not significant negative link regarding sustainable economic growth and interaction of governance and total debt and domestic debt which infers that governance strengthens the relationship established. The study also finds statistically significant negative relationship between sustainable economic growth and interaction of governance and External debt which implies that governance diminishes the relationship especially in EAC where governance indices are negative. Generally, a negative relationship between sustainable economic growth and the interaction term of governance and all debt components exists as the regional governance indices are negative.

The fourth objective of the study was to determine the joint effect of public debt, macroeconomic factors, and governance on sustainable economic growth in the EAC member countries. The study establishes statistically significant relationships between sustainable economic growth and total debt, domestic debt, inflation, and governance. Relationships between sustainable economic growth and external debt, real interest rates, gross capital formation and government consumption expenditure are however not statistically significant thereby confirming no joint effects.

6.3 Conclusions

The study concludes that public debt in all its forms namely total public debt, domestic public debt and external public debt have diverse influences of the levels of sustainable economic growth among the EAC member countries. Specifically, total debt and domestic debt positively affect sustainable economic growth and the relationships are statistically significant. External debt as well positively affects sustainable economic growth. The findings confirm the positive effects of public debt towards sustainable economic growth and more specifically domestic public debt where local investors plough back the returns to country economic development.

Considering the several macroeconomic factors, inflation strengthens the link regarding total debt and sustainable economic growth, gross capital formation strengthens the bond concerning sustainable economic growth and both external debt and domestic debt, government consumption expenditure strengthens the bond concerning total debt and sustainable economic growth. Inflation, gross capital formation and government consumption expenditure diminishes the link between external debt and sustainable economic growth.

Though Governance indicators in the EAC are all negative, the study establishes that level of governance strengthens the bond between the levels of sustainable economic growth and domestic debt. It is also worth noting that negative governance indices diminish the relationship between the sustainable economic growth levels and external debt.

6.4 Recommendations

The findings confirm the positive contribution of the public debt to the achievement of sustainable economic growth. The EAC countries should, therefore, develop appropriate policy framework that embraces debt in the funding of sustainable economic growth programs. In addition, develop suitable policies to ensure development of debt markets in the region. A well-developed debt market will enable the government raise capital efficiently and play an important position in efficient deployment and allocation of resources in the economy.

Interest rates and inflation as macroeconomic factors have different implications on the sustainable economic growth. Whereas the impact of interest rate is not significant, the influence of various debt components and inflation on the sustainable economic growth is significant and cannot be ignored. Through appropriate policy framework, the EAC member countries should monitor these macroeconomic factors and maintain levels that would enhance the debt and sustainable economic growth relationship.

Capital formation and government consumption expenditure are critical in explaining the link between debt components and sustainable economic growth. This relationship should be encouraged through sound policies that should channel larger percentage of public debts towards capital assets creation such as construction of roads, railways, schools, offices,

hospitals, and commercial and industrial buildings etc. that are considered as national capital assets. The policy goal should be to ensure more funds are directed towards development rather than recurrent expenditure.

The negative governance indices in the EAC countries are diminishing the economic benefits of the public debt, particularly the external debt. The countries should address the negative governance trends which includes voice and accountability, absence of violence, political stability, effectiveness of government, the rule of law, corruption, and the quality of regulations to achieve the desired economic benefits from the public debt. In addition, the policy makers should relook at funding specific governance terms and conditions to ensure full compliance.

6.5 Contributions of the Study Findings

The discoveries from this study add to the collection of information in public debt, macroeconomic conditions, governance, and sustainable economic growth. This section explains the findings of this study and contribution to knowledge and benefits to public sector managerial policies and practices towards attainment of sustainable development goals.

6.5.1 Contributions to Knowledge

The study contributes to existing knowledge in public debt, macro-economic factors, governance, and sustainable economic growth in three main ways: Foremost, lagged levels of domestic debt and total debt positively influence sustainable economic growth significantly. Lagged external debt levels positively relates with sustainable economic growth. The study introduces an optimal lag of two years in the analysis. The study contributes to anchoring theory and confirms the propositions in Keynesian theory of public debt by Keynes (1935)

that postulated the benefits of debt as opposed to its liabilities for economic growth of a nation.

