

**THREE ESSAYS ON DEBT, INCOME INEQUALITY AND ECONOMIC
GROWTH**

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(Master Thesis)

Eskişehir, 2021

**THREE ESSAYS ON DEBT, INCOME INEQUALITY
AND ECONOMIC GROWTH**

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MASTER DEGREE THESIS

Eskişehir, 2021

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This study titled ‘Three Essays on Debt, Income Inequality and Economic Growth’ prepared by Wilkista Lore Obiero is found to be successful after the defense exam conducted on the 21st of June 2021 in accordance with the related article of the Graduate Education and Training Regulation of Eskişehir Osmangazi University Institute of Social Sciences. The thesis has accordingly been accepted by the underlisted Jury members and the Department of Economics as Thesis.

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İMZA

ABSTRACT

THREE ESSAYS ON DEBT, INCOME INEQUALITY AND ECONOMIC GROWTH

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Master Degree-2021

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This paper consists of three essays on the relationship between public debt, income inequality, and growth. The first article examines the nonlinear effect of public debt and internal debt and economic growth in Kenya using the Smooth Transition Regression (STR) model and data for the period 1970-2018. The results of this study indicate that a U-shaped relationship exists between public debt and growth and between internal debt and growth. The threshold levels of public debt and internal debt are 33.29% and 17.3115% respectively. These results provide evidence that economic growth will increase in Kenya above a certain level of debt. The second article examines the relationship between inequality and public and internal debt in Kenya based on the ARDL model and data for the period 1970-2018. Toda Yamamoto causality analysis is also conducted following the ARDL model. The findings of this study imply that both public debt and internal debt exacerbate inequality in Kenya. The Toda Yamamoto test results indicate a unidirectional causal relationship from internal debt to inequality and from inequality to public debt. The third article explores the causal relationship in public debt, economic growth, and income inequality relationship for 11 SSA countries including Kenya for the period 1980-2018. For this purpose, Konya (2006) panel causality test approach based on SUR estimation is used. The findings show that there is at least a unidirectional causal relationship between public debt and inequality for nine countries, between inequality and growth for four countries and between growth and debt for four countries. Empirical results also imply that the relations between the relevant variables in the Sub-Saharan African countries may vary according to the characteristics of these countries.

Key Words: ARDL, Economic Growth, Income Inequality, Internal Debt, Panel Causality Analysis, Public Debt, Threshold Value Analysis.

ÖZET

BORÇ, GELİR EŞİTSİZLİĞİ VE EKONOMİK BÜYÜME ÜZERİNE ÜÇ MAKALE

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Yüksek Lisans-2021

İktisat Anabilim Dalı

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Bu çalışma kamu borcu, eşitsizlik ve büyüme arasındaki ilişkileri üzerine üç makaleden oluşmaktadır. Birinci makalede Kenya’da 1970-2018 dönemi için Yumuşak Geçiş Regresyon (STR) Modeli kullanılarak kamu borcu ve iç borcun ekonomik büyüme üzerindeki doğrusal olmayan etkisi incelenmektedir. Bu çalışmanın sonuçları, kamu borcu ve iç borç ile büyüme arasında U şeklinde bir ilişki olduğunu göstermektedir. Kamu borcunun ve iç borcun eşik seviyesi sırasıyla %33,29 ve %17,3115’tir. Bu sonuçlar, Kenya’da belirli bir borç seviyesinin üzerinde ekonomik büyümenin artacağına dair kanıt sunmaktadır. İkinci makale, Kenya'daki eşitsizlik ile kamu ve iç borç arasındaki ilişkiyi ARDL modeline ve 1970-2018 dönemine ait verilere dayanarak incelemektedir. ARDL tahmini ardından Toda-Yamamoto nedensellik analizi de yapılmıştır. Bu çalışmanın bulguları, Kenya’da hem kamu borcunun hem de iç borcun eşitsizliği daha da kötüleştirdiğini ima etmektedir. Toda-Yamamoto test sonuçları, iç borçtan eşitsizliğe ve eşitsizlikten kamu borcuna doğru tek yönlü nedensellik ilişkisinin olduğuna işaret etmektedir. Üçüncü makalede, 1980-2018 dönemi için Kenya’nın da dahil olduğu 11 Sahra Altı Afrika ülkesi için kamu borcu, ekonomik büyüme ve gelir eşitsizliği arasındaki nedensellik ilişkisi araştırılmaktadır. Bu amaç doğrultusunda SUR tahminine dayalı Konya (2006) panel nedensellik testi yaklaşımı kullanılmaktadır. Elde edilen bulgular dokuz ülkede kamu borcu ile eşitsizlik arasında, dört ülkede eşitsizlik ile büyüme arasında ve dört ülkede büyüme ile borç arasında en azında tek yönlü nedensellik ilişkisinin varlığını göstermektedir. Dolayısıyla ampirik sonuçlar, Sahra Altı Afrika ülkelerinde ilgili değişkenler arasındaki ilişkilerin ülkelerin spesifik özelliklerine göre değişebileceğini de ima etmektedir.

Anahtar Kelimeler: ARDL,Ekonomik büyüme, Eşik değer analizi, Gelir eşitsizliği, İç borç, Kamu borcu, Panel nedensellik analizi.

TABLE OF CONTENTS

ABSTRACT.....	v
ÖZET.....	vii
TABLE OF CONTENTS.....	ix
LIST OF TABLES.....	xi
LIST OF ABBREVIATIONS.....	xiii
DEDICATION.....	xv
ACKNOWLEDGEMENT.....	xvi
INTRODUCTION.....	1

1. CHAPTER

THE THRESHOLD EFFECT OF PUBLIC DEBT AND INTERNAL DEBT ON ECONOMIC GROWTH IN KENYA

INTRODUCTION.....	4
1.1. History of Public Debt in Kenya.....	5
1.2. Sustainability of Debt in Kenya.....	6
2. LITERATURE REVIEW.....	8
2.1. Theoretical Framework.....	8
2.2. Empirical Literature Review.....	11
3. METHODOLOGY.....	16
4. DATA AND EMPIRICAL RESULTS.....	18
4.1. STR Regression.....	20
5. CONCLUSION AND POLICY RECOMMENDATIONS.....	24

2. CHAPTER

THE EFFECT OF PUBLIC AND INTERNAL DEBT ON INEQUALITY IN KENYA

INTRODUCTION.....	26
1.1. Inequality in Kenya.....	27

2. LITERATURE REVIEW.....	29
2.1. Theoretical Background	29
2.2. Empirical Literature Review	30
3. DATA AND METHODOLOGY	33
4. EMPIRICAL RESULTS AND DISCUSSIONS	37
5. CONCLUSION AND POLICY RECOMMENDATIONS	43

3. CHAPTER

PUBLIC DEBT, INCOME INEQUALITY AND ECONOMIC GROWTH IN SSA COUNTRIES

INTRODUCTION	45
1.1. History of Debt and Growth in the Selected SSA Countries	48
1.2. History of Inequality and Public Debt in The Selected SSA Countries	50
2. LITERATURE REVIEW.....	50
2.1. Theoretical Literature Review	51
2.2. Empirical Literature Review	52
3. DATA AND METHODOLOGY	54
3.1. Cross-Sectional Dependence Tests	55
3.2. Slope Homogeneity Tests.....	56
3.3. The Bootstrap Panel Causality Test	57
4. RESULTS AND DISCUSSIONS	59
5. CONCLUSION AND POLICY RECOMMENDATIONS	66
GENERAL EVALUATION	68
REFERENCES	71

LIST OF TABLES

Table 1: Summary Statistics and Data Source	19
Table 2: Unit Root Test.....	20
Table 3: Linearity Test on the Transitional Variables	21
Table 4: LSTR Model	21
Table 5: Misspecification Tests.....	23
Table 6: Empirical Literature	32
Table 7: Descriptive Statistics and Data Source	34
Table 8: Unit Root Tests	37
Table 9: Diagnostic Tests.....	38
Table 10: ARDL Bounds Tests	38
Table 11: The Estimates of Long- run Coefficients.....	39
Table 12: The Estimates of the Short-run Coefficients.....	41
Table 13: Toda Yamamoto Causality Test.....	42
Table 14: Cross Sectional Dependence.....	59
Table 15: Homogeneity Test	60
Table 16: Gini and Public debt Bootstrap Panel Causality	60
Table 17: Palma Ratio and Public Debt Bootstrap Panel Causality.....	61
Table 18: Theil and Public Debt Bootstrap Panel Causality.....	61
Table 19: Theil and Economic Growth Bootstrap Panel causality	62
Table 20: Palma Ratio and Economic Growth Bootstrap Panel Causality	63
Table 21: Gini and Economic Growth Bootstrap Panel Causality.....	64
Table 22: Public Debt and Economic Growth Bootstrap Panel Causality.....	64
Table 23: Summary of Causal Relationships Between Variables.....	65

LIST OF FIGURES

Figure 1: Interest rate, GDP growth rates and Debt to GDP ratio for Kenya	7
Figure 2: Transition Function of LSTR (1) Model for Public Debt.....	23
Figure 3: Transition Function of LSTR (1) Model for Internal Debt	23
Figure 4: CUSUM and CUSUMSQ results (Internal debt)	41
Figure 5: CUSUM and CUSUMSQ results (Public debt)	42
Figure 6: Public Debt and growth in SSA for 1990-2018.....	48
Figure 7: Inequality and Public debt in SSA for 1990-2018.....	50

LIST OF ABBREVIATIONS

ADF	: Augmented Dickey Fuller
ARDL	: Auto Regressive Distributed Lag
CUSUM	: Cumulative SUM
CUSUMSQ	: Cumulative SUM of squares
ESTR	: Exponential Smooth Transition
FGLS	: Feasible Generalized Least Squares
GCIP	: Global Consumption and Income Project
GDP	: Gross Domestic Product
GDPC	: Gross Domestic Product per Capita
GNI	: Gross National Income
IMF	: International Monetary Fund
KNBS	: Kenya National Bureau of Statistics
KPSS	: Kwiatkowski-Philips-Schmidt-Shin
LSE	: Least Square Estimate
LSTR	: Logistic Smooth Transition Regression
MENA	: Middle East and North Africa
MRDI	: Multilateral Debt Relief Initiative
OECD	: Organization for Economic Co-operation and development
PP	: Philips-Peron
RIR	: Real Interest Rate
SADC	: South African Development Community
SGR	: Standard Gauge Railway
SPA	: Special Programme Assistance
SSA	: Sub-Saharan Africa
STR	: Smooth Transition Regression

SUR	: Seemingly Unrelated Regression
SWIID	: Standardized World Income Inequality database
UNDP	: United Nations Development Programme
VAR	: Vector Auto Regressive
WDI	: World Development Indicators
ZA	: Zivot Andrews

DEDICATION

This work is dedicated to my parents, Janet Atieno and Eliezer Obiero, thank you for your endless support, prayers, and encouragement. I love you.

ACKNOWLEDGEMENT

First of all, I acknowledge the Almighty God who has supplied wisdom, life, and health to do this work. In him, I have my being. I also acknowledge the endless support of my supervisor Lecturer Seher Gülşah Topuz. Her valuable contributions, wonderful guidance and direction have made a great impact on the writing process of this thesis. I greatly thank Angela and Evance for their support, prayers and love especially during the period of writing this thesis. My classmates and coursemates from other institutions whose advice I sought during the process and provided it without measure. My nephews: Adrian, Ardley, Daryl and Dylan, my siblings, and my entire support system. I say thank you.

Last but not least, I thank YTB for their scholarship without which this reality would still be a dream. I am forever indebted to you.

INTRODUCTION

Kenya is one of the fastest- growing countries in Sub-Saharan Africa with an average growth rate of 5.7 percent over the period 2015-2019 (The World Bank,2021). It has the potential to achieve an even higher growth rate regarding to its active private sector, abundant renewable resources, skilled workforce and good infrastructure. Addressing the challenges of inequality, inflation, climate change, and budget deficits are the major goal of the country in attaining sustained growth. Kenya has experienced a steady increase in public debt in the recent past. The public debt to GDP ratio has increased from 48 percent of GDP at the end of 2014 to 65.6 percent of GDP at the end of 2020. On the other hand, the internal debt to GDP ratio has increased from 25.5 percent of GDP in 2014 to 31.2% in 2020 (Government of Kenya, 2020). As the debt values are increasing, a higher rate of economic growth is needed to reduce the risk of debt distress.

According to OXFAM (2021), Kenya is characterized by very high levels of inequality in income, and wealth. The statistics indicate that less than 0.1 percent of the population own more wealth than the remaining 99.9 percent. Income inequality is also high in Kenya considering the top 1 percent control 15 percent of the total national income. (Eshiwani, 2020). The implication of these high levels of inequality is that a few people benefit from economic growth while a bigger percentage do not benefit. To the best of our knowledge, there are no studies that have examined the inequality, debt, and growth relationship in Kenya.

The increasing level of national income and sustained development are among the main goals of many economies. In the process of achieving these goals, the question arises of how to finance economic and social projects effectively. Underdeveloped and developing countries usually have to borrow for industrialization projects especially if the projects require a high budget. Governments can borrow as internal or external debt. Internal debt refers to money that the government owes to its citizens and issues in local currency, while external debt refers to money issued to those outside the country and in foreign currency. Beside funding development projects, debts can also be used in financing budget deficits, wars, and responding to pandemics. Developed countries may also prefer debt with an aim to protect their economic balance. For example, it has been observed in countries like Japan where the debt to GDP ratio is above 200% (Miyazaki and Onji, 2017).

Using debt to finance productive projects has a positive impact on the output of an economy, the funds from these projects are used for settling the outstanding debt amounts and the accumulated interest rates. However, using debt to finance consumption and nonproductive projects lead to defaulted payments of interest rates which can lead to a debt crisis. The emerging problems after a debt crisis negatively impact an economy by making it fragile against external shocks. In the recent past, many developing countries in the SSA have resorted to debt financing mainly owing to the inadequate amounts of savings in these economies(Coulibaly et al., 2019). Hence, the debt burden problem and sustainability of the debts in these countries is one of the important issues that needs to be addressed.

Another important problem of SSA countries is income inequality. According to the report by Hakura and Dietrich (2015), SSA comes third among the most unequal regions of the world behind Latin America and the Caribbean. Aside from income inequality, the other forms of inequality observed in the SSA region include wealth inequality, gender inequality, ethnic, and geographical inequalities. While some authors argue for a positive impact of inequality on growth, others argue that inequality impacts growth negatively through some channels. The authors who argue in favor of inequality state that the gap between the rich and the poor is a great motivation for the poor to work hard with an aim of closing the gap thus encouraging growth. On the other hand, the authors who argue against inequality claim that it is hard for the low-income earners to afford fundamental needs and thus economic growth can be affected negatively through factors like trend of crime, socio-political instability.

Theoretical literature shows that inequality and debt also influence each other. Debt impacts inequality through the redistribution effect where the government raises tax levels for both the poor and the rich to repay the existing debts. However, the income inequality gap is likely to increase since the government debts are mostly owed to the rich and redistribution occurs from poor to the rich. Inequality also affects debt in that, when the level of inequality is relatively high in an economy, the government may borrow with the intention of reducing inequality levels and in this regard raise debt levels.

The main aim of this thesis is to evaluate the relationship between inequality, debt and economic growth in three separate articles. In addition to the introduction and conclusion section, the study is made up of three articles. The first article analyses the

impact of debt on growth in Kenya for the period 1970-2018 based on the STR model. Separate analysis is conducted for the impact of internal and public debt on growth. Results from this analysis indicate the existence of a U-shaped relationship between public debt and internal debt and economic growth in Kenya. The threshold debt level of public debt and internal debt is found to exist at 33.29% and 17.3115% respectively. The impact of other variables including inflation, investment, trade openness and human capital on growth are also analyzed in the study.

The second article examines the debt and inequality relationship and the causality relationship between these two variables in Kenya for the same period 1970-2018 based on the ARDL model and Toda Yamamoto causality tests. Here, the applicability of the debt redistributive theory in Kenya is being tested. The results from this study indicate the existence of a positive relationship between internal debt and public debt and growth in Kenya for the period under study. The causality test results also indicate the existence of a unidirectional causality relationship from internal debt to inequality and from inequality to public debt.

The third article covers the causality analysis for debt, growth and inequality in 11 countries of the SSA region for the period 1980-2018 basing on the panel bootstrap SUR analysis. SSA countries including Kenya were selected to provide a broader assessment of the debt, inequality and growth relationship. They were limited to only 11 countries because of data unavailability. The results from this study indicate the existence of a causal relationship between public debt and inequality in ten countries, between inequality and growth in five countries and between growth and debt in four countries.

In the conclusion section of the study, the results obtained together with policy recommendations are presented.

1. CHAPTER

THE THRESHOLD EFFECT OF PUBLIC DEBT AND INTERNAL DEBT ON ECONOMIC GROWTH IN KENYA

INTRODUCTION

Debt is important for developing countries owing to their constrained number of creditors, inefficient resources, and inadequate investments which are unable to finance their budget deficits (Babu et al., 2015). On the other hand, excessive borrowing could lead to crowding out, low investment, slowed growth and reduced productivity in these economies. (Kasidi and Said, 2013; Matiti, 2013; Umaru et al., 2013). The impact of public and internal debt, on the growth rate varies from one country to another depending on their initial debt accumulation and how the debt is used. In recent years, Kenya's public debt has been on the rise reaching 61.1% of GDP in 2019 (Ministry of Finance, 2019: 13) up from 43.8% in 2007 (Ministry of Finance, 2008: 5). Kenya's external debt is sourced from institutions like IMF, World Bank, from other donor countries like China and France while internal debt is mainly obtained from the sale of treasury bills and bonds. These debts have been used to finance various structural projects in the country like Standard Gauge Railway (SGR) which seeks to improve transportation in the country and building other public roads and stadia. However, the rapid increase in public debt levels raises questions among many Kenyans who are not quite sure about the implications placed by the high debt amounts on them and their future generations. While some believe that the investments will pay off and improve the country's economic condition, others believe that their future generations will have to grope with increased living costs.

Numerous studies examine the effect of a threshold value of debt on growth for both developing and developed countries, see for instance (Caner et al., 2010; Reinhart and Rogoff, 2010; Mensah et al., 2019; Topuz and Sekmen, 2019; Ndoricimpa, 2020). These studies conclude, however, that the threshold value of debt varies from one country to another depending on a country's characteristics and the method of analysis used. Therefore, we consider it important to perform a threshold analysis on Kenya's public debt and internal debt data to determine the debt threshold level and the possible impact they pose on the economic growth rate. To the best of our knowledge, there are no previous studies conducted to confirm the existence of

debt threshold in Kenya and therefore this study is expected to contribute to the existing literature in this aspect.¹ Furthermore, it is necessary to examine public debt and internal debt because previous studies have neglected these two and focused mostly on external debt. Since external debt is not the only source of debt in Kenya, the effect of internal and public debt is examined. Different from the previous studies in Kenya on debt and growth relationship, this study is used a different methodology which allows for a smooth transition of the variable coefficients across different regimes. This follows the results of the linearity test which indicated that the debt and growth relationship in Kenya is best captured using a nonlinear model. The current study provides an analysis of the threshold effect of public debt to GDP ratio on growth and the threshold effect of internal debt to GDP ratio on growth in Kenya for the period 1970-2018.

The rest of the study is organized as follows: After the introduction, the history of public debt in Kenya is presented, followed by sustainability analysis of the debt. The second section presents the relevant theoretical and empirical literature. The third section details the method and data set. The fourth section includes the analysis of the results, and the fifth section includes the conclusion and policy evaluations.

