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NON-LINEAR EFFECTS OF GOVERNMENT SIZE AND INSTITUTIONAL QUALITY ON MACROECONOMIC PERFORMANCE IN SUB-SAHARAN AFRICAN COUNTRIES.

BY

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Doctoral thesis submitted in fulfilment of the requirement for the award of a Doctor of Philosophy.

The Graduate School of Business Administration, Wits Business School, University of Witwatersrand, Johannesburg.

Supervisor: Prof. Eric Schaling

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ABSTRACT

The size of government and the quality of institutions are crucial factors in a country's macroeconomic performance. The extant literature has provided evidence that a larger government and high-quality institutions can reduce output volatility and stabilize inflation, thereby contributing to sustainable economic growth in countries. The stable economy can then be leveraged to enhance social security for the benefit of the unemployed, children, the disabled, and the elderly, particularly in a developing sub-region like Sub-Saharan Africa (SSA). However, the impact of government size and institutions on the economies of SSA countries has been under-researched. Furthermore, the exact threshold levels of government size and institutional quality above which output volatility and inflation can be reduced or amplified, respectively, remain unknown for the SSA countries, despite their high volatility of output and inflation compared to other developing countries. Also, little is known about whether the magnitude of the impact on inflation of a decrease and an increase in government size is the same or not in the long run for the SSA countries. This thesis, therefore, attempts to fill the knowledge gaps about the experiences of the SSA countries.

The first essay aimed at examining the threshold effects of government size on output volatility in Sub-Saharan African countries (SSA) and subsequently estimating the factors that determine output volatility. The study covered 22 SSA countries spanning over 1997-2021 period. Hansen's (1999) threshold methodology was used to estimate threshold levels of government size on output volatility. The findings show that there is a threshold value of government size on output volatility in SSA countries. The study further reveals that government size below the estimated threshold has a more positive impact on output volatility than above the threshold level. The implication is that smaller government size amplifies output volatility and government size above the estimated threshold has a weakening positive impact on output volatility. This may partially support the Keynesian paradigm. The study further revealed that only financial development and inflation variables have a negative and statistically significant relationship with output volatility. Foreign direct investment, trade openness, and institutional quality index variables are weakly and positively related but have a statistically insignificant relationship with output volatility. These findings have policy implications, suggesting that policymakers should consider the estimated threshold level to mitigate output volatility. Furthermore, the development of the financial sector

and economic diversification are crucial in mitigating the volatility of output that may result from economic globalization in SSA countries.

In the second essay, we examined the effects of asymmetry and causality between government size and inflation. The conventional panel ARDL, the panel non-linear ARDL, and the Toda and Yamamoto methods were used in the estimation. The findings of both panel ARDL and panel non-linear ARDL suggest that government size and inflation have a significant long-run relationship. Thus, government size exerts a significant influence on inflation in SSA. The study further revealed that government size has an asymmetric relationship with inflation, showing that a decrease in government size has a more significant impact on inflation than its increase. The results of the causality test show a significant bi-directional causal relationship between the two variables. Among the control variables, exchange rate, food production, and interest rate seem to be inversely related to inflation in the long run. However, money supply, GDP, and institutional quality appear to have a statistically insignificant influence on inflation in the long run.

Lastly, we investigated the threshold effects of institutional quality and causality on inflation. The FD GMM, dynamic panel threshold of Seo and Shin (2016), and Toda and Yamamoto (1995) methods were used in the estimation. The findings suggest that institutional quality exerts a significant impact on inflation in SSA. The results further show that institutional quality has a threshold effect on inflation. Institutional quality impacts inflation significantly, both below and above the estimated threshold. However, the magnitude of impact on inflation is economically larger above the estimated threshold than below it. The study further revealed that past period inflation, government size, GDP, exchange rate, money supply, and interest rate are inversely related to inflation and statistically significant, except for GDP, which appears to be statistically insignificant. On the other hand, the food production index has a positive effect on inflation and is statistically significant.

These findings have policy implications in that the fiscal authority should embark on institutional quality reforms, and the monetary authority should focus on the conventional monetary policy instruments within the framework of the policy mix to control inflation. Policymakers should consider increasing social security spending to provide relief to the unemployed, elderly, and disabled in response to external risks

exacerbated by globalisation. SSA governments should also prioritise investing in the development of the financial sector to foster sustainable economic growth, as financial development appears to have a more substantial impact on output volatility. Economic diversification is another key strategy to mitigate both domestic and global risks. A practical approach would involve attracting private sector investment by strengthening governance and focusing on the development of financial intermediaries, which have proven effective in allocating resources between lenders and borrowers

Further, membership by the SSA countries to regional bodies such as WAEMU, CAEMC, SADC, and AMU is also encouraged since these regional bodies expect their members to maintain certain higher levels of governance for improving the performance of their economies.

DECLARATION

I, **Khethang Mokoena**, Student number 0515877W, declare that this thesis is my work, unaided, except for sections where I have used others' work, which I have also acknowledged through the references. This thesis is submitted for the fulfilment of the requirements of the Doctor of Philosophy. I have not previously submitted it, in whole or in part, to obtain any qualification.