Bivariate study models have alluded to a positive or negative debt equity nexus without considering the county governance practices as an extraneous variable. The current study opens the possibility of governance environment influencing the relationships. Specifically, governance strengthens the link among domestic debt and sustainable economic growth as it diminishes the bond among external debt and sustainable economic growth.

In the public debt finance debate, studies presume that macroeconomic factors are given, in modelling several macroeconomic factors as having a mediating role in the link among public debt and sustainable economic growth, the study identifies macroeconomic factors that reinforce the effects or otherwise with specific debt strands. Specifically, the positive effect of total debt on sustainable economic growth is strengthened by inflation and government consumption expenditure. Also, the effects of positive effects of external debt and domestic debt on sustainable economic growth are strengthened by gross capital formation.

The diminishing effects of specific macro-economic variables on the connections among public debt and sustainable economic development are also established in this study. Specifically, country levels of inflation, gross capital formation and government consumption expenditure are noted to diminish the relationship between external debt and sustainable economic growth.

6.5.2 Contributions to Managerial Policy and Practices

The conclusions of this research are valuable to several stakeholders including investors, government policy makers, development partners and multilateral policy makers. As countries attempt to finance their sustainable development goal agenda, crafting an optimal mix of domestic debt and external debt finance in an enabling macro-economic environment with good governance is a requirement. The study advises that not only seeking public debt spurs sustainable economic growth. Countries need to put in place suitable governance structures while at the same time cultivating an enabling macroeconomic environment.

The study finds statistically significant positive relationships between domestic debt and sustainable economic growth. For government policy makers, efforts should be put in place to improve the domestic debt market infrastructure and encourage domestic investor participation to benefit from the long-term effects of debt finance. Caution is however required not to crowd out the private sector of finance as the government borrows in the domestic market to finance the sustainable development goals.

Governments have also attracted external finance for financing development initiatives. The study finds that the relationship is positive but is not statistically significant. Policy makers and external development partners should relook at the terms of the specific facilities channeled for development in the region. Considering that some macro-economic factors and specifically, inflation, gross capital formation and government consumption expenditure diminish the effect of external debt on sustainable economic growth, an enabling macro-economic environment with good governance should be put in place amongst the EAC countries to benefit from the debt stock.

6.6 Limitations of the Study

Although this study had a few restrictions, each exertion was made to guarantee that these constraints didn't fundamentally influence the outcome of the study. First, the study presumed existence of a linear relationship between sustainable economic growth, public debt, macroeconomic factors, and governance. There is a possibility of the study variables having a different form of relationship like a curvilinear relationship that the current study did not explore especially on the debt sustainable economic growth nexus.

Secondly, the EAC member countries have different levels of financial markets development and debt management strategies. Domestic debt market yields thus vary amongst the five countries under study. The current study did not delve in investigating the domestic debt market microstructure and how it may influence the relationships.

6.7 Suggestions for Further Research

Given that there are positive and negative impacts of the various elements of public debt on sustainable economic growth, there may be country specific factors that determine debt productivity. Studies should be modeled on the optimal mix of debt and the turning point (threshold) at which the positive effects of public debt revert to negative effects. The study has observed that external debt contributes positively to sustainable economic growth, but the link is not statistically significant. Future studies could model external debt relief scenario to determine whether such measure could significantly contribute to sustainable economic growth in the EAC member countries.

Since some macro-economic factors have been established to diminish the impact of public debt on economic development, studies should advance and establish the optimal levels of the specific macroeconomic indicators namely inflation, gross capital formation and government consumption expenditure that do not yield negative contributions to the debt sustainable economic growth nexus. Specifically, what are the comfortable levels of the specific macro-economic indicators for the diverse debt regimes?

Governance indicators in the region are negative though the EAC member countries continue to attract external financing for development. A study should be designed to undertake a review on the effectiveness of the external debt covenants especially on clauses on governance and the consequences thereon on flouting the covenants. The study should review the types of covenants and the compliance by the governments. In addition, governance has many facets including voice and accountability, absence of violence, political stability, effectiveness of government, the rule of law, corruption and the quality of regulations are the indicators of governance. Studies on specific facets of governance would be useful.