1.1. History of Public Debt in Kenya

Public debt financing is not a new concept in Kenya because it existed even during colonial times. During those days, the government borrowed without restrictions to finance the existing deficits (Shitubi, 2017). After independence in 1963, Kenya relied heavily on debt for economic development and made economic progress evidenced by increased investment and growth rates in the late 1960s and early 1970s of up to 7% per annum (Roberts and Fagernäs, 2004). In the 1970s, however, the growth rate began to decline due to reduced market share following the breakup of the then East Africa Community in 1977. The assets had to be shared proportionately among Kenya, Tanzania and Uganda. see Kimemia (2000). and the negative impact of the world oil crisis of 1973. During these periods, there was a significant increase external debt level provided to finance the budget deficit.

¹ Country-specific studies that have been conducted in the past include Baaziz et al. (2015) who found a debt threshold of 31.37% for South Africa and Omotosho et al. (2016) who found a debt threshold of 73.7% for Nigeria.

More recently, the debt level in Kenya increased from US\$ 3 billion in 1980 to US\$ 7 billion in 1990 (Brien and Ryan, 1999). The increase in debts during this period is attributed to both interests accrued from the previous debt values and the new debts obtained to reinvigorate the economy due to the shocks in the mid-1970s. The late 1980s and early 1990s were particularly bad time for the country because a lot of money was spent on debt repayment. Kenya even entered into a debt crisis (Were, 2001) where debt values piled up leading to periods of slow growth, low investment and high inflation. The country, however, benefited from debt relief and Special Programme Assistance (SPA) to aid in reducing the escalating level of public debts. The effect of these assistance programs was not immediate as the public debt to GDP ratio continued to rise reaching 120.71% in 1993 (KNBS, 1995). The GDP growth experienced after 1993 helped to reduce the debt to GDP ratio despite high debt levels. The various projects and investments that have been undertaken in the country from 2007 have seen the public debt to GDP ratio values increase from 43.8% in 2007 (Ministry of Finance, 2008) to 57.1% in 2018 (Ministry of Finance, 2019).

To ease the pressure that the country was facing from external debt financing and repayment obligations, the country preferred internal debt financing as a deliberate strategy. This source of financing is expensive, but the debt is owed to the locals and has more flexible repayment schedules. Initially, most of the internal debt was sourced from central government and individuals but over time, this has extended to include intermediary financial institutions (Oyugi and Chiraerae, 2011). In the year 2010, internal debts accounted for more than half of the total debt in Kenya (Ministry of Finance, 2010). This trend is still being observed in recent years with the domestic debt as a percentage of total debt at 47.5% in the year 2020 (Government of Kenya, 2020). The value of both internal and public debt are constantly increasing, and this is an important factor affecting other macroeconomic variables in Kenya.

1.2. Sustainability of Debt in Kenya

Kenya just like many other developing African countries has experienced a sustained increase in the value of public debt in the recent past (The Africa Report, 2021). The increase can be attributed to numerous factors: among others, the funds used during unexpected economic conditions in the country, the rising interest rates from previously owed debt amounts, and unfavorable borrowing conditions from more

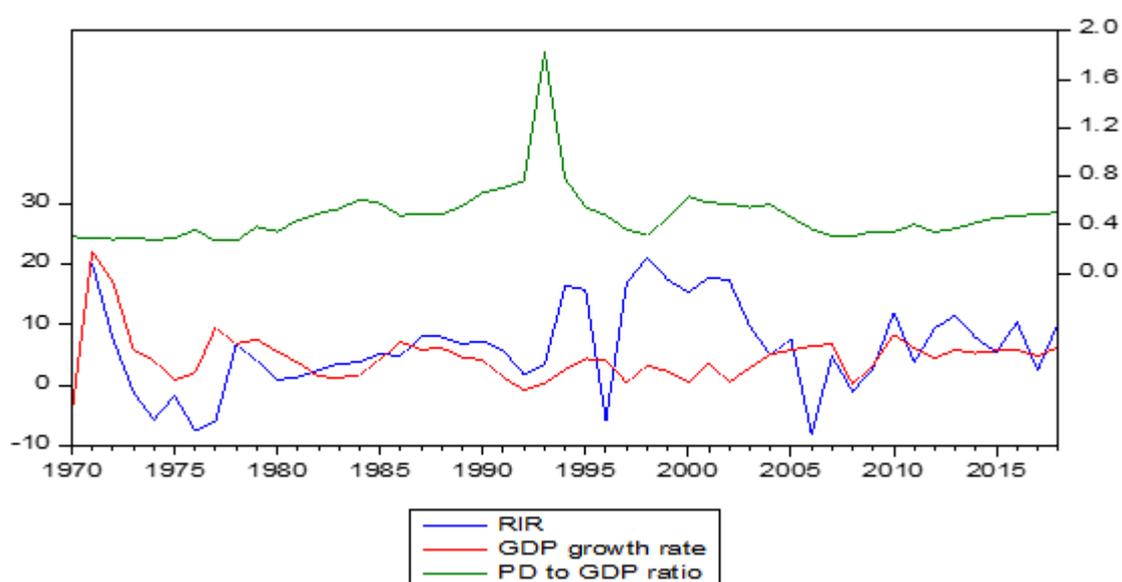
developed countries with stringent demands. Sustainable debt is not harmful to an economy. The sustainability of the debt is dependent on the growth rate of debt in comparison to the GDP growth rate. If GDP is growing at a higher rate than the growth rate of debt then the debt is accepted as sustainable (Gotfries, 2013). The main question addressed by sustainability studies is whether Kenya will be able to meet its debt obligations without resorting to debt defaulting and cancellation requests in the future while at the same time allowing for growth. This is analyzed through the observance of interest rate payments and the proportion of GDP that is used to settle outstanding debt values². When the interest rate exceeds the growth rate then the debt to GDP ratio is rising over time and debt is unsustainable. On the other hand, when the GDP growth rate is higher than the interest rate, then the debt to GDP ratio is falling over time and the debt is sustainable (Gotfries, 2013: 294). Therefore, the sustainability of debt in Kenya can be determined based on the values of interest rate and GDP growth rate. Whereas Kenya seeks to achieve a 10% annual growth rate by 2030, see Debrun et al. (2019), economic growth in Kenya is stymied with high levels of debt and accrued interests. Understanding debt sustainability is useful in determining whether the 2030 growth agenda will be achieved.

Figure 1 shows the interest rate, public debt and growth relationship in Kenya for the period 1970-2018.

From figure 1 it can be observed that the interest rates and GDP growth rates fluctuate over time. It can also be seen that from the mid-80s to around 2004 interest rate was generally higher than the growth rate. The economy recorded the highest rate of public debt to GDP ratio in 1993 but this value later reduced up until 1998 where the lowest public debt to GDP values were obtained. When the interest rate is higher than the growth rate, the debt to GDP ratio will be rising and the debt burden will flare-up. This may lead policy makers into reducing expenditures or increasing taxes both of which are detrimental to economic growth. However, when the interest rate is lower than the GDP growth rate, the debt to GDP ratio is falling and the debt burden reduces.

² More on the algebraic expression of debt sustainability is found in Gotfries (2013: 294)

Figure 1: Interest rate, GDP growth rates and Debt to GDP ratio for Kenya



Source: Author's construct. Data is obtained from KNBS and World Bank data

2. LITERATURE REVIEW

The central issue of debt in economies is not just its presence but rather the sustainability of this debt. This is because some giant economies like Japan and Germany have had very high public debt amounts but are still the top performers among the developed nations. Japan's debt to GDP ratio has risen to 200% since it began rising in 1990 (Debrun et al., 2019). On the other hand, some less developed countries with a debt to GDP ratio of not up to 100% are unable to sustain their debts. This necessitates an analysis of the impact of sources and the use of debts on the economic performance of different countries. In this section, both the existing empirical evidence of debt and growth in various countries and theoretical evidence from different economists and schools of thought are examined.

2.1. Theoretical Framework

In the classical school of thought, the main economists whose ideas on public debt will be considered include Adam Smith, David Ricardo, and John Stuart Mill. Adam Smith addresses the issue of public debt in the last chapter of his book 'An inquiry into the nature and causes of the wealth of Nations' where he states that public debt and taxes are necessary evils because an economy should ideally operate a balanced budget. Households and businesses in many economies are already awash with high tax rates and should not be overburdened with increased debts. The debts

contracted today are just postponed taxes because of future repayment obligations alongside the high-interest payments. Debts are seen to be a way in which funds are transferred from the productive class of the society to the less productive class and this reduces economic growth³. The government when given easy access to debt whenever money is needed will soon stop saving on account of the available lenders (Smith, 1776). On the other hand, John Stuart Mill argues that debt should be taken only if it will be invested in productive activities or taken from the savings available in the economy so as not to reduce the investment levels. Loans are therefore not entirely bad, and they only become 'evil' once they lead to very high interest rates and by extension lead to the exclusion of the private sector from actively participating in growth activities. Economies should thus embark on debts if they have surplus amounts of funds with which to settle the debts. This would be useful in preventing over taxation and its associated negative effects on disposable income and welfare (Mill, 1885).

David Ricardo's views are not entirely different from those of Adam Smith. He argues that debt among other factors can cause a disturbance to an otherwise flourishing economy that is at equilibrium. Debt is considered an 'evil' that interferes with businesses and the economy as a whole. Unlike Adam Smith who argues that an economy should take debts in the event of war, Ricardo thinks that people should be taxed highly to settle the burden that comes with war rather than resorting to debts. Another undesirable effect of public debt is that it leads to capital flight as it causes the movement of many capitalists from their native homes to invest and live abroad for fear of future high taxes which will cripple their businesses. He mostly argues for taxation as a means of raising revenue in place of debts (Churchman, 2001).

John Maynard Keynes has a different view from the classical economists because he views debt as a fiscal stabilizer that revamps the economy, especially during recessions by boosting aggregate demand. According to the Keynesian school of thought, the economy usually grows through the multiplier effect whereby one person's expenditure is seen as the source of another person's income, and in this way, the economy is rejuvenated when consumption and expenditures increase. When debts are contracted, it is possible to increase people's income and by extension their

³ Adam Smith and by extension the classical economists are supply-side economists. They argue that overtaxing the productive class is counterproductive which stifles economic growth.

consumption, and as a result, growth is experienced in the economy. Keynes argued that tax is not as effective as debt in rejuvenating the economy because taxation reduces disposable income thereby reducing consumption. Keynes, therefore, suggests that debt is not entirely bad as posited in the classical school of thought as it may encourage growth.

The debt overhang hypothesis which is put forward by Myers (1977) is formulated to explain a firm's financing options but has since been extended to explain the options in financing an economy through debt. By applying this concept to high indebted countries, Krugman (1988) shows that when a country cannot finance its debt obligation, the debt is likely to be reprofiled or defaulted. High indebtedness is likely to lead to reduced economic growth occasioned by low investment due to the crowding-out effect and high debt servicing. A country is thus said to have reached debt overhang when it is spending much of its income on debt repayment rather than on activities that encourage economic growth. Also, debt overhang is likely to affect the total factor productivity negatively further reducing growth rates (Hwang et al., 2010).

Debt overhang does not only just arise from countries having a high amount of debt but can also be caused by poor policies and unexpected shocks to the economy (Abdullahi et al., 2016). It states that indebted countries cannot perform well when they have a huge burden of existing public debt taken under unfavorable terms. This can be because any increase in productivity or increase in export income is channeled towards settling the outstanding debt amounts. Thus, it can be said that the factor that is most affected is the investment level of the debtor country. The debt overhang periods of a country, therefore, are characterized by slow growth and the countries find it hard to repay their outstanding debt amounts in the following period. In addition, it can also be said that the reduced investment can result from the increased tax rate.

High debt levels mostly affect the common citizens mainly through higher taxes, inflation, and reduced living standards. This is a condition that affects both developed and developing countries alike. There are other unforeseen circumstances like the current COVID-19 pandemic which is likely to plunge indebted countries further into the debt overhang possibility. It can be also said that one of the main causes of the debt overhang problem is financial openness. For instance, the debt is acquired in foreign currencies, when the value of the currency of the borrower country falls and

the value of the debt does not change then the indebted country ends up paying higher amounts.

Recently, aside from the theories discussed above, a new school of thought has emerged which redefines the debt and growth relationship as being nonlinear and dependent on the level of debt to GDP ratio in the economy. This school of thought became popular after the financial crisis of 2009 and since then many studies have been conducted to find the threshold debt level for different economies. After Reinhart and Rogoff (2010) published their seminal work in which they showed that only a debt to GDP ratio of 90% and above impacted negatively on the growth of selected economies, many studies have since used it as a benchmark to arrive at different threshold levels for various economies.

2.2. Empirical Literature Review

In recent years, there has been an increasing amount of study on growth and debt relationship for different countries. These studies use public debt to mean either domestic debt, external debt or both depending on data availability which has been a challenge in many studies.

The national debt values in many countries, both developing and developed, have been rising since the early 1980s. This was after the great recession of the 1970s where countries were borrowing to offset the undesirable effects of the recession. Increasing debt, however, has been accompanied by economic growth in some countries and periods of stagnation and slow growth in others (Watson and Regling, 1992). There is no consensus in previous studies analyzing the relationship between public debt and economic growth and so they have been unsatisfactory. The authors have provided mixed evidence. While some studies show the positive impact or negative impact of debt on growth or no relationship and others the existence of a non-linear relationship between debt and growth. These results can depend on the sample size, sample period, and method applied in the study.

Firstly, it can be said that many empirical studies suggest that debt cannot improve economic growth. Rais and Anwar (2012), Kasidi and Said (2013), and Munzara (2015) examine the impact of external debt on the growth process for Zimbabwe, Tanzania, and Pakistan, respectively. A negative relationship is claimed to exist between the variables and therefore the authors state that policies to mobilize

more resources and reduce overdependence on external aid should be encouraged in these countries. Ejigayehu (2013) associates the negative impact of external debt to crowding out of the private businesses.

Ehikioya (2012), Ada et al. (2016), Favour et al. (2017), and Onafowora and Owoye (2017) examine the impact of external debt on growth in Nigeria for different time periods based on OLS, ARDL, VECM, and SVAR methods respectively. External debt is found to impact negatively on growth. Similar results are found to be applicable for external debt in Kenya by Ngure (2003), Mukui (2012), and Muinga (2014) who all conducted OLS analysis. Although Were (2001) arrives at the same conclusion, the results are based on the two-step Engle Granger analysis method.

Shayanewako (2013) and Mhlaba and Phiri (2019) find that external debt impacts growth negatively in South Africa. The studies are based on VECM and ARDL models respectively. Malik et al, (2010), Safdari and Mehrizi (2011), and Kharusi and Mbah (2018) arrive at the same conclusion for Oman, Pakistan, and Iran respectively. Unlike other studies, Pegkas (2018) focuses on the issue of the break effects between debt and economic growth in Greece. According to the study, the negative relationship arises from debt breaks.

Umaru et al, (2013), Osuma et al. (2018), Ajayi and Edewusi (2020), and Didia and Ayokunle (2020) indicate that external debt has a negative effect on the economic growth rate, but domestic debt impacts positively on economic growth in Nigeria. Therefore, domestic debt is a more reliable source of funds in Nigeria as compared to external debt. This is however, not the same finding by Rawat (2019), who finds that both external and domestic debt have a detrimental impact on the growth rate of Pakistan.

Babu et al. (2015) state that the role of domestic debt on GDP growth in East Africa is positive using data for the period 1990-2010. Owosu-Nantwi and Erickson (2016) also claim that there is an existence of a positive relationship between public debt and economic growth in Ghana based on results from data for the period 1970-2012. Maana et al. (2008) find that the impact of domestic debt is positive and insignificant in Kenya while Sheikh et al, (2010), and Putunoi and Mutuku (2013, state that there is a significant positive impact of domestic debt on growth in Kenya and Pakistan respectively.

Similar to our study, Mwaniki (2016), Ngugi (2016), and Kimtai (2019) examine this relation for Kenya and show that domestic debt positively affects growth while external debt negatively affects growth. On the other hand, Umaru et al, (2013) point out that the impact of external debt on growth is positive in the long run for transition economies for the 1991-2010 period. Therefore, it can be said that the positively sloping side of the debt-Laffer curve is valid for transition countries. Similarly, Ogunmuyiwa (2010), Onyango (2016), and Gövdeli (2019) claim a positive impact of external debt on growth in Turkey, Nigeria and Kenya respectively.

A panel study of Pacific Island countries by Jayaraman and Lau (2009) indicates the presence of a positive impact of external debt on growth which is only limited to the short run while a study on South Asian countries by Siddiqui and Malik (2002) shows a positive impact of external debt on growth both in the long and short-run Matiti (2013) concludes that external debt is a cheaper source of finance than domestic debt in Kenya.

The impact of public government debt, encompassing both domestic and external, on growth has been analyzed in a number of studies. Brini et al. (2015), Njoroge (2015), Bazza et al. (2018), Chudik et al. (2018), Ncanywa and Masoga (2018), and Mohanty and Panda (2019) find a negative impact of public debt on growth while Egbetunde (2012), Fincke and Greiner (2015), Kamundia (2015), Saifuddin (2016), Burhanudin et al. (2017), and Njoroge (2020), ascertain that public debt encourages growth and should therefore be invested in productive activities.

Zaghdoudi and Hakimi (2017) examine the applicability of the debt overhang hypothesis in 25 developing countries for the period 2000-2015 by using the IM-OLS method. The study revealed the existence of a negative and significant relationship between debt and growth in these economies. Debt is also found to be responsible for increasing inequality levels in these countries. These results imply the existence of debt overhang in many developing countries which calls for better debt repayment term negotiations. Debts should contribute to improving the economy of the debtor nation and not making it worse off.

The causal relationship between debt and growth has been analyzed in some studies including Utomi (2014), Manik and Khan (2018), Saungweme and Odhiambo (2018), and Adedoyin et al. (2020). Whereas Saungweme and Odhiambo (2018) and

Adedoyin et al. (2020) do not find any evidence of an existing causal relationship, Utomi (2014), and Manik and Khan (2018) ascertain the existence of a bidirectional causality between external debt and growth in India and that a unidirectional causality exists from growth to both external and domestic debt in Nigeria respectively.

The proponents of the existence of a non-linear relationship between debt and growth became popular after the 2008 recession. The existence of an inverted U relationship between debt and growth is observed in some countries. According to this view, before debt values reach the threshold value the relationship is positive and when the debt to GDP ratio exceeds the threshold level is negative. This threshold value changes from one country to another. Doğan and Bilgili (2014) examine the nonlinear impact of external debt on growth by using Markov switching regime model for the period 1974-2016 in Turkey. The results indicate that debt and growth do not follow a linear pattern of relationship and this changes for different regimes of debt. Other variables like investment and human capital are found to affect growth positively in all the regimes. In a comparative study of the effect of external debt on growth in Nigeria and South Africa, Ayadi and Ayadi (2008) find that there is a nonlinear debt and growth linear relationship for Nigeria but linear for South Africa.

Although limited, there are studies on the threshold effect of debt on growth, especially for low-income developing countries. Ndoricimpa (2020) ascertains a threshold level of 62-66% for the African countries. On the other hand, Chudik et al. (2015) fail to establish the existence of a single threshold value for all the 40 countries analyzed in their study. This is because countries are all different with special characteristics and economic conditions responsible for their debt positions.

In a study aimed at analyzing the threshold debt level that discourages growth in Africa, Mensah et al. (2019) find that most countries in Africa have a threshold value of between 20-50% of debt to GDP ratio. This study is important because it represents the threshold effect of African countries which is lower than the 90% threshold value established for developed countries by Reinhart and Rogoff (2010). Caner et al. (2010) establish the threshold level which is at 64% debt to GDP ratio for developing countries. Veiga et al. (2016) find that Sub-Saharan countries achieve the highest growth rate when the public debt to GDP ratio is about 30-60%. These papers help put forward the idea that the threshold effect of debts exists for both developed and developing countries.