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APPENDICES

Appendix 1: Data Collection Form

Country Name																				
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Independent Variables																				
Total debt % GDP																				
Domestic Debt % GDP																				
External Debt % GDP																				
Dependent Variable																				
SEG Index																				
Intervening Variables																				
Consumer Price Index																				
Real Interest Rates																				
Gross Capital Formation % GDP																				
Government Consumption Expenditure % GDP																				
Moderating Variable																				
Governance Index																				

Appendix 2: Research Raw Data

Year	Country	CPI	RIR	GCF	GCE	GOV	SEG	TD	DD	ED
2000	Burundi	25.500	-16.679	2.781	14.857	-1.37	244.52	1.025125	0.10851	1.272476
2001	Burundi	7.900	2.733	4.468	15.533	-1.04	224.50	0.986459	0.110287	1.264969
2002	Burundi	-1.300	18.252	3.949	14.733	-1.36	230.85	1.079006	0.126591	1.51805
2003	Burundi	10.600	5.614	7.869	17.461	-1.38	216.76	1.006167	0.139848	1.758492
2004	Burundi	8.200	4.515	10.347	19.227	-1.46	227.60	0.908055	0.199005	1.529279
2005	Burundi	13.300	-0.334	18.200	14.100	-1.14	218.25	0.706653	0.159791	1.171437
2006	Burundi	2.700	13.833	18.513	15.200	-1.09	226.19	0.265773	0.175946	1.084872
2007	Burundi	8.400	7.915	15.186	19.000	-1.14	215.00	0.267094	0.164377	1.044013
2008	Burundi	24.400	-6.195	13.409	20.200	-1.13	223.37	0.209039	0.142552	0.864857
2009	Burundi	10.600	3.275	18.975	19.700	-1.07	213.88	0.223661	0.167029	0.344146
2010	Burundi	6.500	3.554	17.160	21.900	-1.19	224.34	0.225565	0.17077	0.307186
2011	Burundi	9.600	4.492	16.346	22.900	-1.19	227.71	0.230612	0.182116	0.272456
2012	Burundi	18.200	0.024	16.324	23.300	-1.23	229.28	0.214611	0.160322	0.286796
2013	Burundi	7.900	6.662	14.620	24.700	-1.12	233.52	0.286844	0.156854	0.278635
2014	Burundi	4.400	9.841	14.200	25.900	-0.98	238.16	0.311269	0.173805	0.255713
2015	Burundi	5.600	-4.949	12.178	22.421	-1.25	219.76	0.372939	0.219412	0.201751
2016	Burundi	5.500	13.169	9.191	23.476	-1.41	211.63	0.3291	0.280611	0.203754
2017	Burundi	16.600	2.984	8.806	25.086	-1.40	206.28	0.36499	0.300492	0.193828
2018	Burundi	1.200	18.158	11.103	26.210	-1.43	200.73	0.40663	0.357896	0.191617
2019	Burundi	7.300	5.400	12.300	20.030	-1.04	220.25	0.49141	0.313	0.2134
2000	Kenya	7.800	15.327	17.414	15.054	-0.77	758.55	1.364251	0.212949	0.488817
2001	Kenya	5.800	17.813	18.790	15.973	-0.56	781.59	1.273867	0.209562	0.428031
2002	Kenya	2.200	17.358	15.138	17.078	-0.75	775.11	1.590883	0.227937	0.467971
2003	Kenya	6.000	9.771	16.482	18.131	-0.68	786.82	1.719693	0.255614	0.455617
2004	Kenya	8.400	5.045	16.962	17.860	-0.64	817.27	1.727383	0.240283	0.43354
2005	Kenya	7.800	7.610	17.650	17.380	-0.72	851.18	1.369801	0.222925	0.346457
2006	Kenya	6.000	-8.010	18.634	14.347	-0.65	871.82	1.302549	0.192155	0.259816
2007	Kenya	4.300	4.819	20.457	14.630	-0.71	897.85	1.296132	0.188117	0.237287
2008	Kenya	15.100	-0.985	19.613	15.674	-0.75	866.04	1.025138	0.126939	0.21384
2009	Kenya	10.600	2.837	19.333	15.214	-0.77	872.75	0.256882	0.125958	0.231467
2010	Kenya	4.300	12.028	20.841	14.169	-0.65	921.70	0.469117	0.141544	0.222226
2011	Kenya	14.000	3.839	21.703	14.012	-0.69	942.89	0.397576	0.042217	0.24202
2012	Kenya	9.400	9.457	21.476	13.858	-0.73	951.65	0.399299	0.037969	0.23653

2013	Kenya	5.700	11.548	20.106	14.140	-0.65	973.80	0.365555	0.034098	0.25316
2014	Kenya	6.900	7.815	22.432	13.890	-0.57	990.33	0.338662	0.253	0.278973
2015	Kenya	6.600	5.509	21.466	14.088	-0.58	1013.61	0.424453	0.244	0.31216
2016	Kenya	6.300	7.792	18.255	12.939	-0.57	1037.69	0.482	0.27	0.315306
2017	Kenya	8.000	4.628	18.798	12.711	-0.53	1050.13	0.5171	0.274	0.343608
2018	Kenya	5.000	9.939	18.443	12.914	-0.57	1075.46	0.5844	0.28621	0.361448
2019	Kenya	5.600	8.500	19.160	15.030	-0.57	906.15	0.63542	0.292	0.322541
2000	Rwanda	3.900	13.332	13.376	17.859	-1.12	218.84	0.522303	0.132	0.717113
2001	Rwanda	3.400	15.035	13.728	17.902	-0.40	223.36	0.562184	0.102	0.752331
2002	Rwanda	2.000	22.378	13.481	18.767	-1.01	242.98	0.618442	0.124	0.83914
2003	Rwanda	7.400	-4.762	13.858	18.442	-0.85	240.63	0.601327	0.131	0.821339
2004	Rwanda	12.000	2.553	15.033	17.628	-0.84	255.48	0.537951	0.124	0.780082
2005	Rwanda	9.100	6.088	15.779	17.473	-0.94	271.49	0.48343	0.096	0.574239
2006	Rwanda	8.800	4.781	16.574	17.581	-0.62	294.63	0.439751	0.086	0.140445
2007	Rwanda	9.100	3.843	18.652	15.518	-0.50	299.83	0.383724	0.087	0.163166
2008	Rwanda	15.400	1.724	23.657	13.411	-0.44	325.08	0.41469	0.059	0.192209
2009	Rwanda	10.300	7.865	23.055	13.820	-0.45	337.43	0.410948	0.059	0.206398
2010	Rwanda	2.300	14.001	22.675	14.216	-0.30	351.23	0.444032	0.066	0.214853
2011	Rwanda	5.700	7.444	22.911	12.940	-0.26	374.06	0.430494	0.047	0.224493
2012	Rwanda	6.300	11.048	25.382	13.868	-0.23	395.94	0.416945	0.054	0.250665
2013	Rwanda	4.200	12.310	26.526	13.542	-0.14	401.10	0.414933	0.068	0.309193
2014	Rwanda	1.800	13.788	25.291	15.071	-0.06	420.15	0.466663	0.071	0.371266
2015	Rwanda	2.500	16.999	26.449	14.643	-0.04	445.48	0.513272	0.085	0.427335
2016	Rwanda	5.700	11.183	25.882	15.070	-0.04	456.02	0.5499	0.086	0.522542
2017	Rwanda	4.800	9.151	23.829	15.217	0.01	469.65	0.55179	0.096	0.540063
2018	Rwanda	3.300	17.881	24.358	14.898	0.00	487.22	0.60147	0.072	0.589634
2019	Rwanda	5.500	9.800	20.550	15.700	-0.40	340.81	0.61597	0.084	0.454553
2000	Tanzania	6.000	12.363	17.457	7.851	-0.50	390.63	0.775838	0.027754	0.542646
2001	Tanzania	5.100	14.541	18.310	8.004	-0.36	408.94	0.814704	0.025513	0.491
2002	Tanzania	4.600	8.547	18.082	8.864	-0.46	420.27	0.896889	0.007978	0.508797
2003	Tanzania	4.400	5.625	20.677	10.378	-0.52	435.75	0.907016	0.006011	0.486236
2004	Tanzania	4.100	6.787	24.485	11.476	-0.51	456.57	0.635329	0.073222	0.524671
2005	Tanzania	4.400	8.327	27.396	11.918	-0.46	475.51	0.552248	0.069462	0.466071
2006	Tanzania	7.300	9.612	30.324	11.890	-0.33	483.38	0.360157	0.098183	0.220005
2007	Tanzania	7.000	6.390	32.651	13.109	-0.34	507.94	0.220256	0.098907	0.233332
2008	Tanzania	10.300	-1.202	37.490	11.318	-0.36	517.30	0.203107	0.089888	0.21755