Other researchers like Chudik et al. (2015) and Topuz and Sekmen (2019) highlight the fact that public debt could have a negative impact on growth both below and above the threshold. The latter study uses 40 countries including both developed and underdeveloped economies while the former uses data belonging to OECD countries. These results point out that there is no one size fit all in the countries for the public debt to growth relationship.

In a more specific study on South Africa, Baaziz et al. (2015) analyze the effect of public debt to GDP ratio using the Smooth Transition method. The results indicate the presence of the debt threshold at 31.37% of debt to GDP ratio. Beyond this point, debt has a negative effect on GDP. Osinubi and Olaleru (2006) find that the debt threshold level of Nigeria is 60% beyond which debt is no longer a desirable source of financing. A similar study was conducted for a panel of countries by Ueshina and Nakamura (2019) using the endogenous growth model. The authors analyze the debt in different levels including household level, debts owned by firms, and government debts. The inverted U relationship is found to exist when the government finances public investment through issuing of new bonds. But the authors are claimed that the bonds should not exceed the current public investment level.

Eberhardt and Presbitero (2015) find heterogeneous public debt and growth relationships among countries with some countries exhibiting the existence of an inverse U-shaped relationship between public debt and growth with others having U shaped relationship between public debt and growth. Presbitero (2012) ascertains that a negative debt to growth relationship is observed for developing countries when the threshold value of public debt is below 90%. Égert (2013) conducts an analysis to prove the postulation of Reinhart-Rogoff's study. They cannot find any evidence about the 90 percent threshold level proposed by Reinhart and Rogoff (2010). Cecchetti et al. (2011) argue that the debt threshold ratio is at 85% of debt to GDP ratio for OECD countries, while Alshammery et al. (2020) ascertain the existence of a debt threshold of 58% beyond which public debt is detrimental to growth for MENA countries.

Lastly, studies by Mweni (2014) and Okiro and Murungi (2018) provide no conclusive evidence on the existing relationship between public debt and economic growth in Kenya. Similar results are obtained by Lof and Malinen (2013) in an analysis of 20 developed countries for the period 1954-2008 using the VAR model. Osewe (2013), Kimtai (2019) and Tuna (2019) find no evidence of a significant relationship

between external debt and growth in Kenya while Singh (1999) also finds no evidence of any long-run relationship between domestic debt and growth in India.

3. METHODOLOGY

The relationship between debt and economic growth is analyzed using the Smooth Transition Regression model.⁴ The term “smooth transition” was first suggested by Bacon and Watts (1971). The authors suggest a model in which the transition from one extreme linear regime to another is smooth. The STR model, which provides the opportunity to determine nonlinearity, and the basic framework of this model are presented in detail by Terasvirta (1998).

The standard nonlinear STR model is as follows:

$$y_t = x_t' \varphi + (x_t' \theta) G(\gamma, c; s_t) + u_t \quad (t = 1, \dots, T) \quad (1.1)$$

Where $x_t = (1, x_{1t}, \dots, x_{pt})' = (1, y_{t-1}, \dots, y_{t-k}; z_{1t}, \dots, z_{mt})'$ $p = k + m$ is a vector of explanatory variables, while $(\varphi = \varphi_0, \varphi_1, \dots, \varphi_p)'$ and $(\theta = \theta_0, \theta_1, \dots, \theta_p)'$ are parameter vectors. u_t is the error term. $G(\gamma, c, s_t)$ is a continuous function of the transition variable s_t . The STR model allows for switching between regimes but is limited to one or two regimes only. The choice of variables to include in the model is backed up by economic theory while the threshold value is not chosen by the researcher.

There are different definitions for G in the literature. One of them is as follows:

$$G_1(\gamma; c, s_t) = (1 + \exp\{-\gamma(s_t - c)\})^{-1} \quad , \quad \gamma > 0 \quad (1.2)$$

Equations (1.1) and (1.2) above jointly define the Logistic STR model of the LSTR1 model. The parameters of the LSTR1 model change monotonically as a function of s_t . Parameter γ controls the slope while c is the determined location parameter and indicates where the transition occurs. When $\gamma = 0$, the transition function $G_1(\gamma; c, s_t)$ equal to 1/2, and thus the STR model includes the linear model. On the other hand, when $\gamma \rightarrow \infty$, the LSTR (1) model approaches the switching

⁴ Terasvirta (1994) can be followed for detailed information on the STR model. This model has been applied by previous studies examining public debt threshold and economic growth including Baaziz et al. (2015) and Ndoricimpa (2020).

regression model with two regimes having equal variances. If however, the transition function is as follows:

$$G_2(\gamma, c; s_t) = (1 + \exp\{-\gamma(s_t - c_1)(s_t - c_2)\})^{-1}, \quad \gamma > 0, \\ c_1 \leq c_2 \tag{1.3}$$

Equations (1.1) and (1.3) above jointly define the Logistic STR model of the LSTR2 model. When $\gamma \rightarrow \infty$ in the LSTR (2) model, the result is another switching regression model with three regimes such that the outer regimes are identical, and the mid regime is different from the other two. An alternative to the LSTR (2) model is called the exponential STR (ESTR) model. It is Equation (1.1) with the transition function:

$$G(\gamma, c; s_t) = 1 - \exp\{-\gamma(s_t - c)^2\}, \quad \gamma > 0 \tag{1.4}$$

Modeling of an STR model consists of three stages namely: Specification, estimation, and evaluation. In the specification, a linearity test is conducted on the variables to determine whether their relationship is best specified using a linear model, STR model with one regime, or STR model with two regimes. As already stated above, the choice of variables is influenced by economic theory as only those variables which have been consistently shown to affect growth are included but the value of the threshold and number of regimes is determined in the model (Terasvirta et al., 1994). Another way in which the appropriate regime can be chosen is with Taylor expansion under the null $\gamma = 0$. This specification produces the function below (Terasvirta, 1998: 514)

$$y_t = x_t' \delta_0 + (x_t' s_t)' \delta_1 + u_t^* \quad t = 1, \dots, T \tag{1.5}$$

where: $u_t^* = u_t + (x_t' \theta) R_1(\gamma, c; s_t)$, δ_1 is a $(p + 1) \times 1$ parameter vector.

For univariate models, the appropriate lag selection is important for reliability of the results. If the linearity relationship fails to be rejected in this step, then the nonlinear model cannot be specified and so the researcher proceeds with an appropriate linear model selection. If, however, the linearity relationship is rejected, an appropriate nonlinear model is then specified.

The specification of an LSTR (1) or LSTR (2) model can also be dependent on Equation (1.5). the coefficient vectors $\delta_j, j = 1,2,3$ are functions of the parameters of the original STR model and these vectors depend on the type of the model. When $c = 0, \delta_2 = 0$, and the model is LSTR (1). When $\delta_1 = \delta_3 = 0$, the model can either be LSTR (2) or ESTR model. The model can still be classified as LSTR (1) model when δ_2 is closer to the null vector than δ_1 and δ_3 . The summary of this alternative test is presented below:

- a) Test the hypothesis $H_{04}: \delta_3 = 0$
- b) Test the hypothesis $H_{03}: \delta_2 = 0 / \delta_3 = 0$
- c) Test the hypothesis $H_{02}: \delta_1 = 0 / \delta_3 = \delta_2 = 0$

In the above hypotheses, if (b) yields the strongest rejection based on the probability values then LSTR2 or ESTR model is preferred. LSTR (1) is preferred in the remaining cases (a) and (b) above having stronger rejection values based on their respective probabilities. This alternative procedure is specified by Terasvirta (1994) and is equally effective in deciding the more appropriate model between LSTR (1) and LSTR (2). H_{04} is tested by F_4 , H_{03} by F_3 , and H_{02} by F_2 . Based on the results, the appropriate model is selected, and estimation is then conducted by use of conditional maximum likelihood estimation. Different parameter values are chosen and the one which minimizes the residual sum of squares is then presented. The appropriate model is specified based on the chosen values of c and γ .

4. DATA AND EMPIRICAL RESULTS

In this study, Annual data is used for the period 1970-2018. The dependent variable is the annual GDP growth rate while public debt to GDP ratio and internal debt to GDP ratio are the threshold variables.⁵ The other control variables that used include human capital, trade openness, inflation, and investment rate⁶. Table 1 presents a brief description of the data and the sources.

⁵ Two models are estimated: one of them indicates the threshold public debt level and the another indicates the threshold internal debt level.

⁶ Previous studies such as Muinga (2014), (Babu et al., (2015), and Ndoricimpa (2020)) suggest that these variables affect growth and are suitable options for control variables.

Table 1: Summary Statistics and Data Source

Variable	Data definition and Sources	Obs	Mean	Std dev	Min	Max
GDP growth rate (GDP gr rate)	The annual percentage growth rate of GDP. WDI data	49	4.593	4.16	-4.65	22.17
Public Debt (PD_GDP)	Public Debt (%GDP) KNBS data	49	53.16	20.32	26.81	120.60
Internal Debt (ID_GDP)	Internal Debt (%GDP) KNBS data	49	22.58	6.417	12.49	39.49
Inflation (Inf)	Inflation data in percentages. WDI data	49	11.76	8.07	1.55	45.97
Investment (Inv)	Investment (%GDP) Theglobeconomy.com	49	20.61	3.33	15.00	29.79
Trade Openness (To)	Trade openness (sum of exports and imports as a function of GDP). The globaleconomy.com	49	56.64	8.38	36.15	74.57
Human Capital (SSE)	Human economic capital. (Secondary school enrolment %gross). The globaleconomy.com	49	40.98	15.21	16.43	70.30

Source: Authors' calculations based on the data

Before examining the STR model, the unit root test is applied to determine the stationarity of variables. Following this purpose, ADF, Zivot Andrews, and KPSS tests are used. This is because the ADF unit root test has been criticized for not being able to distinguish between persistent stationary process from non-stationary process clearly. Subjecting the variables to more than one unit root test is important in overcoming the shortcomings of each test. The results are presented in Table 2. The results of the unit root tests conducted in Table 2 indicate stationarity for most of the variables. Inflation and Investment are found to be stationary at level for all the tests conducted. The results of ADF and KPSS tests indicate that the GDP growth rate is stationary. Public debt is found to be non-stationary in the tests except for the KPSS test result. Internal debt and human capital are stationary for ZA and KPSS while trade openness data is stationary for KPSS. Taken together, these results prove that all the variables were found to be stationary in at least one test.

Table 2: Unit Root Test

Variable	Test statistic	Level		First Difference	
		Intercept	Intercept and Trend	Intercept	Intercept and Trend
GDP_gr_rate	ADF	-5.54***	-5.69***	-11.96***	-12.03***
	ZA	-3.65	-4.65	-6.30***	-6.37***
	KPSS	0.2070	0.1656**	0.2249	0.1634**
PD_GDP	ADF	-1.8683	-1.7720	-6.8585***	-6.8346***
	ZA	-2.8907	-4.2129	-8.2614***	-8.1749***
	KPSS	0.2184	0.1913**	0.1168	0.0668
ID_GDP	ADF	-2.4524	-2.4317	-8.1951***	-8.1158***
	ZA	-5.186**	-6.9746***	-9.3019***	-9.4139***
	KPSS	0.2205	0.1478**	0.0853	0.0632
Inf	ADF	-3.97***	-4.07**	-7.28***	-7.28***
	ZA	-5.10**	-5.419**	-8.18***	-8.0782***
	KPSS	0.4032*	0.2482***	0.0208	0.0093
To	ADF	-2.2899	-3.2297	-7.9714***	-7.9425***
	ZA	-4.1750	-4.2652	-6.5844***	-6.5722***
	KPSS	0.5380**	0.0778	0.1285	0.0818
Inv	ADF	-3.79***	-4.41***	-10.08***	-9.97***
	ZA	-6.2332***	-6.4042***	-7.0395***	-6.9665***
	KPSS	2.1609***	0.3651***	0.0208	0.0190
SSE	ADF	-0.0549	-1.7534	-7.6540***	-7.9425***
	ZA	-3.0624	-3.1028	-8.2547***	-8.1922***
	KPSS	0.8570***	0.1150	0.0966	0.0704

Source: Author's calculations based on the data, *** p<0.01, ** p<0.05, * p<0.1 represent significance levels

4.1. STR Regression

Before the application of an STR model, a linearity test should be conducted to ascertain whether public debt and GDP growth rate are best defined by a linear or nonlinear relationship.

Based on the results obtained in Table 3, the F values reject the linearity implying that both public debt and internal debt and economic growth relationship in Kenya for the period under study is nonlinear and best described by an LSTR (1) model which is preferred when F2 and F4 are more strongly rejected. The model is thus estimated as shown in Table 4.

Table 3: Linearity Test on the Transitional Variables

F stat	PD_GDP	ID_GDP
	p - value	p - value
F	4.7855e-04	7.7901e-05
F4	1.5821e-02	5.2807e-02
F3	2.0882e-01	5.8258e-03
F2	1.0750e-03	1.0734e-03

Source: Author's calculation.

Table 4: LSTR Model

Variable	PD_GDP growth		ID_GDP growth	
	Coefficient of Linear Part	Coefficient of nonlinear part	Coefficient of Linear Part	Coefficient of nonlinear part
GDP_gr_rate(t-1)	-1.2541* (0.7068)	2.2976* (1.3083)	-0.9686* (0.5821)	1.7401* (1.1116)
Inf(t)	-1.5164*** (0.3390)	1.8116*** (0.600)	-0.9286** (0.3278)	0.8752* (0.4722)
PD_GDP(t)	-2.1670** (1.0637)	1.4856** (0.7233)	-	-
ID_GDP (t)	-	-	-8.2886*** (2.7307)	6.4160*** (2.5241)
SSE	-0.4025* (0.2330)	0.6667* (0.4072)	-0.1417 (0.2360)	0.3243 (0.3546)
Inv	0.1910 (0.7827)	0.00617 (1.0946)	0.3384 (0.6621)	-0.0949 (1.0474)
To	-0.5895 (0.5397)	0.9147 (0.7034)	-0.7625** (0.3873)	1.1621** (0.5178)
Intercept	94.833*** (27.1648)	-52.8909 (0.000)	164.21*** (41.2454)	-120.84*** (12.6636)
Gamma		0.7839*** (0.1467)	1.000*** (0.1651)	
C		33.2938** (0.0269)	17.3115*** (1.9965)	
R ²		0.8203	0.7463	

Source: Author's calculations based on the data. Significance levels are '***', '**' and '*' for 1%, 5% and 10% respectively. Standard errors in parentheses

From table 4 we note that a threshold value of 33.29% public debt to GDP ratio and 17.31% internal debt to GDP ratio has been obtained. The smoothing parameters have been obtained as 0.7839 and 1.00 respectively indicative of a smooth transition from the lower regime to the upper regime. The public debt threshold lies within the 20-50% range put forward by Mensah et al. (2019) for developing countries and is comparable to the 31.37% threshold for South Africa by Baaziz et al. (2015). The internal debt threshold value is similarly comparable to the 13.6% internal debt threshold obtained for Nigeria by Eboime & Sunday (2017). These threshold values are however significantly different from the threshold values of 62-66% for African countries obtained by Ndoricimpa (2020).

The coefficient estimate of the public debt variable is found to be negative and significant in the lower regime but positive and significant in the upper regime. The coefficient of internal debt is also negative and significant in the lower regime but positive and significant in the upper regime. No evidence is found to support the existence of an inverse U-shaped public debt and growth relationship and internal debt to growth relationship in Kenya. The results of this study imply that public debt to GDP growth in Kenya and internal debt to GDP growth in Kenya all have a U-shaped relationship with the rate of growth of the economy. The reason for achieving the U-shaped relationship may be due to weak institutional factors as noted by Butkus and Seputiene (2018). With good institutions, government expenditures are used appropriately, and growth can be realized even at lower debt levels thus preventing the need of depending on more debt for growth (Masuch et al., 2016: 2).

For both models, the first lag of GDP has a negative impact in the lower regime but a positive impact on growth in the upper regime both of which are significant. Inflation has a negative impact in the lower regime and a positive significant impact on growth in the upper regime. The rate of secondary school enrollment has a negative impact on growth in the lower regime but a positive impact on growth in the upper regime albeit the impact is only statistically significant in the public debt model. This goes against the expected positive impact of human capital on growth in both the lower and upper regimes. Investment has a positive impact on growth in all the regimes of the two models except the upper regime of the internal debt model although these impacts are statistically insignificant. The finding could be because high public spending by the government crowds out investment hence the insignificant impact on growth. Trade openness has a negative impact on growth in the lower regime and a positive impact in the upper regime for both models. This impact is only significant in the internal debt model. The positive impact is attributed to increased total factor productivity especially as a result of improved technology and movement of capital associated with trade openness.

Figure 2: Transition Function of LSTR (1) Model for Public Debt

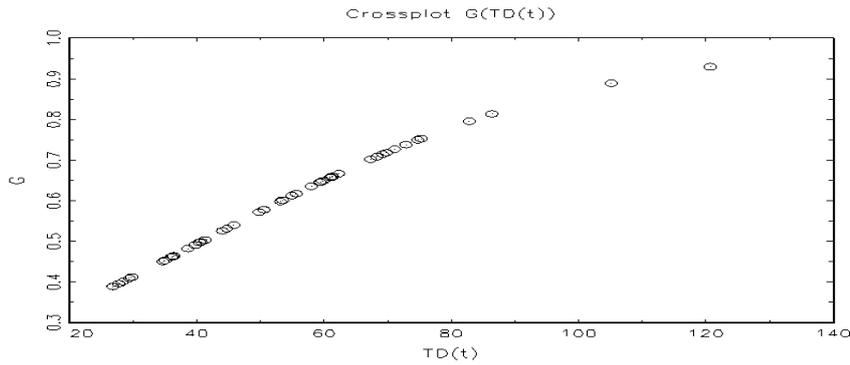
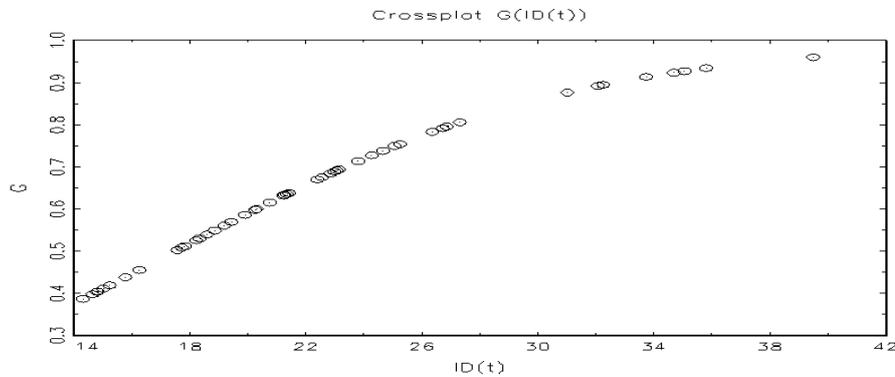


Figure 3: Transition Function of LSTR (1) Model for Internal Debt



Figures 2 and 3 show that the observed thresholds are smooth over the respective regimes. This implies that the impact of debt on growth is not immediate but is observed over time.

To confirm the results above, misspecification tests were conducted, and the results are as shown in Table 5.

Table 5: Misspecification Tests

Test	H_0	PD model	ID model
		P-value	P-value
LM	No Autocorrelation	0.3962	0.5163
ARCH	No ARCH effects	0.3892	0.8311
JB	Residuals are normal	0.8072	0.3335

Source: Author's calculations based on the data.

The results from Table 5 above indicate that the model is well specified, and the residuals are normal and not suffering from heteroscedasticity or autocorrelation.

5. CONCLUSION AND POLICY RECOMMENDATIONS

This study aims to examine whether the public and internal debt have a threshold effect on the economic growth in Kenya for the period 1970-2018. The STR model is used for this purpose. The findings indicate that the threshold level of domestic debt is estimated at 17.3115% and internal debt has a positive effect on economic growth above this threshold. The public debt threshold level is determined at 33.29% and has a positive effect on economic growth when this level is exceeded. Below the threshold values, public debt and domestic debt are harmful to economic growth. This can be attributed to institutional factors. With weak institutions, public sector funds including debts are not properly managed and so the low public debt to GDP ratio ends up in corruption and repayment of other initially existing debts thereby negatively affecting the economy. Creating the need for more debts before economic growth is realized. The negative impact of debt on growth is in line with the views put forward by Adam Smith who views debt as a necessary evil. This is because debt redistributes money into the hands of the unproductive rich officials from the productive classes of society.

The positive impact of higher public debt to GDP ratio can be attributed to the debt being used productively in funding public investments. This conclusion indicates that the public debt can contribute to the economic growth of the country only if invested productively. Furthermore, these findings estimated for Kenya are in line with the Keynesian view where debt is defined as a source of government income and can have a positive impact on the economy through the multiplier effect. It also supports the view by Georgieva (2020) that debt by itself is not bad but the negative or positive impact that it has on the growth rate depends on the uses of the debt. If the debt is used to finance recurrent expenditure, for consumption or is misused by government officials, then its impact on economic growth is likely to be negative.

The positive impact of public debt and internal debt on growth does not however imply that Kenya can rely on public debt as a source of funding without limit to the debt to GDP ratio. Alternative sources of funding should be preferred by authorities. Overreliance on the method of debt financing can lead to higher debt distress.

When these results are evaluated, appropriate policy recommendations can be made to ensure the proper use of public debt. The main goal should be to keep the debt at a sustainable level and to reduce the misuse of public debt by government officials. Clear guidelines defining how debt is obtained and used can help to channel debt in financing more productive activities like research and development. Similarly, a more transparent and frequent debt finance supervision could be useful in curbing misuse of funds by government officials. It is envisaged that the implementation of these policies will contribute to sustained growth without debt default.

However, since the threshold levels obtained for Kenya are quite low, these results suggest that the threshold value of the public and internal debt may be more than one. Therefore, the relationship between these variables can also be studied by the use of alternative approaches that allow for the determination of more threshold levels. From this point of view, the results of this study are a guide to future similar studies.

2. CHAPTER

THE EFFECT OF PUBLIC AND INTERNAL DEBT ON INEQUALITY IN KENYA

INTRODUCTION

The question of how income should be distributed, and what level of inequality is acceptable in society has been a major source of concern for many economists. Some argue that income ought to be distributed according to the contribution of the income-earner so that more productive people earn higher than less productive ones (Byrns and Stone, 1989: 591). Another argument that is put forward by Karl Marx (1818-1883) is that distribution should be done according to people's needs although this view has received sharp criticism for its tendency to encourage laziness. Others yet believe that income should be distributed equally among all individuals, and this too has been criticized as being likely to reduce productivity in the society (Conrad, 2016). The Greek philosopher Plato argues that income distribution should ensure that the income of the richest person should not exceed four times the income of the poorest person in society (Byrns and Stone, 1989). This is however not the case with our societies today where some people are extremely wealthy while others cannot even afford the necessities of life like proper food and shelter.

Some form of inequality, whether in income or labor, exists in every economy. This may result from the ability of some people to perform some tasks better than others, work longer, take risks, warranting higher payments (Schmidt et al. (2015); Checchi et al. (2017)). Differences in education and skills also qualify people into different job groups, see van Damme (2014), in addition, some people inherit wealth while others do not (Elinder et al., 2018). Economists have different views on how this existing inequality level should be handled⁷.

According to theoretical views, one of the macroeconomic variables that explain income inequality is debt. This relationship, however, is not straightforward.

⁷ Some schools of thought argue that it should be left to the market mechanism to work towards alleviating inequality (Dworczak et al., 2018), however, it is criticized on account that inequality will only be intensified because markets are in the hands of the rich and the decisions are made in their favor. On the other hand, interventionists believe that the government's participation could contribute to a reduction of inequality through providing affordable education, a better healthcare system, and adoption of a progressive tax system(OECD (2015); Breunig and Rose (2019)).

Productive use of debt could lead to a reduction in inequality levels, see for instance You and Dutt (1996), while high debt values could lead to volatility of income and as a result increase inequality (Azzimonti et al., 2014). The direction and impact of this relationship, therefore, varies from country to country depending on their macroeconomic policies (Anselmann and Krämer, 2016).

The redistributive theory states that an increase in internal debt will lead to an increase in inequality levels in an economy. Internal debts are held in the form of government securities, coupled with the fact that the government securities have relatively high prices, it is only the rich who can purchase the bonds. Consequently, when debt is serviced, it is the rich class of bondholders who again receive interest from the debt amounts. Given that debt servicing is achieved through taxation, resources end up being transferred from the poor to the rich bondholder class. The redistributive theory forms the main motivation of this study because, despite many studies having examined inequality and its impact on the economy, little attention has been given to analyzing the effect of debt on inequality at least not in the Kenyan context, a gap which this study seeks to fill.

There are limited studies on this topic, but to the best of our knowledge none of them examine the Kenyan economy. Debt-inequality nexus is a peculiar phenomenon for every country and the current study will be specific to Kenya. In this study, the effect of internal and public debt on income inequality is examined using ARDL Method for the 1970-2018 period in Kenya. After determining the long-term relationships between variables, Toda Yamamoto Causality tests are also conducted to ascertain the existence of causal relationships between debt and inequality. The rest of the study will be organized as follows: A brief description of the inequality types and their causes in Kenya is provided. The next section will provide theoretical and empirical background on the study, followed by the methodology and data section while the last section is where the results, conclusion, and policy recommendation will be provided.

1.1. Inequality in Kenya

The presence of inequality is expressed in the way people live whereby some are able to afford luxurious living while others cannot meet their basic needs. Even though inequality is commonly measured by income disparities among individuals and

households, it is not limited to just differences in income it goes further into differences in resource endowment, gender, and ethnicity (United Nations, 2021). The ethnic inequality in Kenya has however reduced significantly with the advancement of education (Simson, 2018). Existing data indicates that despite the economic growth rate in Kenya, income and wealth inequality continue to rise. According to Society for International Development (2004: 3) top 10% of the rich households in Kenya control up half of the total income in the country while the bottom 10% control less than 1% (0.076%) of the total income. Wealth distribution is equally skewed with 0.1% of Kenyans owning more wealth than the remaining 99.9% (Seery et al., 2019). These statistics make Kenya one of the most unequal countries in East Africa. It could be said that Kenya's economic growth would be more sustainable if wealth and income were not concentrated in the hands of a few individuals (Eshiwani, 2020).

The sources of income and wealth inequality in Kenya include; Differences in regions whereby the people in rural areas earn lower than their counterparts in the urban areas. Differences in human capital whereby some jobs pay higher returns than others and gender differences. Females are less likely to attend higher levels of education as compared to their male counterparts, due to the roles and responsibilities laid on them by society like taking care of the home (Society for International Development, 2004).

Inequality in Kenya ensures that only a few rich people benefit from economic growth while the poor people pay higher taxes and fall into the poverty gap. This is a huge contributor to increasing crime rates in Kenya especially in the cities where many young people resort to crimes and gambling as a means of livelihood (Debrun et al., 2019: 13). Inequality can also be associated with undesirable characteristics like teenage pregnancy, violence, and increased dependence (United Nations Populations Fund, 2017). Inequality is likely to have an impact on the rate of growth either directly through its influence on consumption and investment levels or indirectly through interaction with other variables. According to OECD (2015), countries with lower inequality generally tend to perform better than their counterparts with higher inequality. This performance not being limited to just economic growth but also includes better social and environmental indicators.

Plato, an ancient Greek philosopher, proposed that the richest person in a country should not own more than four times what a poor person owns in that same

economy. (Mankiw and Taylor, 2017: 372). This is not however the case for Kenya where the rich people own a lot in terms of cash and investments abroad while the poor cannot even afford the necessities. It is therefore important to undertake studies on inequality and how it influences different macroeconomic variables.

2. LITERATURE REVIEW

There are quite limited studies analyzing debt, especially internal debt, and income inequality relationship for different countries. Most studies emphasize the growth and debt, and growth and income inequality relationship. In this section, the existing theoretical and empirical studies on inequality and debt are presented.

2.1. Theoretical Background

In a bid to stimulate the economy, the government may resort to either debt financing or an increase in taxes. The impacts of these forms of financing on the economy have been analyzed by various economists. Ricardian equivalence is the view that there is no change in the national output when either form of funding is adopted. The term was first formulated by Barro (1989) and has since been argued by economists as one of the theoretical views on public debt and inequality relationship. A decline in government budget deficit is offset by an increase in private savings implying no change in the national savings amount (Ricardo, 1817). This is because if taxes are reduced currently, the rational consumer increases their savings as opposed to increasing their consumption. The increase in savings is then spent in the bonds market increasing government debt in return. It is the rich in the society who often save as compared to the poor who are likely to channel the increase in disposable income to consumption. Implying that government borrows from the rich but taxes both rich and poor. Therefore, government financing decisions impact inequality position even though it may not impact output as postulated by Ricardo.

Another explanation for the theoretical relationships between domestic debt and inequality is that domestic debt causes income redistribution. According to this theory, internal debt causes income redistribution in the economy since the people who purchase government bonds and treasury bills are the rich while the repayment burden lies on the entire tax base. This implies that during the debt repayment process, although rich people also pay tax, they receive interest rates from their treasury bills and bonds thus gaining more income. Through this process, the rich lenders become

richer while the poor become poorer thereby increasing the inequality gap. See for instance (Alesina and Tabellini (1987); Elmendorf and Mankiw (1998: 8); Mishkin (2014: 438); Salti (2015); Bohoslavsky (2016: 189)). This effect, however, may not be experienced in the short run because most rich people are highly dependent on capital income while the poor rely mostly on income from labor. When a debt crisis occurs due to a high amount of debt in the economy, a decline in output is likely to be experienced implying a reduction in both capital and labor incomes. In the long run, however, the capital income owners receive compensation for their capital making them richer while the poor are not compensated and tend to become poorer.

The direction of the relationship between debt and income inequality can also be from inequality to debt (Kumhof (2015); Bohoslavsky (2016: 183)). With inequality, there is an existing possibility of reduced future consumption and so private investors seeking to maintain their present consumption into the future will purchase government securities when they are issued. The demand for government bonds thus increases. Through elections and exercising of democratic rights, the government is forced to issue more bonds implying higher public debts. Inequality thus triggers both the demand and supply of bonds. The rich vote for the bonds and treasury bills because it is a safe way of keeping money and ensuring continued consumption. The poor keep voting because of reduced international interest rates which are attractive to them.

2.2. Empirical Literature Review

Much of the current literature on inequality pays particular attention to the relationship between inequality and economic growth. Similarly, a considerable number of empirical studies on debt and economic growth have been conducted. However, the studies on the relationship between debt, both public and internal, and income inequality are quite limited. These studies are summarized in Table 6. Sakkas and Varthalitis (2019) and Tung (2020) ascertain that public debt harms inequality for countries in the Euro Area and Asia-pacific region respectively. These studies taken together suggest that governments may use public debt as a means of reducing inequality. However, Akram and Hamid (2016) analyze the impact of internal debt and external debt separately. The study concludes that only internal debt reduces inequality whereas external debt has no impact on inequality. The study finds no statistically significant difference in the impact of external debt on the rich and the poor in South Asian economies.

Country-specific studies include Akram (2013) and Farid et al. (2016) who provide an analysis on how external debt impacts inequality levels in Pakistan. The former study uses the OLS method while the latter uses the ARDL method of analysis. Both studies find that external debt is not pro-poor as they prove the existence of a positive relationship between external debt and income inequality in Pakistan. Sayed (2020) and Topuz (2021) find that there is a positive relationship between domestic debt and income inequality in Lebanon and Turkey respectively. In a study conducted for Turkey, Arslan (2019), proves the applicability of the redistribution effect in Turkey. The results from this study indicate that there is an improvement in income inequality levels in the country when public borrowing reduces.

Some of the panel studies that have considered the inequality and debt relationship for both developing and developed economies belong to Prechel (1985), Arawatari and Ono (2015), Salti (2015), Tibi (2015), Detzer (2016), and Sezgenç (2019). Detzer (2016) uses financialization to explain the differences in debt and inequality for developed and developing economies while Prechel (1985) explains that the insignificant debt and inequality relationship in these economies is due to the differences in export and investment strategies. Sezgenç (2019) on the other hand attributes the differences in debt and inequality relationships to the political social setup of the countries and Tibi (2015) states that the initial level of income and development level of an economy highly influences the debt and inequality relationship. Arawatari and Ono (2015) find that countries with high inequality tend to have higher debt amounts compared to countries with lower inequality. The study emphasizes the role played by loose fiscal policies in causing high debt levels and high inequality. Salti (2015) concludes that internal debt is responsible for the increased inequality in different economies. Governments should adopt alternative sources of financing to help reduce inequality.

The relationship between debt and inequality for OECD countries is analyzed by Jabłoński et al. (2015), Karlin (2018), and Luo (2019). The studies are conducted for different periods. While Jabłoński et al. (2015) claims that rising inequality contributes to an increase in public debt, Karlin (2018) states that there is a negative impact of external and internal debt on inequality for OECD countries. In this study, the impact of external debt is found to be stronger in reducing income inequality compared to internal debt. Unlike the other studies, Luo (2019), introduces labor and

capital inequality. Inequality in labor contributes to higher debts in these economies while inequality in capital leads to a reduction of debt levels in these economies.

Finally, a remarkable study due to the results obtained belong to Aksman (2017). The author analyzes the impact of inequality and poverty on public debt to GDP ratio for European countries. This study finds out that inequality and poverty are not very significant in explaining changes in public debt.

Looking at the studies in the literature, especially on the relationship between internal debt and income inequality, it can be said that they are quite limited. To the best of our knowledge, no study has examined the debt and income relationship for Kenya. The gap in the literature that arises due to an undefined relationship between these variables in Kenya forms the basis for this research.

Table 6: Empirical Literature

Author(s)	Sample (Country) and Period	Methodology	Main Findings
Prechel (1985)	Panel data. 1960-1975	Panel OLS	The impact of debt on inequality is positive for some countries, negative for others, and non-significant for all.
Akram (2013)	Pakistan. 1975-2008	ARDL	External debt has a positive and significant impact on inequality
Arawatari and Ono (2015)	Panel data of developed and developing countries. 1980-2010	Panel regression methods	An increase in inequality leads to an increase in public debt. Low inequality leads to lower debts.
Jabłoński et al., (2015)	34 OECD countries. 1995-2010	Multiple regression	High levels of inequality contribute to rising debt values.
Salti (2015)	Panel data of high- and low-income countries. 1990-2007	Fixed effects model	Domestic debt contributes more to inequality than public debt.
Tibi (2015)	Panel data of 34 countries. 1980-2010	Fixed effects panel regression	Income inequality has a positive impact on debt in developing countries but a negative impact on debt for developed countries.
Akram and Hamid (2016)	Selected South Asian countries. 1975-2010	Fixed Effects model	Public debt has no significant relationship with inequality: Domestic debt has negative relationship with inequality.
Detzer (2016)	Developed and developing countries	Stock flow.	Inequality and debt relationships are different across countries.
Farid et al. (2016)	Pakistan. 1973-2013	OLS Augmented Engle-Granger test	External debt has a positive impact on inequality

Aksman (2017)	A panel study of EU countries. 1995-2015	Dynamic panel data model.	Income inequality is not a significant predictor of the public debt to GDP ratio.
Karlin (2018)	OECD countries. 1980-2015	Fixed Effects model, Random-Effects model	Both external debt and domestic debt harm inequality, but the effect of external debt is stronger.
Arslan (2019)	Turkey. 2005-2015	Income decomposition method.	Decreased borrowing leads to an improvement in income distribution.
Luo (2019)	OECD countries. 1970-2010	Fixed effects model	Labor income inequality has a positive impact on debt while capital income inequality has a negative impact on debt.
Sakkas and Varthalitis (2019)	Euro Area. 2001-2015	Closed economy dynamic general equilibrium model	Debt favors rich households.
Sezgenç (2019)	Panel data. 1990-2016	OLS	Public external debt has a negative impact on income distribution.
Sayed (2020)	Lebanon. 1990-2015	ARDL and ECM	Domestic debt has a positive impact on inequality.
Tung (2020)	A panel study of 17 developing and emerging countries in the Asia Pacific region. 1980-2018	Fixed Effects model, Random-Effects model	Public debt has a negative impact on inequality
Topuz (2021)	Turkey. 1987-2018	VAR	Unidirectional causality from domestic debt to income inequality exists. An increase in public domestic debt increases inequality

3. DATA AND METHODOLOGY

This study uses data for the period 1970-2018 to determine the relationships among the variables. The dependent variable is the Gini coefficient which represents the income inequality. This data is obtained from the Standardized World Income Inequality Database (SWIID) published by Solt (2020). The internal and public debt data are sourced from the Kenya National Bureau of Statistics (KNBS) while the remaining data is from the World Development Indicator (WDI).

Table 7: Descriptive Statistics and Data Source

Variable	Data definition source	Obs	Mean	Std dev	Min	Max
Gini	Gini coefficient for Kenya. SWIID	49	46.18	17.90	21.38	95.82
ID	Internal debt (%GDP) KNBS	49	22.58	6.42	12.49	39.49
PD	Public debt (%GDP) KNBS	49	53.42	20.32	26.81	120.70
MEXP	Military expenditure (% GDP) WDI	49	2.17	1.14	1.05	5.50
SSE	Secondary school enrolment (%gross enrolment). WDI	49	40.98	15.21	16.42	70.3
GPC	Annual growth in GDP per capita (%). WDI	49	1.988	4.304	-3.95	17.88
INV	Investment (%GDP) WDI	49	20.61	3.36	15	29.78
TO	Trade openness (sum of exports and imports % GDP) WDI	49	56.64	8.38	36.15	74.57

Source: Authors, (2021)

Other control variables like military expenditure, human capital, per capita GDP, trade openness, and investment are also included. The choice of the control variables is based on their consistent association with inequality as suggested in the studies by Akram (2013) and Salti (2015). Based on economic theory, a positive relationship between internal debt, public debt, military expenditure, and investment in income inequality is expected. The variables expected to have a negative impact on income inequality include GDP per capita, trade openness, and secondary school enrollment. Table 7 shows the descriptive statistics and source of the variables.

To demonstrate the effect of debt on income inequality in the long run, we used Auto-Regressive Distributed Lag (ARDL) based boundary test developed by Pesaran et al. (2001). To determine whether cointegration exists between the variables, the following equation is specified⁸:

⁸ The debt variable represents both internal debt and public debt variables.

$$\begin{aligned}
\Delta Gini_t = & \beta_0 + \sum_{i=0}^m \beta_{1i} \Delta Gini_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta Debt_{t-i} + \sum_{i=0}^p \beta_{3i} \Delta MEXP_{t-i} + \\
& \sum_{i=0}^q \beta_{4i} \Delta SSE_{t-i} + \sum_{i=0}^r \beta_{5i} \Delta GPC_{t-i} + \sum_{i=0}^s \beta_{6i} \Delta INV_{t-i} + \sum_{i=0}^v \beta_{7i} \Delta TO_{t-i} + \\
& \beta_8 Gini_{t-1} + \beta_9 PD_{t-1} + \beta_{10} ID_{t-1} + \beta_{11} Mexp_{t-1} + \beta_{12} SSE_{t-1} + \beta_{13} GPC_{t-1} + \\
& \beta_{14} Inv_{t-1} + \beta_{15} TO_{t-1} + \mu_t
\end{aligned}
\tag{2.1}$$

Where β_0 is the constant term, Δ is a difference of variables, $\beta_{1i}, \dots, \beta_{7i}$ and $\beta_8, \dots, \beta_{15}$ are the variable coefficients, m, n, p, q, r, s, v , represents the optimal lag length and μ_t is the error term. The optimal lag is chosen based on the Akaike information criterion. To determine the existence of a long-run relationship, we derive the hypothesis below from equation (2.1):

Ho: $\beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = 0$ (no cointegration)

H1: $\beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq \beta_{14} \neq \beta_{15} \neq \beta_{16} \neq 0$ (cointegration)

The test results are obtained by comparing the F statistic with the upper and lower bound critical values as suggested by Pesaran et al. (2001). The rejection of the null hypothesis is done when the calculated F statistic is greater than the upper bound value implying the presence of a cointegrating relationship between the variables.