2009	Tanzania	12.100	5.492	34.356	12.333	-0.34	532.44	0.191935	0.08638	0.266999
2010	Tanzania	7.200	4.675	32.017	10.362	-0.36	556.51	0.22939	0.087739	0.282857
2011	Tanzania	12.700	2.464	34.736	9.697	-0.39	590.30	0.236448	0.099559	0.294341
2012	Tanzania	16.000	4.591	34.844	10.427	-0.42	604.97	0.241601	0.073	0.296307
2013	Tanzania	7.900	5.649	37.470	10.045	-0.44	632.57	0.276963	0.083	0.292036
2014	Tanzania	6.100	9.654	37.654	9.868	-0.49	656.24	0.312076	0.084	0.295137
2015	Tanzania	5.600	7.912	32.759	9.927	-0.45	679.24	0.343855	0.087	0.328709
2016	Tanzania	5.200	7.896	32.175	9.067	-0.42	703.37	0.37066	0.099	0.332669
2017	Tanzania	5.300	14.523	34.017	8.496	-0.50	724.30	0.39711	0.118	0.353059
2018	Tanzania	3.800	12.061	29.830	10.300	-0.55	750.09	0.41368	0.119	0.330632
2019	Tanzania	4.700	17.130	29.600	9.500	-0.36	554.96	0.4357	0.112	0.35595
2000	Uganda	3.400	10.622	19.484	14.504	-0.71	395.15	0.659123	0.007188	0.580905
2001	Uganda	1.900	17.334	19.302	15.582	-0.51	391.53	0.579647	0.028041	0.665784
2002	Uganda	-0.300	22.996	20.217	16.792	-0.72	416.52	0.587598	0.088591	0.66503
2003	Uganda	8.700	10.329	20.984	15.745	-0.66	427.64	0.573914	0.063225	0.737721
2004	Uganda	3.700	4.339	20.146	13.887	-0.64	436.81	0.560229	0.042841	0.620948
2005	Uganda	8.600	21.766	22.355	14.493	-0.71	447.40	0.559726	0.056635	0.510762
2006	Uganda	7.200	15.909	21.130	14.102	-0.58	475.32	0.426475	0.052218	0.134745
2007	Uganda	6.100	10.981	22.083	12.893	-0.54	496.77	0.284474	0.03992	0.137576
2008	Uganda	12.000	13.243	22.978	11.211	-0.56	524.09	0.215151	0.033433	0.164353
2009	Uganda	13.000	-9.749	24.997	9.225	-0.60	542.67	0.243591	0.045	0.154947
2010	Uganda	3.700	8.689	25.556	9.594	-0.59	552.17	0.273426	0.042811	0.15008
2011	Uganda	15.000	16.440	27.457	12.787	-0.58	580.71	0.278424	0.038842	0.164447
2012	Uganda	12.700	3.809	27.297	8.215	-0.58	578.01	0.291509	0.046445	0.166848
2013	Uganda	4.900	18.513	28.351	7.994	-0.60	567.69	0.30901	0.100994	0.3556
2014	Uganda	3.100	17.581	27.282	8.484	-0.62	569.10	0.33795	0.119232	0.324326
2015	Uganda	5.400	16.758	24.616	9.303	-0.59	586.22	0.365163	0.13204	0.359738
2016	Uganda	5.500	19.538	25.462	7.502	-0.58	581.14	0.3644	0.138812	0.426505
2017	Uganda	5.600	14.115	23.607	8.015	-0.55	585.30	0.36617	0.133485	0.46055
2018	Uganda	3.800	16.134	24.992	12.087	-0.59	595.92	0.37293	0.138389	0.463418
2019	Uganda	4.200	13.200	23.590	11.700	-0.52	512.52	0.37672	0.14741	0.381278