To represent the short- run equation, the error correction model used is as shown below:

$$\begin{aligned}
\Delta Gini_t = & \beta_0 + \sum_{i=0}^m \beta_{1i} \Delta Gini_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta Debt_{t-i} + \sum_{i=0}^p \beta_{3i} \Delta MEXP_{t-i} + \\
& \sum_{i=0}^q \beta_{4i} \Delta SSE_{t-i} + \sum_{i=0}^r \beta_{5i} \Delta GPC_{t-i} + \sum_{i=0}^s \beta_{6i} \Delta Inv_{t-i} + \sum_{i=0}^v \beta_{7i} \Delta TO_{t-i} + \\
& \beta_8 ECM_{t-i} + \mu_t
\end{aligned}
\tag{2.2}$$

Where β_8 is the error correction coefficient and shows the speed of adjustment to long run equilibrium.

After examining the long-term relationships between the variables using the ARDL method, the Toda Yamamoto causality test is applied. The conventional approach for testing causality relationship was put forward by Granger (1969), however, it is limited as it may lead to spurious results if the variables are non-stationary or cointegrated of the same order (Wolde-Rufael, 2005). The Toda Yamamoto test is preferable as it produces reliable results as long as the order of integration does not exceed the lag length (Toda and Yamamoto, 1995). Toda Yamamoto causality test is implemented in stages with the first step being fitting a

VAR equation with k number of lags based on the different information criteria, AIC, or SC, similarly, the maximum order of integration (d_{max}) is made known in this step. The second step is based on the two values (k and d_{max}) where a new VAR of order ($k + d_{max}$) is fitted. To understand the existence of a causality relationship, a modified Wald (MWALD) test is applied. The resulting parameter has asymptotic χ^2 distribution which is important for inferencing. Equations 2.3, 2.4, 2.5, 2.6, 2.7, and 2.8 are used to test for Toda Yamamoto causality relationship in the internal debt, public debt, and income inequality models.

$$ID_t = \alpha_0 + \sum_{i=1}^k \delta_{1i} ID_{t-i} + \sum_{j=k+1}^{k+d_{max}} \delta_{2j} ID_{t-j} + \sum_{i=1}^k \gamma_{1i} Gini_{t-i} + \sum_{j=k+1}^{k+d_{max}} \gamma_{2j} Gini_{t-j} + \mu_{1t} \quad (2.3)$$

$$Gini_t = \varphi_0 + \sum_{i=1}^k \phi_{1i} Gini_{t-i} + \sum_{j=k+1}^{k+d_{max}} \phi_{2j} Gini_{t-j} + \sum_{i=1}^k \theta_{1i} ID_{t-i} + \sum_{j=k+1}^{k+d_{max}} \theta_{2j} ID_{t-i} + \mu_{2t} \quad (2.4)$$

$$PD_t = a_0 + \sum_{i=1}^k \omega_{1i} PD_{t-i} + \sum_{j=k+1}^{k+d_{max}} \omega_{2j} PD_{t-j} + \sum_{i=1}^k \sigma_{1i} Gini_{t-i} + \sum_{j=k+1}^{k+d_{max}} \sigma_{2j} Gini_{t-j} + \varepsilon_{1t} \quad (2.5)$$

$$Gini_t = c_0 + \sum_{i=1}^k \rho_{1i} Gini_{t-i} + \sum_{j=k+1}^{k+d_{max}} \rho_{2j} Gini_{t-j} + \sum_{i=1}^k \tau_{1i} PD_{t-i} + \sum_{j=k+1}^{k+d_{max}} \tau_{2i} PD_{t-j} + \varepsilon_{2t} \quad (2.6)$$

$$ID_t = r_0 + \sum_{i=1}^k d_{1i} ID_{t-i} + \sum_{j=k+1}^{k+d_{max}} d_{2j} ID_{t-j} + \sum_{i=1}^k b_{1i} PD_{t-i} + \sum_{j=k+1}^{k+d_{max}} b_{2j} PD_{t-j} + \lambda_{1t} \quad (2.7)$$

$$PD_t = w_0 + \sum_{i=1}^k p_{1i} PD_{t-i} + \sum_{j=k+1}^{k+d_{max}} p_{2j} PD_{t-j} + \sum_{i=1}^k n_{1i} ID_{t-i} + \sum_{j=k+1}^{k+d_{max}} n_{2j} ID_{t-j} + \lambda_{2t} \quad (2.8)$$

Granger causality from Gini to internal debt (ID), implies that $\gamma_{1i} \neq 0 \forall i$, granger causality from ID to Gini implies that $\theta_{1i} \neq 0 \forall i$, granger causality from Gini

to Public debt (PD) implies that $\sigma_{1i} \neq 0 \forall i$, while granger causality from public debt to Gini implies that $\tau_{1i} \neq 0 \forall i$, similarly granger causality from public debt to internal debt implies that $b_{1i} \neq 0 \forall i$, and granger causality from internal debt to public debt implies that $n_{1i} \neq 0 \forall i$. The error terms $\mu_{1t}, \mu_{2t}, \varepsilon_{1t}, \varepsilon_{2t}, \lambda_{1t}$, and λ_{2t} are iid $(0, \delta^2)$.

4. EMPIRICAL RESULTS AND DISCUSSIONS

This section presents the results of the ARDL model estimation and Toda Yamamoto causality tests in Kenya for the period 1970-2018. The results of Augmented Dickey-Fuller (ADF), Philips Perron (PP), and Zivot Andrews (ZA), unit root tests are shown in Table 8. After determining that the stationarity level of the variables are I(0) and I(1), the ARDL model can be estimated.

Table 8: Unit Root Tests

Variables	Test statistic	Level		First Difference	
		Constant	Constant and trend	Constant	Constant and trend
Gini	ADF	-2.3129	-2.5706	-6.3098***	-6.4041***
	PP	-2.4285	-2.4200	-10.266***	-10.555***
	ZA	-2.5948	-2.6373	-9.7247***	-9.76***
PD	ADF	-1.8694	-1.7732	-6.8598***	-4.5442***
	PP	-1.8457	-1.7407	-6.8598***	-6.8357***
	ZA	-2.8908	-4.2129	-8.2614***	-8.1749***
ID	ADF	-2.4524	-2.4317	-8.1951***	-8.1158***
	PP	-2.3979	-2.3897	-8.2171***	
	ZA	-5.1864**	-6.9746***	-9.3019***	-8.1158***
MEXP	ADF	-1.3921	-2.5559	-5.2406***	-5.2979***
	PP	-1.6280	-2.5123	-3.6200***	-3.6250***
	ZA	-4.1329	-3.5536	-5.5354***	-8.8388***
SSE	ADF	-0.0549	-1.7534	-7.6540***	-7.6074***
	PP	-0.0549	-1.7600	-7.6511***	-7.6047***
	ZA	-3.0624	-3.1028	-8.2547***	-8.1922***
GPC	ADF	-4.8251***	-4.7758***	-7.3163***	-7.4968***
	PP	-4.6197***	-4.5704***	-12.036***	-13.297***
	ZA	-5.1894**	-5.2054**	-6.1541***	-6.6684***
TO	ADF	-2.2899	-3.2297*	-7.9714***	-7.9425***
	PP	-2.2278	-3.2767*	-8.4435***	-8.7830***
	ZA	-4.1750	-4.2652	-6.5844***	-6.5722***
INV	ADF	-3.7947***	-4.4163***	-10.081***	-9.9712***
	PP	-3.6658***	-4.3827***	-28.227***	-29.410***
	ZA	-6.2331***	-6.4041***	-7.0395***	-6.9665***

Source: Authors, (2021). The values demonstrate t statistic for the test. *, **, *** represents significance at 10%, 5% and 1% level. respectively.

The results of the ADF and PP test above indicate that all the variables are non-stationary at levels except for per capita GDP, trade openness, and investment. The remaining variables are stationary after the first difference. The two tests, ADF and PP, provide similar results. On the other hand, the ZA test indicates that internal debt, GDP per capita, and investment are stationary at levels while Gini, public debt, trade openness, Secondary school enrollment, and military expenditure are stationary after the first difference. Consequently, according to the results of these tests, the variables have different levels of stationarity, I(0) and I(1), the ARDL model suggested by Pesaran et al. (2001) is appropriate for estimating the long run results.

Table 9: Diagnostic Tests

Test	ID model <i>ARDL (1, 1, 1, 0, 1, 0, 0)</i>	PD model <i>ARDL (1,2,2,0, 2,1,0)</i>
Jarque-Bera Test Normality Test	0.3570	0.6311
Breusch- Godfrey Test Autocorrelation	0.1034	0.1107
Breusch-Pagan Heteroscedasticity	0.2689	0.1005
Ramsey Reset Test	0.0826	0.1181

Source: Authors, (2021): The values represent probability values at 5% significance level.

Table 9 presents the diagnostic test results of this model. The results indicate that there are no autocorrelation and heteroscedasticity. The model has normally distributed errors and the functional form is correctly specified.

Table 10: ARDL Bounds Tests

ID model	Test stat	Value	Significance	I(0)	I(1)
	F stat	4.6745	10%	1.99	2.94
	K=2		5%	2.27	3.28
			1%	2.88	3.99
PD model		6.1470	10%	1.99	2.94
			5%	2.27	3.28
			1%	2.88	3.99

Source: Authors, (2021): The optimal lag length, k, was determined based on Akaike Information Criteria. The values represent probability values at 1%, 5%, and 10% significance levels.

Table 10 presents the ARDL bounds test results. The F values are larger than both I(0) and I(1) values indicating the existence of a long-run relationship between the variables for both the PD and ID model. Table 11 presents ARDL model-based long-run coefficient estimations after identifying the existence of cointegrating relationships.

The long-run results indicate that public debt has a positive and significant impact on inequality. This is unlike the results obtained by Akram and Hamid (2016) who do not find any relationship between public debt and income inequality in South Asian countries. Internal debt also has a positive and significant impact on income inequality, and this is consistent with the redistribution theory which states that internal debt contributes to the redistribution of income from the poor to the rich. Similar results are obtained by Salti (2015), Sayed (2020), and Topuz (2021). The impact of internal debt on income inequality is found to be greater than that of public debt. Similarly, Salti (2015) finds that internal debt has a higher positive impact on inequality than public debt for the panel data study.

Table 11: The Estimates of Long-run Coefficients

Variable	Coefficient (ID model)	Coefficient (PD model)
PD	-	0.6904*** (0.0871)
ID	1.9599*** (0.4119)	-
GPC	-2.1775** (0.9428)	-1.6449** (0.7039)
SSE	-0.8540*** (0.2232)	-0.5742*** (0.1431)
INV	3.0761** (1.4190)	4.600*** (0.9329)
TO	-1.2004*** (0.3960)	-1.1013*** (0.2701)
MEXP	1.2240 (2.9126)	1.4414 (2.1046)
Constant	44.7260 (33.3471)	2.2070 (24.9331)

Source: Authors (2021) : *, **, *** represents significance at 10%, 5% and 1% level, respectively. The values in brackets represent the standard error values.

GDP per capita is found to have a negative and significant effect on inequality in both the public debt model and the internal debt model. This is because higher GDP per capita implies increased access to opportunities and higher incomes by individuals in the economy which leads to an increase in equality level. Akram (2013) also finds a negative impact of GDP per capita on income inequality. The impact of human capital as shown by secondary school enrollment on inequality is also found to be negative implying that the skills acquired in school are useful for better-paying jobs and that school is a great equalizer. Similar results are obtained by Abdullah et al. (2015) who find that education is particularly significant in reducing inequality levels in Africa.

The impact of investment on inequality for both the models is found to be positive and significant, this can be explained using the Kaldorian view where the impact of investment on inequality does not arise directly but rather indirectly. This indirect impact arises from the fact that it is mostly the rich who save. An increase in savings thus implies growth of the economy but at the expense of increased inequality. Similar results are obtained by Banerjee (2004). Trade openness also has a negative and significant impact on inequality. The negative impact implies that international trade contributes to a reduction of the existing level of inequality in the country. When a country's level of trade openness increases, it implies that the country is trading more, and the effect of increased trade can indicate an increase in real wages of the workers thus leading to reduced inequality. This is consistent with Heckscher-Ohlin's theory that inequality decreases with trade openness in developing countries. Similar results are obtained by Ravinthirakumaran and Ravinthirakumaran (2015) for the Asia-Pacific countries.

Military expenditure has a positive and non-significant impact on inequality. This can be because of the existing pay differentials between the military and the civilians, military are paid a much higher salary as compared to civilians (Ali (2007); Töngür (2012)). Similarly, fewer women are present in the military compared to men and therefore it can be said that this widens gender inequality which is one of the existing inequality forms in Kenya.

Table 12 shows the short-run coefficient estimates. The error correction terms, which are also the speed of adjustment term for both the internal debt and public debt model, are negative and significant as expected. It implies that the errors are corrected at an adjustment speed of 48% and 75% respectively.

Table 12: The Estimates of the Short-run Coefficients

Variable	Coefficient (ID model)	Coefficient (PD model)
ΔID	-0.7342** (0.3384)	-
ΔPD	-	-0.0846 (0.1629)
$\Delta PD(-1)$	-	-0.4636*** (0.1474)
ΔGPC	0.2134 (0.3022)	0.4529 (0.3464)
$\Delta GPC(-1)$	-	0.7082* (0.3873)
ΔSSE	0.4134*** (0.1347)	-0.4359*** (0.1283)
ΔINV	0.9100* (0.4727)	0.9793** (0.5218)
$\Delta INV(-1)$	-	-1.3977** (0.4884)
ΔTO	-0.5812*** (0.1897)	-0.2548 (0.2372)
$\Delta MEXP$	0.5926 (1.4348)	1.0944 (1.6199)
$\Delta Coint EQ$	-0.4841*** (0.1066)	-0.7592*** (0.1316)

Source: Authors, (2021): *, **, *** represents significance at 10%, 5% and 1% level. respectively. The values in the brackets represent the standard error of the coefficients.

Figure 4: CUSUM and CUSUMSQ results (Internal debt)

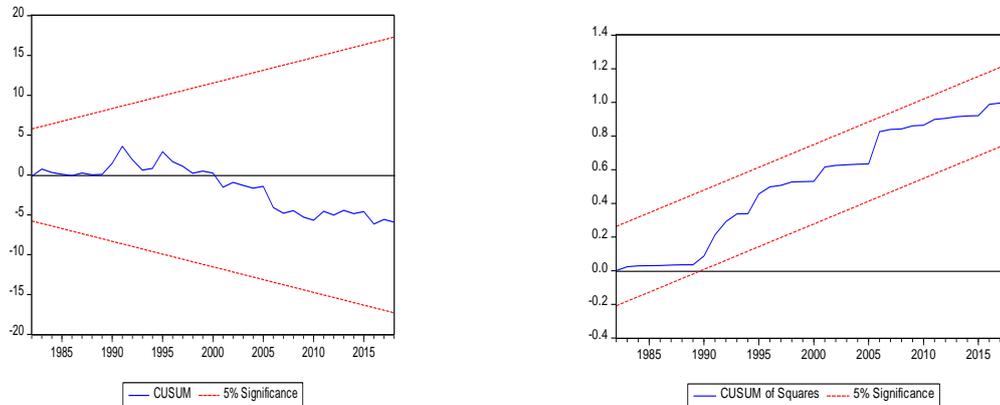
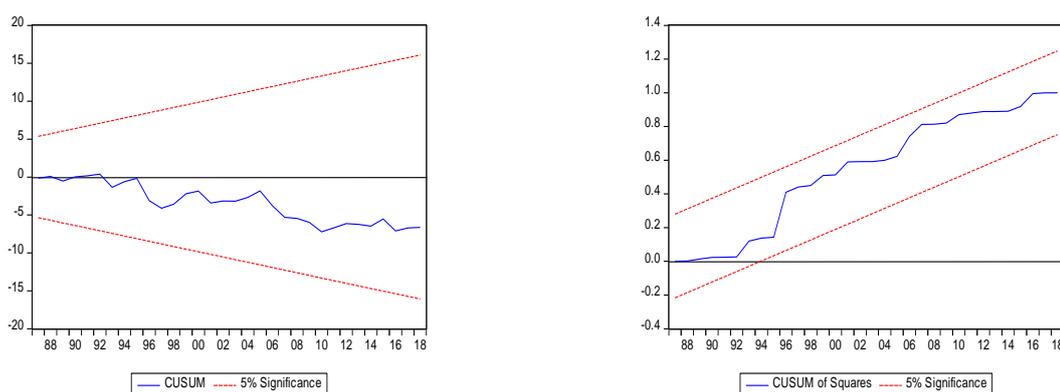


Figure 5: CUSUM and CUSUMSQ results (Public debt)



The results obtained from CUSUM and CUSUMSQ tests proposed by Brown et al. (1975) indicate that the estimated parameters are stable over the period 1970-2018.

The Toda Yamamoto causality test is preferable over other causality tests because it can be used when the variables are cointegrated of random order, same order, or not cointegrated at all. (Ekeke, 2020). This is because the Toda Yamamoto causality test ignores the cointegration property of the variables and fits a vector autoregressive model for the variables at their levels (Wolde-Rufael, 2006).

The unit root tests in Table 8 reveal that the maximum order of integration for Gini, internal debt, and inequality is $I(1)$. Table 13 represents the results of the Toda Yamamoto causality test.⁹

Table 13: Toda Yamamoto Causality Test

Variable	Lag(k)	Lag (k+max)	Prob	χ^2 statistic	Causality Test Results
Dependent Variable: Gini	2	3	0.0566	5.7429	ID \rightarrow Gini
Dependent variable: ID	2	3	0.3354	2.1850	PD $\not\rightarrow$ Gini Gini $\not\rightarrow$ ID
Dependent Variable: PD	2	3	0.0000	25.3646	PD \rightarrow ID
	2	3	0.0517	5.9261	Gini \rightarrow PD
	2	3	0.0003	16.3527	ID \rightarrow PD

Source: Authors, (2021). The probability values are based on 5% level of significance.

The findings indicate that a unidirectional causality relationship exists from internal debt to income inequality but there is no evidence of an existing causality

⁹ We obtain the appropriate lag length. The result of the test indicates that the optimal lag length is 2. Furthermore, the inverse roots of the characteristic equation associated with the ARDL to ascertain the dynamic stability of the ARDL are applied. The characteristic roots all fall inside the unit root circle indicating stationarity of the process at the second lag.

relationship from income inequality to internal debt in Kenya. Unlike Aksman (2017), we can say that we have found a relationship from internal debt to income inequality. This is consistent with expectations from macroeconomic theory. It implies that changes in inequality can be explained using internal debt values and for inequality to reduce, other sources of funds other than internal debt have to be explored. These results further indicate that the redistributive effect of internal debt is applicable in Kenya for this period. These results are similar to those of Topuz (2021) for Turkey.

A bidirectional causal relationship is found to exist between internal debt and public debt. Public debt does not granger cause income inequality, but income inequality granger causes public debt in Kenya. Internal debt is found to be more likely to have a higher redistributive impact on income inequality compared to public debt. This could be because a higher percentage of internal debt holders are likely to be the citizens of the country, therefore, their income levels are affected directly by the changes in internal debt amounts (Panizza, 2008).

5. CONCLUSION AND POLICY RECOMMENDATIONS

One of the main goals in macroeconomic policies of developing and underdeveloped countries is to ensure equity in income distribution. These countries also aim at a more productive use of their existing debt. However, there are limited studies that examine the relationship between debt and income inequality more so for these countries. This study investigates the impact of public and internal debt on inequality in Kenya using data for the period 1970-2018. Firstly, the ARDL model is used to explore the long-run relationship between the variables and then the Toda Yamamoto causality test to determine the existence of a causal relationship.

Kenya has resorted to public debt as a source of financing leading to rising debt in the recent decades. Although public debt as a source of finance is inclusive of both internal and external debt, the redistribution effect identifies internal debt as having a stronger redistributive impact on income inequality compared to public debt taken as a whole. The findings of this empirical analysis suggest that the effect of both public and internal debt is positive and significant in the long run. Based on these results, it can be said that debt widens the income gap between the rich and the poor in Kenya. The causality relationship also showed the existence of a unidirectional relationship from internal debt to income inequality. This is in line with the theoretical

expectations. The presence of a causality relationship implies that changes in inequality can be explained by internal debt while changes in internal debt cannot be explained by inequality at least for the period under consideration. A bidirectional causal relationship is found to exist between internal debt and public debt. Public debt does not cause income inequality, but income inequality causes public debt in Kenya. Also, the findings imply that debt financing is worse for low-income earners compared to high-income earners, thus debt financing should not be overly relied upon.

In place of short-term debts with high interest rates, long-term term debts with low- interest rates could be preferred as a measure to reduce inequality albeit in the long run. In addition to debt financing, other sources of financing like progressive taxes and increased exports can be promoted. This positive relationship between internal debt and income inequality can be explained by the existing theoretical argument whereby internal debts increase when wealthy people are able to purchase government securities, however, during repayment everyone is taxed including the poor who typically do not buy government securities. The owners of government bonds receive interests that can cushion them from the impacts of taxation. Therefore, the income gap gradually increases. The results obtained in this empirical analysis could explain the increasing debt and income inequality in Kenya in recent years.

3. CHAPTER

PUBLIC DEBT, INCOME INEQUALITY AND ECONOMIC GROWTH IN SSA COUNTRIES

INTRODUCTION

When the economic history of Africa is examined, serious fluctuations are revealed with promising periods of economic growth and other periods characterized by stagnation and slow growth (Zamfir, 2016). The periods of recession have often been attributed to the effects of colonization and adverse weather conditions in the continent (Collier et al., 1999). In response to the impact of the 1970 oil crisis, tough economic periods in the 1990s, and the financial crisis of 2008, the continent has been led to accumulate high debt amounts (Zamfir, 2016). Further, poor political leadership and depreciation in currency value characterizing many African countries have also contributed to this phenomenon (Coulibaly et al., 2019). Income and wealth distribution inequality and also non-income forms like gender and opportunity is also prevalent in this region of the world (Harsch, 2018).¹⁰

Developing countries usually need debt to fund development projects due to the huge savings gap created by widespread poverty. In many SSA¹¹ countries, debt has been increasing with the values from 35% debt to GDP ratio in 2010 to 46% debt to GDP financing in 2017 (Adeniran et al., 2018). Some countries like South Sudan have been included in the debt distressed countries (IMF, 2019a: 8). Eurobond debts have also been rapidly increasing in African countries in the recent past (The Africa Report, 2021). A high debt level is usually viewed as occurring due to nonproductive use of funds by the country, but this is not always the case as sometimes it is an obligation for a country to receive debt. For instance, when responding to pandemics and during wars. Investing debt in productive projects allows the indebted country to grow and repay the debt. However, the indebted country will not be able to repay the

¹⁰ Odusola et al. (2017) states that more than half of the 19 most unequal countries in the world are in Sub Sahara Africa (hereafter SSA).

¹¹ SSA countries refers to countries in Sub Sahara Africa.

debt¹² if debt funds consumption, current expenditures, and other nonproductive activities like wars (Aybarç, 2019).

Debt is likened to a ‘two-edged sword’ that can be used to finance projects with potential economic future returns or hurt the economy severely if it is not used properly (Cecchetti et al., 2011). Different authors have put forward a different view about the effect of debt on the economic variables. Some of them state that it is a public curse while others believe that it is a national blessing (Bloemberg, 2019). The governments in developing and developed countries usually have to borrow funds both internally and externally. The debt supplements their incomes from taxes and domestic investments which may not be enough to fund their existing budget deficits (Mukui, 2012).

Debt is usually considered as preferable source of funding to taxes because very high taxes can discourage people from working hard¹³ thereby reducing output greatly (Gale et al., 2016: 2). In the short run, people can prefer debt to taxes but in the long-run debt funding is also non-desirable due to factors like crowding out of investments¹⁴ and private business, debt repayment obligations, and accrued interest rate on debt which ultimately leads to increased taxes. Eventually, the government may still refer to a higher tax rate to settle the increasing debt servicing requirements. Therefore, underdeveloped and developing economies should invest their public debts productively. The repayment period of the debts should be taken into consideration because debts with shorter repayment periods tend to have higher interest rates (Alfaro et al., 2007).

After the global financial crisis, it was necessary to redefine the debt and growth relationship. This is due to the different responses shown by the countries having different debt levels. Some highly indebted countries continued to grow regardless of the crisis while some countries with moderate debt levels were hit hard

¹² Investing debt in nonproductive activities like war can lead to debt distress whereby there is accumulation of unpaid debts, and the country is unable to fulfill all its obligations including interest rate repayment.

¹³ When the tax rate is very high, people are not motivated to work hard, they prefer resting to working and end up increasing their free time. This leads to a reduction in economic output.

¹⁴ Crowding out of domestic investments occur when the real interest charges on debt are high and so the foreign income is spent in servicing of debt and outstanding interest amounts, this not only worsens trade but also leaves no money for domestic investments.

(IMF, 2019). This thus creates the question of whether there exists some level of debt for each country beyond which debt starts to hamper growth, but below which debt encourages growth. The impact of debt on growth is also largely dependent on the specified use of the debt whereby countries that use debt for consumption do not benefit as much as countries that use it for development projects.

While Africa is one of the fastest- growing continents in the world (Atchia et al. 2013), it is still one of the continents having countries with very high inequality levels (Oduola et al., 2017). A study by Okojie and Shimeles (2006) identifies SSA as one of the regions of the world facing very high inequality levels.¹⁵ This implies that the growth path adopted by the African countries are not pro-poor. Other reasons that have been put forward for the existence of inequality include bad politics, high population growth rate, and adoption of underdeveloped technologies (Oduola et al., 2017). Differently, Van De Walle (2009) identifies colonial influence as the reason for high inequality levels in Africa. Previous studies by Kumhof and Rancière (2011) and Bohoslavsky (2016) have shown that inequality levels are higher for countries with high debt levels.

Understanding the relationship between debt, inequality and economic growth is important because many countries in Africa are characterized by high debt and inequality levels with fluctuating growth patterns (United Nations, 2004: 9), (UNDP, 2016). The main aim of this study is to test the relationship of debt, inequality, and economic growth in selected SSA countries between 1980-2018 and determine appropriate policy recommendations. To the best of our knowledge, this study is one of the first investigations to focus specifically on the causal relationship of public debt, income inequality level and economic growth in the selected SSA countries¹⁶. One of the contributions of this study is that it uses the SUR model, unlike previous studies, to determine the causal relationship between debt, growth, and inequality in the SSA. Secondly, different measurements of inequality as Theil index and Palma ratio are used in the analysis for the comparison Gini which is commonly used for many empirical studies. Given that most developing SSA countries are characterized by high levels of

¹⁵ According to Seery et al. (2019) Africa is the second most unequal continent in the world with the five richest men in Africa owning more wealth than the bottom 50% combined.

¹⁶ The list of SSA countries considered in this study include Botswana, Ghana, Kenya, Lesotho, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zambia. They were chosen based on the availability of data.

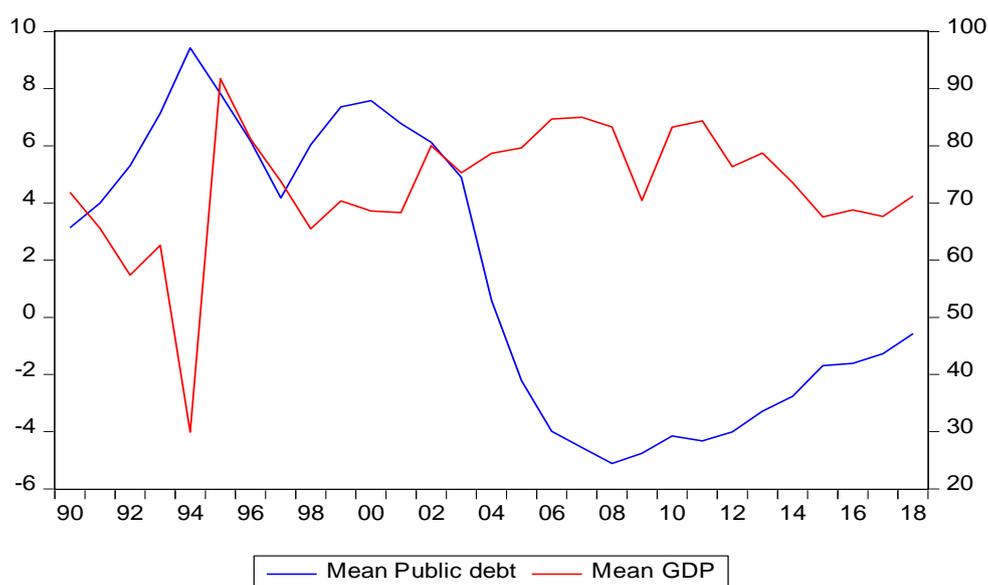
debt and inequality, these results will be useful in coming up with measures to better plan the use of available debts and reduce inequality levels.

The rest of the study is organized as follows; a brief history of debt and growth relationship and a history of inequality and growth relationship in the SSA countries will follow the introduction. The second section is the literature review where the existing relevant empirical and theoretical literature is provided. The third section is the data and methodology section. Results and discussion is the fourth section, while the fifth section is the conclusion and the policy recommendation section.

1.1. History of Debt and Growth in the Selected SSA Countries

In this section, the evolution of public debt and economic growth relationship for the selected SSA countries over the period 1990-2018 is presented. Examining the historical processes of the series allows for the presentation of possible causes and explanations for debt accumulation and regression periods.

Figure 6: Public Debt and growth in SSA for 1990-2018



Source: Authors construct based on data from IMF and World Bank¹⁷

Figure 6 represents the average debt values as a percentage of GDP and average economic growth values for the selected SSA countries for the period 1990-2018. In these regions, it is observed that the public debt is characterized by sudden increases

¹⁷ Public debt data is from IMF while GDP data is from The World Bank

and decreases. The average debt to GDP ratio was 66% in 1990, this was followed by an upward trend in the debt amounts reaching an all-time high of 97% in 1994.

The increasing debt value can be associated with different factors that were being experienced in the specific countries of the region. For example, there was a change of government in South Africa (Rustomjee, 2006). These high debt amounts are among some of the poor economic choices the new regime was set to turn around. Rwanda was undergoing a tough period of internal war among the tribes where approximately one million people could have died (World Bank, 2019). These alongside other factors like poor institutions and problems in governance could have also contributed to this increase (Mustapha, 2014). The debt to GDP ratio is seen to decrease to 71% in 1997 and then increasing again to 88% in 2000. Ajayi & Khan (2000), associate the increasing debt to the overreliance of SSA countries on external funding for development. However, during this period, 30 African countries including SSA countries received debt relief leading to the sudden decline of debt to 24% in 2008 (Sandefur and Wadhwa, 2018). Some of the SSA countries that benefited from the Multilateral Debt Relief Initiative (MRDI) are Ghana, Zambia, Rwanda, Tanzania, and Uganda (IMF, 2021). However, debt value has accumulated after this initiative and debt value has reached 47% debt to GDP ratio in 2018.

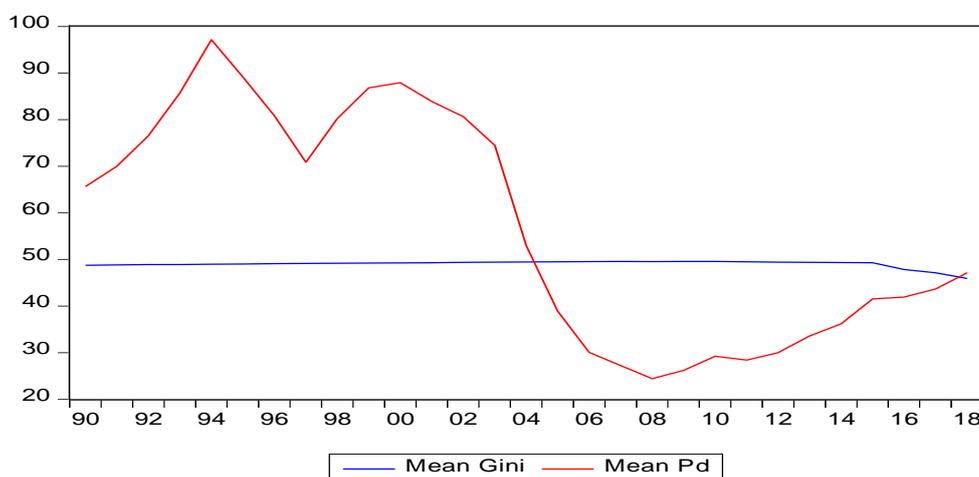
According to Koh et al. (2020), the periods of high debt to GDP ratio in African countries is associated with financial and non-financial crises because the debt exposes these countries to external influence thus making them vulnerable.

It can be observed that the economic growth rate has also not been consistent over the all period but can be characterized by sudden fluctuations reaching an all-time low at -4% in 1994 and the highest value being recorded at 6% in 1995. The period of lowest economic growth is parallel with the period of the highest debt to GDP ratio in the region as observed in Figure 6. This can be an indicator of the negative impact of public debt on the economic growth rate of these countries. Economic growth in this region, however, is affected by factors other than debt. The impact of the 2008 financial crisis caused a sudden deep decline in the economic growth rate of the region. Allen and Giovannetti (2011) attribute this decline in growth to the dependence of these countries on other more developed countries. Figure 1 reveals a declining trend in the economic growth values from 5.7% in 2013 to 4.2% in 2018.

1.2. History of Inequality and Public Debt in The Selected SSA Countries

In this section, the evolution of public debt and inequality relationship for the selected SSA countries over the period 1990-2018 is presented.

Figure 7: Inequality and Public debt in SSA for 1990-2018



Source: Authors construct based on data from SWIID and IMF¹⁸

Figure 7 represents the average inequality represented by Gini and public debt values for the selected SSA countries for the period 1990-2018. The highest inequality value is given at 53.3 in 1991 while the lowest inequality value is given at 45.9 in 2018. When labor intensive development path is adopted, inequality levels are more likely to reduce as compared to adopting capital intensive development (Odusola et al., 2017). Financial crises in these regions could be a major factor contributing to the widening inequality gap. Other identified drivers of inequality include inadequate investments especially in health education, gender differences and poor wage structure (Odusola, 2018). There is no direct relationship the inequality and debt as seen in the figure. Whereas public debt values are fluctuating over the period, the changes of the Gini coefficient are relatively low across the countries.

2. LITERATURE REVIEW

This section presents the theoretical and empirical studies which have been conducted on this relationship. Firstly, the theoretical arguments are presented, followed by empirical literature which is organized as follows: studies on inequality

¹⁸ Gini data is obtained from SWIID database while Public debt data is obtained from IMF database.

and growth then public debt and growth in African countries followed by the studies in which all the variables are analyzed are presented.

2.1. Theoretical Literature Review

The debt and growth relationship has gained sparked interest in economic discussions. The classical economists, Adam Smith, David Ricardo, and John Stuart Mill, all argue against the accumulation of public debt as one way of encouraging growth (Tsoulfidis, 2007). High public debt is likely to give rise to increased interest rates, a situation described by Adam Smith as ‘Right hand paying back the left’ (Smith, 1776). Similarly, David Ricardo argues that an increase in debt amount is likely to lead to increased taxation by the government. When people are taxed highly then there is a possible reduction in savings and investment amounts (Churchman, 2001). John Stuart Mill also shares his views against public debt on account that debt is ‘evil’ because it leads to crowding out of the private sector and eventually may retard a nation (Churchman, 2001). All these have a deteriorating impact on the growth level of an economy.

The Keynesian school of thought however, has a different view from the classical economists as they argue that productive debt is beneficial. The debts acquired should be invested in projects that are repayable within the life cycle of the project. Nonproductive debts are not preferred as they are likely to lead to rising interest rates and decreasing growth levels (Brown-Collier and Collier, 1995 and Aspromourgos, 2018)

The debt overhang hypothesis by Myers (1977) was initially formulated to explain the financing options of a firm but has since been extended to explain how economies are financed through debts. A country is said to have experienced debt overhang when the outstanding debt amount is very high, and the economy is deteriorating as a result.

The income inequality and growth relationship has received much attention in economic literature. Simon Kuznets claims that income inequality and growth relationship have an inverted U shape (Kuznets, 1955). Kuznets suggests that income inequality increases at the initial development stages but gradually decreases after a threshold. The incomes of individuals in the agricultural sector are lower than those of the industrial sector but are more evenly distributed. Transition to the industrial sector

increases not only the incomes but also raises the inequality levels. On the other hand, Barro postulates that inequality discourages growth in developing countries but encourages growth in the developed countries (Barro, 1999).

Debt redistribution theory on the other hand, states that an increase in debt will contribute to the widening of the inequality gap. According to this theory, debt causes income redistribution in the economy since the people who purchase government bonds and treasury bills are the rich while the repayment burden lies on the entire tax base. During repayment, the rich earn interest from the bonds while the poor do not earn thus making them worse off after tax.

2.2. Empirical Literature Review

Whereas Odedokun and Round (2001), Nel (2003), Akadiri and Akadiri (2018), and Nel (2018) prove a negative impact of inequality on growth in SSA, they explain with different channels for this influence. Odedokun and Round (2001) attributes the negative impact of inequality to reduced education exposure, high fertility rate, and political instability, Nel (2003) ascribes the negative impact to reduced investments owing to negative perception by investors. Akadiri and Akadiri (2018) accredits the detrimental effect of inequality on growth to population increase and reduced foreign direct investment. Nel (2018) attributes the harmful effect of inequality to limited access to credit markets by the low-income earners and the inability to create and sustain institutions that encourage growth. These studies bring out the need to close the inequality gap in the SSA region and thereby adopt suitable growth policies. Babu et al. (2016) also find that inequality has a detrimental effect on growth in a study of selected emerging economies. Although Babu et al. (2016) do not state the channel through which inequality harms growth, the paper introduces the concept of gross inequality and gross inequality and their separate effects on growth.

In a study investigating the existence of a causal relationship between economic growth and income inequality for SSA countries, Adeleke and Sule (2020) find that a unidirectional causality relationship exists from economic growth to inequality in middle-income countries. The countries are classified as low- income, lower- income, and middle-income. There is no observed causality relationship in the low and lower- income countries.

Studies on public debt and economic growth in African countries belong to Hussain et al. (2015) and Lartey et al. (2018). They state that debt adversely impacts growth in this region. The Dynamic Arellano-Bond panel data estimation for the period 1995-2012 and the Generalized Method of Moments estimation for the period 1980-2015 are used in the studies respectively. Whereas Hussain et al. (2015) attribute this negative impact to the crowding out effect of the private sector, Lartey et al. (2018) state that high interest rates on debts during repayments take a negative toll on growth rate.

A similar study focusing on the countries in the East African region by Kwoba & Kosimbei (2015) reveals that external debt has deleterious impact on growth. Data for the period 1990-2013 is analyzed using the random-effects model. The study recommends that one of the ways of encouraging growth in this region is by adopting appropriate policies to control the level of public debt.

The examining of between debt and growth nonlinear relationship became popular especially after the 2008 recession. Threshold level analysis of debt implies that the effect of debt on growth changes depending on debt level. This level has been examined for African countries by Veiga et al. (2016), Mensah et al. (2019), and Ndoricimpa (2020). Veiga et al. (2016) subdivide the African countries into three regions as SSA, Southern African Development Community (SADC), and Northern Africa. The debt threshold for both SADC and Northern Africa is found to exist at 30% while the threshold debt level for SSA exists at between 60-90%. On the other hand, Mensah et al. (2019) and Ndoricimpa (2020) find a threshold debt level for the African countries to exist at 50-80% and 62-66% respectively. In all these studies, the effect of debt on growth is positive below the threshold level and negative above the threshold level. Therefore, African countries should try to reduce the level of debt when it exceeds the threshold level to ensure sustained growth.

The relationship between debt and growth can be examined by also using causality analysis. Some of the studies on causality relationships include Amoateng and Amoako-Adu (1996) and Afxentiou (1993). Whereas Amoateng and Amoako-Adu (1996) finds that a bidirectional positive causality relationship exists between debt servicing and economic growth in African countries, Afxentiou (1993) states that there is no causality relationship between foreign debt and GNP growth for middle-income

developing countries. The author claims that the causality relationships vary from one country to another.

There are limited studies that examine the relationship between public debt, economic growth, and income inequality. Lucchino and Morelli (2012) analyze the role of consumption in the inequality, debt and growth relationship. This study is conducted in the UK states for 1971-2009 by dividing incomes into deciles and analyzing each group. The results reveal that inequality leads to increased debt which later reduces growth through a reduction in the consumption levels. Marchionne and Parekh (2015) conduct a panel analysis on 27 countries using data for the period 1994-2010. In this study, the authors use random effects and fixed effects regression model. The results show that the threshold level of public debt is highly dependent on the level of income inequality. Countries with a high Gini coefficient tend to have a low debt to GDP threshold level, any increase in public debt in these countries impacts negatively on the economic growth rate. Sanyal and Ehlen (2017) use data for the period 1987-2011 to examine the relationship between public debt, income inequality and economic growth for the various states in the US. This paper is different because it uses a Bayesian non-parametric regression model. The results of this study indicate that both income inequality and debt have a negative impact on GDP growth.

In light of the previous studies, it can be seen that studies analyzing the relationship between inequality, economic growth, and public debt for SSA countries are quite limited, which is the main motivation of our study.

3. DATA AND METHODOLOGY

This study aims to examine the causal relationship between public debt, income inequality and economic growth. The analysis is based on yearly data from 11 SSA countries (Botswana, Ghana, Kenya, Lesotho, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zambia) for the period 1980-2018¹⁹. Country selection depends on data availability. Inequality variable (*Ineq*) symbolizes Gini coefficient, Palma ratio and Theil index. Theil index and Palma ratio²⁰ data are obtained from the GCIP database while Gini coefficient and public debt data are obtained from the IMF

¹⁹ For Gini, the data period is limited to 1990-2018 based on availability in all the countries.

²⁰ Palma ratio is calculated by taking the top 10% of population's share of Gross National Income and dividing it with the bottom 40% of the population's income.

database. Public debt (*Pd*) data is measured as a percentage of GDP, GDP per capita growth rate (*Gdpc*) data is the annual percentage growth values.

3.1. Cross-Sectional Dependence Tests

In the first step, the presence of cross-sectional dependence is tested. This is important because the countries are interdependent implying a possible spillover effect of shocks across the countries (Hsiao et al. (2007) and De Hoyos and Sarafidis (2006)). Four different tests exist including Breusch and Pagan (1980) LM test, Pesaran (2004) scaled LM test, Pesaran (2004) CD test, and Pesaran et al. (2008) bias-adjusted LM test. In a long panel data with $T > N$, the Lagrange multiplier (LM) test which was developed by Breusch and Pagan (1980) is more powerful. The LM statistic can be constructed from the standard panel equation given in Equation (3.1):

$$y_{it} = \delta_i + \beta' x_{it} + u_{it}, \quad i = 1, \dots, N \text{ and } t = 1, \dots, T \quad (3.1)$$

Where y_{it} is the dependent variable, i represents the cross-sectional units, t is the time series dimension, x_{it} is a $K \times 1$ vector of regressors, β is a $K \times 1$ vector of parameters, δ_i are country-specific intercepts that do not depend on time, and lastly $u_{it} \sim iid$. The hypothesis of cross-sectional dependence is:

$$H_0: \rho_{ij} = \rho_{ji} = \text{cor}(u_{it}, u_{jt}) = 0, \text{ for } i \neq j$$

$$H_1: \rho_{ij} = \rho_{ji} \neq 0 \text{ for some } i \neq j \text{ where } \rho_{ij} \text{ is the correlation coefficient of the errors}$$

$$\text{and is defined by } \rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^T u_{it} u_{jt}}{(\sum_{t=1}^T u_{it}^2)^{1/2} (\sum_{t=1}^T u_{jt}^2)^{1/2}}$$

For fixed N and $T \rightarrow \infty$, the LM statistic proposed by Breusch & Pagan (1980) is given by:

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \sim \chi_{\frac{N(N-1)}{2}}^2 \quad (3.2)$$

where $\hat{\rho}_{ij}$ is the sample estimate of pairwise correlation of the residuals.

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^T \hat{u}_{it} \hat{u}_{jt}}{\left(\sum_{t=1}^T \hat{u}_{it}^2 \right)^{\frac{1}{2}} \left(\sum_{t=1}^T \hat{u}_{jt}^2 \right)^{\frac{1}{2}}} \quad \text{where } \hat{u}_{it} \text{ is the estimate of } u_{it} \text{ in equation (3.1)} \quad (3.3)$$

However, this test is likely to lead to unreliable results when T is finite and N is large therefore, Pesaran (2004) presents a scaled version of the LM statistic presented in equation (3.4)

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right) \quad (3.4)$$

The $CD \sim N(0,1)$ when $N \rightarrow \infty$ and T is sufficiently large. The mean of CD statistic is zero for fixed values of T and N . One major weakness of CD is that the probability of obtaining an incorrect value of the CD statistic increases when the mean of the pairwise correlations of the population is zero. Under such circumstances, the use of standard normal distribution may lead to distortion in size. Pesaran et al. (2008) develop a new version of the LM test which is called LM_{adj} . The bias-adjusted LM test statistic is given as:

$$LM_{adj} = \sqrt{\left(\frac{2}{N(N-1)} \right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \frac{(T-K) \hat{\rho}_{ij}^2 - \mu_{Tij}}{\sigma_{Tij}}, \sim N(0,1) \quad (3.5)$$

Where K refers to the number of regressors μ_{Tij} and σ_{Tij}^2 show the exact mean and variance of $(T-K) \hat{\rho}_{ij}^2$ respectively.

3.2. Slope Homogeneity Tests

Slope heterogeneity tests are important to determine the differences in slopes, β_i , across the countries. Ignoring the slope heterogeneity may increase the probability of obtaining biased results. The tests used in determining slope heterogeneity are delta tests ($\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$) as suggested by Pesaran and Yamagata (2008). The delta tests equations are presented in equations (3.6) and (3.7)

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - 1}{\sqrt{2}} \right) \quad (3.6)$$

\tilde{S} represents Swamy's test statistic while N represents the cross-sectional dimension of the data.

One way of improving the properties of the delta statistic in equation (3.6) is through the biased adjusted version as shown in equation (3.7)

$$\tilde{\Delta}_{adj} = \sqrt{\frac{N(T+1)}{T-k-1}} \left(\frac{N^{-1} \tilde{S} - k}{\sqrt{2k}} \right) \quad (3.7)$$

Where k represents the number of exogenous regressors.

3.3. The Bootstrap Panel Causality Test

Since both cross-sectional dependence and heterogeneity exist, it is possible to use the panel bootstrapping causality method developed by (Kónya, 2006). This causality method uses seemingly unrelated regression (SUR) models, individual bootstrap critical value of the Wald statistic for each country is reported. Additionally, it does not require any pretesting for the existence of unit roots. Equations (3.8), (3.9), (3.10), (3.11), (3.12), and (3.13) are then estimated based on the SUR system:

$$Pd_{1,t} = \alpha_{1,1} + \sum_{l=1}^{mly_1} \gamma_{1,1,l} Pd_{1,t-l} + \sum_{l=1}^{mlx_1} \phi_{1,1,l} Ineq_{1,t-l} + \varepsilon_{1,1,t}$$

$$Pd_{2,t} = \alpha_{1,2} + \sum_{l=1}^{mly1} \gamma_{1,2,l} Pd_{2,t-l} + \sum_{l=1}^{mlx1} \phi_{1,2,l} Ineq_{2,t-l} + \varepsilon_{1,2,t}$$

□

$$Pd_{N,t} = \alpha_{1,N} + \sum_{l=1}^{mly1} \gamma_{1,N,l} Pd_{N,t-l} + \sum_{l=1}^{mlx1} \phi_{1,N,l} Ineq_{N,t-l} + \varepsilon_{1,N,t}$$

(3.8)

$$Ineq_{1,t} = \alpha_{2,1} + \sum_{l=1}^{mly2} \gamma_{2,1,l} Pd_{1,t-l} + \sum_{l=1}^{mlx2} \phi_{2,1,l} Ineq_{1,t-l} + \varepsilon_{2,1,t}$$

$$Ineq_{2,t} = \alpha_{2,2} + \sum_{l=1}^{mly2} \gamma_{2,2,l} Pd_{2,t-l} + \sum_{l=1}^{mlx2} \phi_{2,2,l} Ineq_{2,t-l} + \varepsilon_{2,2,t}$$

□

$$Ineq_{N,t} = \alpha_{2,N} + \sum_{l=1}^{mly2} \gamma_{2,N,l} Pd_{N,t-l} + \sum_{l=1}^{mlx2} \phi_{2,N,l} Ineq_{N,t-l} + \varepsilon_{2,N,t} \quad (3.9)$$

$$Pd_{1,t} = \omega_{1,1} + \sum_{l=1}^{mly1} \vartheta_{1,1,l} Pd_{1,t-l} + \sum_{l=1}^{mlx1} \rho_{1,1,l} Gdpc_{1,t-l} + \mu_{1,1,t}$$

$$Pd_{2,t} = \omega_{1,2} + \sum_{l=1}^{mly1} \vartheta_{1,2,l} Pd_{2,t-l} + \sum_{l=1}^{mlx1} \rho_{1,2,l} Gdpc_{2,t-l} + \mu_{1,2,t}$$

□

$$Pd_{N,t} = \omega_{1,N} + \sum_{l=1}^{mly1} \vartheta_{1,N,l} Pd_{N,t-l} + \sum_{l=1}^{mlx1} \rho_{1,N,l} Gdpc_{N,t-l} + \mu_{1,N,t} \quad (3.10)$$

$$Gdpc_{1,t} = \omega_{2,1} + \sum_{l=1}^{mly2} \vartheta_{2,1,l} Pd_{1,t-l} + \sum_{l=1}^{mlx2} \rho_{2,1,l} Gdpc_{1,t-l} + \mu_{2,1,t}$$

$$Gdpc_{2,t} = \omega_{2,2} + \sum_{l=1}^{mly2} \vartheta_{2,2,l} Pd_{2,t-l} + \sum_{l=1}^{mlx2} \rho_{2,2,l} Gdpc_{2,t-l} + \mu_{2,2,t}$$

□

$$Gdpc_{N,t} = \omega_{2,N} + \sum_{l=1}^{mly2} \vartheta_{2,N,l} Pd_{N,t-l} + \sum_{l=1}^{mlx2} \rho_{2,N,l} Gdpc_{N,t-l} + \mu_{2,N,t} \quad (3.11)$$

$$Gdpc_{1,t} = \eta_{1,1} + \sum_{l=1}^{mly1} v_{1,1,l} Gdpc_{1,t-l} + \sum_{l=1}^{mlx1} \lambda_{1,1,l} Ineq_{1,t-l} + v_{1,1,t}$$

$$Gdpc_{2,t} = \eta_{1,2} + \sum_{l=1}^{mly1} v_{1,2,l} Gdpc_{2,t-l} + \sum_{l=1}^{mlx1} \lambda_{1,2,l} Ineq_{2,t-l} + v_{1,2,t}$$

□

$$Gdpc_{N,t} = \eta_{1,N} + \sum_{l=1}^{mly1} v_{1,N,l} Gdpc_{N,t-l} + \sum_{l=1}^{mlx1} \lambda_{1,N,l} Ineq_{N,t-l} + v_{1,N,t} \quad (3.12)$$

$$Ineq_{1,t} = \eta_{2,1} + \sum_{l=1}^{mly2} v_{2,1,l} Gdpc_{1,t-l} + \sum_{l=1}^{mlx2} \lambda_{2,1,l} Ineq_{1,t-l} + v_{2,1,t}$$

$$Ineq_{2,t} = \eta_{2,2} + \sum_{l=1}^{mly2} v_{2,2,l} Gdpc_{2,t-l} + \sum_{l=1}^{mlx2} \lambda_{2,2,l} Ineq_{2,t-l} + v_{2,2,t}$$

□

$$Ineq_{N,t} = \eta_{2,N} + \sum_{l=1}^{mly2} \beta_{2,N,l} Gdpc_{N,t-l} + \sum_{l=1}^{mlx2} \lambda_{2,N,l} Ineq_{N,t-l} + v_{2,N,t}$$

(3.13)

N is the total number of countries ($i = 1, 2, \dots, 11$). t is the time ($t = 1980, \dots, 2018$) while l is the lag length. The SUR method, which uses the FGLS (Feasible Generalized Least Squares) estimators in the presence of horizontal cross-section dependence, is more effective than Least Square Estimators (LSE). The prediction method provides the Wald test for country-specific bootstrap critical values. This approach does not require the testing of a common hypothesis, unit root test, and cointegration relationships for the entire panel.

4. RESULTS AND DISCUSSIONS

Before examining the causality test findings, it is necessary to evaluate the results of the cross-sectional dependency tests for the panel.

Table 14: Cross Sectional Dependence

Test	Theil/ Pd	Theil/ Gdpc	Palma/ Pd	Palma/ Gdpc	Gini/ Pd	Gini/ Gdpc	Pd/ Gdpc
<i>CD_{lm}</i> (Breusch and Pagan, 1980)	1565.267 (0.000)	1814.414 (0.000)	1135.749 (0.000)	1496.791 (0.000)	1409.763 (0.000)	1482.103 (0.000)	1105.109 (0.000)
<i>CD_{lm}</i> (Pesaran, 2004)	143.998 (0.000)	168.135 (0.000)	103.045 (0.000)	137.469 (0.000)	129.172 (0.000)	136.069 (0.000)	100.124 (0.000)
<i>CD</i> (Pesaran, 2004)	39.447 (0.000)	42.619 (0.000)	33.031 (0.000)	38.342 (0.000)	37.293 (0.000)	38.376 (0.000)	32.778 (0.000)
<i>LM_{adj}</i> (Pesaran & Yamagata, 2008)	4.572 (0.000)	4.270 (0.000)	8.687 (0.000)	5.095 (0.000)	4.025 (0.000)	2.465 (0.007)	3.920 (0.000)

The values in parenthesis represents the probability values.

Table 14 shows the results of the cross-section dependency tests used in the models used for causality testing. The null hypothesis that there is no cross-section dependency in all of the models used is strongly rejected.

Secondly, $\tilde{\Delta}_{test}$ and $\tilde{\Delta}_{adj}$ test statistics developed by Pesaran and Yamagata (2008) are used to determine homogeneity. The results of the Homogeneity test are presented in Table 15.

Table 15: Homogeneity Test

Test	Theil	Palma	Pd	Gdpc	Gini
$\tilde{\Delta}_{test}$	8.094*** (0.000)	6.902*** (0.000)	7.377*** (0.000)	3.019*** (0.001)	5.726*** (0.000)
$\tilde{\Delta}_{adj}$	8.571*** (0.000)	7.302*** (0.000)	7.811*** (0.000)	3.196*** (0.001)	6.151*** (0.000)

*, **, *** denotes significance at 10%, 5%, and 1% respectively.

The results show that the null hypothesis of slope homogeneity for both $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ tests are similarly rejected for all the variables at 1% significance level. Therefore, based on the results of cross-sectional dependence and homogeneity tests, SUR causality test is conducted.

Table 16: Gini and Public debt Bootstrap Panel Causality

Country	Pd does not cause Gini					Gini does not cause Pd				
	Wald stat	p-value	Critical values			Wald stat	p-value	Critical values		
			1%	5%	10%			1%	5%	10%
Botswana	11.331	0.074	26.41	13.802	9.575	1.488	0.301	19.454	7.154	4.216
Ghana	26.433	0.028	38.364	20.196	14.151	0.000	0.988	7.088	3.962	2.705
Kenya	0.001	0.983	25.407	9.566	5.943	0.096	0.781	16.143	6.764	4.283
Lesotho	4.517	0.133	12.24	7.354	5.286	3.851	0.145	11.482	6.525	4.8
Malawi	28.818	0.003	19.956	11.991	8.754	11.7	0.092	23.229	14.733	11.295
Nigeria	3.576	0.018	4.245	2.577	1.845	0.142	0.659	8.425	3.832	2.394
Rwanda	45.864	0.001	30.595	22.634	18.943	15.092	0.001	8.827	5.85	4.48
SA	75.813	0.022	84.219	66.062	57.319	0.14	0.743	8.181	4.63	3.223
Tanzania	19.272	0.030	24.555	16.821	13.597	1.832	0.974	44.568	31.061	25.481
Uganda	25.404	0.000	13.075	7.349	5.356	1.609	0.39	19.898	7.481	5.001
Zambia	11.337	0.743	74.971	54.367	46.137	0.645	0.773	27.609	12.833	8.601

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 16 shows the results of the causality relationship between Gini and Public debt. A bidirectional causality relationship between Gini and public debt exists for Malawi, and Rwanda. One way causality relationship from public debt to Gini exists in six countries, Botswana, Ghana, Nigeria, South Africa, Tanzania and Uganda. In the remaining three countries, Kenya, Lesotho, and Zambia, the existence of a causality relationship cannot be ascertained. According to these results, it can be said

that the causality relationship from debt to Gini, which is used as an income inequality indicator, is more distinct and that these results are accordant with theoretical expectations.

Table 17 shows the results of the causality relationship between the Palma ratio and public debt. A bidirectional causality relationship exists between the Palma ratio and public debt for Malawi and Rwanda. These results are similar to the results obtained when Gini is the inequality indicator. A unidirectional causality relationship exists from debt to inequality in three countries, Botswana, Ghana, and Tanzania. On the other hand, unidirectional causality relationship from inequality to public debt is observed in two countries, Kenya and South Africa. In the remaining countries, there is no evidence of the existence of any causality relationship. When these results are compared with the results in Table 16, it can be said that the causality from inequality to debt is more distinct for Palma Ratio.

Table 17: Palma Ratio and Public Debt Bootstrap Panel Causality

country	Pd does not cause Palma					Palma does not cause Pd				
	Wald Stat	p-value	Critical Values			Wald Stat	p-value	Critical Values		
			1%	5%	10%			1%	5%	10%
Botswana	20.47	0.013	22.665	12.19	9.541	2.153	0.633	16.378	10.276	8.182
Ghana	9.958	0.054	16.03	10.30	7.931	0.793	0.704	15.174	9.602	7.202
Kenya	1.181	0.262	6.353	3.88	2.739	11.358	0.004	8.768	5.08	3.779
Lesotho	0.126	0.781	7.963	4.528	3.237	3.001	0.261	12.538	7.614	5.627
Malawi	38.981	0.011	39.746	27.46	22.606	9.719	0.024	11.861	7.581	5.773
Nigeria	3.87	0.202	8.378	5.985	4.984	0.808	0.252	4.415	2.513	1.77
Rwanda	67.07	0.00	29.22	21.982	18.921	4.975	0.003	3.805	2.277	1.543
SA	1.308	0.748	13.478	9.061	7.298	3.556	0.027	5.064	2.714	1.838
Tanzania	7.809	0.066	12.858	8.581	6.817	3.276	0.237	9.195	6.243	4.961
Uganda	0.739	0.178	3.062	1.666	1.127	1.517	0.536	9.912	6.747	5.267
Zambia	0.075	0.649	2.822	1.568	1.052	2.419	0.598	11.044	7.974	6.62

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 18 presents the results of the causality relationship between Theil index and public debt. Differently, a bidirectional causality relationship exists between inequality and growth for three countries, Kenya, Malawi, and Rwanda. One way causality relationship exists from public debt to inequality in Botswana and Ghana. This implies that redistributive impact of debt is applicable in these countries. Unidirectional causality relationship is found to exist from inequality to public debt in

South Africa. The results of the causality test relationship from Theil index to debt are the same as for Palma ratio. The remaining countries, however, do not exhibit any existing causality relationship.

Table 18: Theil and Public Debt Bootstrap Panel Causality

Country	Pd does not cause Theil					Theil does not cause Pd				
	Wald Stat	p-value	Critical Values			Wald Stat	p-value	Critical Values		
			1%	5%	10%			1%	5%	10%
Botswana	14.29	0.012	15.037	8.352	6.343	1.892	0.386	10.642	6.566	4.961
Ghana	13.808	0.015	15.236	9.044	6.625	1.387	0.606	17.518	10.439	7.723
Kenya	5.728	0.02	6.563	4.081	2.99	11.394	0.009	11.155	7.176	5.691
Lesotho	1.459	0.355	11.712	6.277	4.463	3.963	0.102	9.755	5.693	4.013
Malawi	37.126	0.005	32.901	21.849	17.195	10.606	0.023	13.075	8.434	6.63
Nigeria	2.3	0.436	7.981	5.622	4.558	0.261	0.495	4.504	2.53	1.71
Rwanda	23.998	0.001	14.864	11.237	9.533	3.439	0.011	3.536	1.92	1.364
SA	2.113	0.518	13.312	8.564	6.662	4.744	0.003	3.543	1.963	1.41
Tanzania	3.235	0.392	11.515	7.905	6.414	1.522	0.125	4.245	2.491	1.772
Uganda	0.558	0.284	3.368	1.921	1.319	1.042	0.746	11.959	8.036	6.438
Zambia	1.2	0.249	5.488	3.087	2.266	3.286	0.442	11.376	8.204	6.732

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 19: Theil and Economic Growth Bootstrap Panel causality

Country	Gdpc does not cause Theil					Theil does not cause Gdpc				
	Wald stat	p-value	Critical values			Wald stat	p-value	Critical values		
			1%	5%	10%			1%	5%	10%
Botswana	0.275	0.632	12.549	7.633	5.403	28.431	0.001	16.588	9.39	6.744
Ghana	2.232	0.349	17.367	9.589	6.587	1.019	0.647	16.586	10.076	7.672
Kenya	1.765	0.152	5.99	3.361	2.351	0.034	0.873	9.832	5.411	3.749
Lesotho	0.161	0.725	8.56	4.949	3.456	16.654	0.004	12.983	6.927	4.795
Malawi	1.705	0.279	13.556	6.992	4.53	2.48	0.321	16.891	9.486	6.677
Nigeria	7.388	0.027	9.705	5.968	4.37	3.271	0.161	12.309	6.684	4.664
Rwanda	0.208	0.704	9.053	5.594	4.041	2.463	0.351	14.858	8.894	6.65
SA	0.461	0.515	8.469	4.644	3.112	0.009	0.933	9.074	5.048	3.523
Tanzania	0.059	0.853	7.335	4.565	3.309	5.28	0.445	22.042	14.961	11.948
Uganda	0.362	0.795	14.144	8.443	6.288	0.021	0.931	17.106	9.94	7.184
Zambia	1.371	0.337	12.154	6.407	4.399	6.307	0.115	17.365	9.676	6.907

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 19 presents the results of causality relationship between Theil index and GDP per capita. There is no causality relationship between economic growth and

income inequality except for Botswana, Lesotho, and Nigeria. Unidirectional causality relationship was observed from income inequality to economic growth in Botswana and Lesotho and from economic growth to income inequality in Nigeria. These findings imply that there is no significant relationship between income inequality and economic growth in almost all SSA countries.

Table 20: Palma Ratio and Economic Growth Bootstrap Panel Causality

Country	Gdpc does not cause Palma					Palma does not cause Gdpc				
	Wald stat	p- value	Critical Values			Wald stat	p-value	Critical Values		
			1%	5%	10%			1%	5%	10%
Botswana	0.371	0.542	11.329	6.357	4.188	20.236	0.006	16.789	9.399	6.677
Ghana	2.801	0.381	18.683	10.758	7.804	0.259	0.778	13.952	8.228	6.057
Kenya	2.718	0.124	6.908	4.258	3.089	0.048	0.849	10.263	5.678	3.973
Lesotho	0.002	0.98	9.179	5.459	3.949	3.182	0.173	13.056	6.812	4.61
Malawi	3.964	0.215	17.461	9.936	6.997	2.308	0.326	15.754	9.071	6.282
Nigeria	6.416	0.043	9.673	5.958	4.383	3.66	0.164	13.368	7.286	5.132
Rwanda	0.168	0.729	12.559	6.8	4.562	2.303	0.375	14.591	8.989	6.611
SA	0.13	0.786	10.412	5.841	4.05	0.315	0.617	10.124	5.077	3.596
Tanzania	0.16	0.667	5.569	3.365	2.373	2.007	0.514	14.27	9.187	7.154
Uganda	0.223	0.904	15.749	10.085	7.631	0.029	0.933	18.597	10.939	8.181
Zambia	0.504	0.487	11.755	6.235	3.761	4.931	0.153	17.029	9.666	6.567

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 20 presents the results of causality relationship between Palma ratio and economic growth. The results are similar to the findings of the relationship between Theil and economic growth. There is a unidirectional causality relationship only for Botswana and Nigeria, but it is seen that these relationships are inverse.

Similarly, Table 21 shows the causality test results between Gini and GDP per capita in SSA countries. According to the test results, there is no causality relationship between Gini and economic growth except for South Africa. In South Africa, one way causality is found to exist from economic growth to Gini. Considering all the test results examined between income inequality and economic growth, it can be said that there is no significant causal relationship between the related variables, contrary to theoretical expectations like Kuznets (1955).

Table 22 shows the causality relationship between public debt and GDP per capita. The results indicate that in 7 out of the 11 countries, no causality relationship exists between economic growth and public debt. However, in Botswana, South

Africa, and Uganda, a unidirectional causality relationship exists from public debt to economic growth. For these three countries, it can be said that public debt level is significant factor for economic growth rate, but this cannot be observed for most countries.

Table 21: Gini and Economic Growth Bootstrap Panel Causality

country	Gdpc does not cause Gini					Gini does not cause Gdpc				
	Wald test	p-value	Critical values			Wald stat	p-value	Critical values		
			1%	5%	10%			1%	5%	10%
Botswana	8.083	0.148	40.163	19.29	11.353	0.445	0.607	22.331	9.577	5.974
Ghana	22.58	0.106	50.652	32.016	23.337	1.563	0.289	9.705	5.408	3.773
Kenya	6.047	0.181	26.712	13.685	9.31	0.187	0.737	12.995	6.912	4.704
Lesotho	23.416	0.102	47.693	30.578	23.595	0.58	0.575	14.928	8.111	5.418
Malawi	6.037	0.173	25.36	12.97	9.034	0.185	0.756	16.812	8.776	5.909
Nigeria	1.045	0.366	8.791	5.043	3.509	0.048	0.845	11.085	5.785	3.816
Rwanda	0.443	0.673	95.937	15.634	9.202	0.02	0.941	17.643	10.561	7.736
SA	43.584	0.06	73.219	46.286	35.181	0.02	0.917	13.918	7.45	5.102
Tanzania	0.013	0.997	37.161	24.178	19.371	13.368	0.144	29.539	19.713	15.608
Uganda	5.065	0.448	31.143	18.501	14.119	0.777	0.511	15.247	7.987	5.435
Zambia	23.79	0.067	50.499	27.459	19.091	0.655	0.596	17.762	9.079	6.17

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 22: Public Debt and Economic Growth Bootstrap Panel Causality

Country	Pd does not cause Gdpc					Gdpc does not cause Pd				
	Wald stat	p-value	Critical values			Wald stat	p-value	Critical values		
			1%	5%	10%			1%	5%	10%
Botswana	13.156	0.02	16.051	9.344	6.485	0.031	0.868	8.549	4.605	3.152
Ghana	0.091	0.799	11.361	5.858	3.957	2.024	0.466	14.418	8.837	6.66
Kenya	0.313	0.735	16.363	9.349	6.61	7.031	0.248	21.152	14.087	10.876
Lesotho	0.177	0.74	12.629	6.833	4.751	0.102	0.767	9.061	4.872	3.385
Malawi	0.127	0.782	12.655	6.957	4.871	2.624	0.415	21.528	12.93	9.091
Nigeria	1.769	0.347	14.799	8.009	5.554	0.026	0.968	12.495	8.446	6.749
Rwanda	2.112	0.274	12.498	7.103	4.865	31.261	0.006	25.918	11.305	7.504
SA	12.982	0.003	9.222	5.029	3.412	1.775	0.454	13.577	8.276	6.067
Tanzania	1.108	0.779	19.571	12.122	9.236	0.26	0.689	9.813	5.727	4.022
Uganda	3.934	0.077	8.848	4.944	3.393	0.262	0.788	12.364	7.728	5.818
Zambia	0.084	0.904	21.67	12.694	9.319	10.657	0.145	23.852	15.585	12.439

Note: Critical values were based on 10,000 bootstrap replications. The values were calculated based on constant and trend values. The choice of lag length was based on Akaike information criteria, and the maximum lag length is 4.

Table 23: Summary of Causal Relationships Between Variables

Country	Debt Gini	Debt Palma	Debt Theil	Gdpc Gini	Gdpc Palma	Gdpc Theil	Debt Gdpc
Botswana	→	→	→		←	←	→
Ghana	→	→	→				
Kenya		←	↔				
Lesotho						←	
Malawi	↔	↔	↔				
Nigeria	→				→	→	
Rwanda	↔	↔	↔				←
SA	→	←	←	→			→
Tanzania	→	→					
Uganda	→						→
Zambia							

Note: '→' and '←' denotes unidirectional causality while '↔' denotes bidirectional causality relationships.

The causality results are summarized in Table 23. When the table is examined, it can be said that the intensity of the existence of causality is between debt and income inequality in SSA countries. Out of the 11 countries under study, a unidirectional relationship from public debt to inequality is observed in Botswana, Ghana, Tanzania, South Africa, Uganda, and Nigeria. This may be possible due to the debt redistribution theory which states that debt contributes to the widening of the inequality gap through income redistribution from the poor to the rich. (Bohoslavsky (2016); Mishkin (2014); Salti (2015)). Bidirectional relationship is observed in Malawi and Rwanda for the three indicators of income inequality. Kenya and South Africa provide mixed results while no relationship is observed in Lesotho and Zambia. Economic growth and income inequality relationship are observed in 4 countries. The causal relationship between economic growth and income inequality is determined in relatively few countries. In Botswana and Lesotho, although income inequality level is the determining factor on the economic growth rate, this relation is quite weak since it does not exist for all indicators of income inequality. According to Rubin and Segal, (2014), income inequality can be a positive determinant of economic growth because high-income earners are dependent on wealth income, and this has a greater impact on growth compared to labor income. Among the low-income earners, labor income is more dominant and is likely to slow down growth. For Nigeria and South Africa, economic growth can lead to income inequality. There is no evidence of any causality between income inequality and economic growth in Ghana, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Zambia. Economic growth and public debt relationship are observed in Botswana, Rwanda, South Africa and Uganda indicating that in these countries, debt is not a symptom of economic slowdown as proposed by Bulow and Rogoff (1990). There is no relationship among the variables in any direction in the remaining 7

countries. The study further reveals that no causality relationship in public debt, income inequality and economic growth is observed in Zambia.

5. CONCLUSION AND POLICY RECOMMENDATIONS

In this paper, the causality relationship of public debt, income inequality and economic growth between 1980 and 2018 for selected SSA countries is analyzed. The panel data approach proposed by Kónya (2006) which is based on the SUR model and presents separate country-specific results is applied. Different measures of income inequality are used in this analysis including the Gini coefficient, Palma ratio, and Theil index. The economic growth rate is represented using the GDP per capita growth rate for each country while public debt data used is the total public debt(%GDP). Due to limitations in data availability, separate components of public debt including external and internal debt values cannot be examined separately. Firstly, the causality relationship between inequality and public debt is conducted, followed by income inequality and economic growth and finally public debt and economic growth.

Causality results of the inequality and debt relationship indicate that debt to inequality relationship is more pronounced than the converse relationship in most countries. Inequality and growth and growth and debt relationships on the other hand, indicate no meaningful relationships in most of the countries. Moreover, these results are similar for all the indicators of inequality. Comparatively, debt contributes more to income inequality than growth in SSA countries.

In accordance with the results obtained, the governments of SSA countries should put the procured debts into self-financing projects like the building of airports and seaports. Such investments will ensure that debts are able to be repaid without the need for increasing tax rates thus reducing the possibility of income redistribution from the poor to the rich. In addition, restructuring of the borrowing system so that the state-owned enterprises borrow based on their own balance sheet will localize debts to the specific enterprises and greatly limit the debt burden on the public. Of equal importance also, is the need for a special body of experts charged with approving debts before they are acquired. A transparent process open to public scrutiny is important in controlling the amount and type of debt obtained. Similarly, other tax measures targeting the rich including savings tax and taxing of the luxury goods consumed mainly by the rich will help in closing the inequality gap.

Although the results revealed the presence of a unidirectional causality relationship from growth to inequality in Nigeria, and South Africa, this does not imply that growth is not desirable in these economies rather, it brings to light the need to strike an optimal balance between labor induced growth and wealth induced growth. The labor commission in these countries should set the minimum wage rate commensurate to the current economic situation of the country so that the labor of the poor people is sufficient to cushion them from the adverse effects of wealth induced growth. These countries should also target low-income earners when coming up with growth policies. Such policies include better prices for the farmers, improved infrastructure and affordable quality education. There is a need for expert public project appraisal committee that is charged with identifying and appraising projects that are profitable for the poor and the country as a whole. Improved social security policies including prompt payment of retirees, support for the unemployed in terms of provision of cheap loans, and affordable insurance are also key in reducing inequality levels.

Despite the significant contribution of this paper to the body of literature, It is limited in application as it only concentrated on causality analysis. It is therefore recommended that more detailed analysis using different approaches and data for different time periods be conducted in future studies.

GENERAL EVALUATION

Both public and internal debt and income inequality are important factors influencing the level of economic growth. Kenya and many countries in SSA have high inequality and debt values, and these have an effect on the growth rate of these regions. In this study, the relationship between public and internal debt, income inequality, and economic growth is analyzed empirically for Kenya and selected SSA countries. The study has three main results. Firstly, the relationship between public debt and internal debt and economic growth is U shaped in Kenya, with the debt to GDP threshold level at 33.29% and 17.3115% respectively. Secondly, public and internal debt have a positive impact on inequality in Kenya. Moreover, the impact of internal debt on income inequality is greater than that of public debt. Thirdly, public debt contributes more to income inequality in SSA countries than economic growth implying that debt redistribution theory is applicable in more SSA countries than Kuznets hypothesis.

The first chapter is aimed at finding the existence of the relationship between public and internal debt and economic growth in Kenya. In the study, analysis is conducted as on whether linear or nonlinear models best define the effect of public and internal debt on economic growth. The results of this chapter are explained as follows: (i) The debt and growth relationship in Kenya is nonlinear thereby best represented using nonlinear models. (ii) Economic growth rate is a function of debt in Kenya and the impact of debt on growth turns positive once the threshold debt limit is exceeded. The results obtained from the first chapter of this study are important for Kenya and developing countries as a whole. One aspect that comes out from these results is the need for productive use of the debts for growth. However, care should be taken to prevent the overreliance on debt as the main source of income as this may contribute to unwanted negative economic results like reduced investments, increased taxes and crowding out of the private sector.

The second chapter is aimed at examining the applicability of the debt redistribution theory in Kenya. In the study, the effects of internal debt and public debt on inequality is analyzed using ARDL method and causality analysis conducted using Toda Yamamoto causality test. The results indicate the existence of a positive relationship between internal debt and public debt on income inequality in Kenya. One way causality from internal debt to income inequality is also found proving the

applicability of debt redistributive theory in Kenya. Similarly, unidirectional causality relationship is also found to exist from income inequality to public debt.

The results obtained from this study indicate that government should invest on human capital, and this can reduce inequality in Kenya. More progressive taxes as an alternative source of funding should be adopted. This can help reduce overdependence on debt as a source of income which in turn closes the income gap. The government should invest more in policies aimed at income redistribution like free primary and secondary education, slum upgrading project and the economic stimulus project. The government should prefer long term debts with lower interest rates in place of the short-term debts with higher interest rates. Minimum wage rate should be improved to match the cost of living, this will ensure that even the low-income earners can afford the necessities.

The third chapter is aimed at examining the existence of a causality relationship for public debt, economic growth and income inequality in 11 selected SSA countries. Three different indicators as Gini coefficient, Palma ratio and Theil index are used for income inequality. The causality test results between all variables are presented on a country basis. The results obtained from this study indicate that all income inequality indicators provide similar results in most of the countries. In particular, the relationship between debt and inequality should be carefully examined by governments in SSA countries. Although income inequality does not have a significant effect on debt in most countries, it is more evident that public debt causes inequality. On the other hand, according to the test results, it can be said that there is no significant causal relationship between the income inequality and economic growth. In addition, unidirectional relationship from debt to growth is found to exist for only three countries. The findings from the third chapter indicate that for SSA countries, the effect of debt on income inequality is important than the effect of economic growth on income inequality as explained in the Kuznets hypothesis. In order to control the high inequality levels in these economies, more focus should be focus on debt policies. There is need for the SSA countries to invest debt in productive and self-financing projects. This can reduce the need to raise tax rates during debt repayment period. In addition, direct measures like increasing minimum wage rate, promoting cheaper and quality education, investing in slum upgrading programs are also useful in curbing the high inequality for these countries.

In conclusion, the relationship between debt, income inequality and economic growth was examined theoretically and empirically in Kenya and Sub-Saharan African countries. In the literature, studies to determine the relationships between these variables for this country and group of countries are quite limited. However, these countries have relatively high debt levels and income inequality, and therefore determining the relationships between variables is very important. Governments, on the other hand, must carefully choose the policies they will implement in this direction.

Finally, it cannot be said that the empirical findings across all chapters are of course perfect. Therefore, the empirical findings of these three chapters may change based on the application of different econometric models and use of data for different periods.

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