Khethang Mokoena

Khethang Mokoena

DEDICATION

I dedicate this work:

In memory of my late parents and my uncle, Tebatso Mokoena

And

To my lovely wife, Elizabeth

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LIST OF ACRONYMS

AMU	African Monetary Union
CAEMC	Central African Economic and Monetary Community
CFA	African Financial Community
ECOWAS	Economic Community of West African States
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	General Method of Moments
IMF	International Monetary Fund
IQI	Institutional Quality Index
NARDL	Non-linear Autoregressive Distributive Lag
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least Square
PMG	Pool Mean Group
SAP	Structural Adjustment Programmes
SSA	Sub-Saharan Africa
SURE	Seemingly Unrelated Regression Equation
VIF	Variance Inflation Factor
VAR	Vector Autoregressive
WAEMU	West African Economic and Monetary Union
2SLS	Two-Stage Least Squares

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CHAPTER ONE

1. INTRODUCTION

1.0. Background to study

The effect of government size (share of government expenditure to gross domestic product) on the stability of economies of countries has been the subject of extensive theoretical and empirical research. The interest of academics and policymakers in this line of research on macroeconomic outcomes was sparked by the global financial crisis of 2007-2009, which was accompanied by the world economic downturn. The extant literature provides information that a large government size serves as a cushion against domestic and foreign economic shocks. In the same vein, interest has also been growing in the study of the effect of institutions on economic activity in developing countries. The argument is that the quality of institutions is important in shaping the economic performance of countries, particularly in developing countries, Sub-Saharan African countries (SSA) included (Acemoglu, Johnson, & Robinson, 2001; Bell, 2002; Edwards & Tabellini, 1991; North, 1990).

Although the financial crisis of 2007-2009 emanated from the financial markets of the USA, the economic effects were felt across the globe. For instance, in the SSA countries, macroeconomic volatility was also felt and was already high, despite the declining overall output and inflation volatilities across the world due to the *Great Moderation* phenomenon (Hakura, 2007)[1]. All these developments necessitated national governments across countries to intervene through fiscal stimulus packages to alleviate the economic meltdown.

Apart from the volatility of the output and equity market prices, SSA countries' average inflation rates have also shown upward movement, hovering around 10% between 1980 and 1988. In some instances, inflation could reach up to 40% as observed in the 1990s. Although average inflation has fallen globally after 2019 to 3.6%, in the SSA sub-region it was, on average, 8.1% and still high by world standards (Afari, Son, & Haligah, 2021). Inflation trends in the SSA region are mainly caused by external macroeconomic distortions, although country-specific factors are also suggested,

[1] A gradual decline of output volatility across the globe as observed from 1980s onwards.

such as procyclical fiscal policies, weak institutions, and economic mismanagement (Abaidoo, 2012; Afari et al., 2021; Cooperation & Attenborough; Hakura, 2007). These countries also struggle to deal with the crises because they have weak measures to mitigate the effects of external shocks. Moreover, their financial markets are thin and poorly developed to deal with external shocks by diversifying their economies (Hakura, 2007; Portillo & Melina, 2018).

Larch and Vandeweyer (2013) pointed out that in addition to the regional variation of the output losses and their severity, the size of the output losses also depends on the size of the government and possibly weak institutions. In support of the variation in the severity of the financial crisis, Mohanty and Zampolli (2009) state that the output losses between the third quarter of 2008 and the second quarter of 2009 in Hong Kong, Mexico, and Taiwan were about 10%. On the other hand, the output losses experienced in Norway and France were 2% and 1% respectively. The share of governments to gross domestic product (GDP) of Hong Kong, Mexico, and Taiwan was relatively small, about 18-20% compared to the share of governments to GDP, estimated to be over 40% and 50% of Norway and France, respectively. The authors contend that the above differences in output losses between these groups of countries are due to the unequal size of their governments and the differences in the quality of the institutions.

The size of government and strong institutions have emerged as effective tools to stabilise macroeconomic volatilities. This belief had implications for both policymakers and researchers. First, the size of governments' expenditures increased both in developed and developing countries. Second, there was an acceleration of the development of economic theory and empirical studies on the effect of government size and the role of institutions on macroeconomic performance (Acemoglu, Johnson, & Robinson, 2004; North, 1990; Oz-Yalaman, Sevinc, & Sevil, 2019; Turan & Iyidogan, 2017). In support of the role of the quality of institutions on the economy, Acemoglu et al. (2004) posit that the present macroeconomic crises in most of the developing countries, including SSA, are the symptoms of weak institutional quality.

However, theoretically and empirically, the influence of government size and institutions on output volatility and inflation assumes linear relationships between the variables under study. This assumption could bias the results if the actual relationship

is nonlinear. It is therefore important to examine the possible existence of a non-linear relationship between government size, institutions, and these variables of interest to report accurate results about their interactions in the SSA sub-region.

Considering the above, this study aims to examine the threshold effects of government size on output volatility in SSA using panel data. The asymmetric effects of government size and the threshold effects of institutional quality on inflation are also investigated using panel data for the SSA countries. It has been professed that larger governments reduce output volatility but increase inflation rates (Oz-Yalaman et al., 2019; Tariq, Amin, & Ahmad, 2023; Woldu, 2022). Regarding the connection between government size and inflation, empirical evidence is, however, inconclusive, as shown in the work of Onuoha and Okorie (2020), and Ezirim, Eniekezimene, Amuzie, and Charles-Anyaogu (2014). Similarly, high inflation is associated with weak institutions in developing countries (Barugahara, 2015; Cicen, 2023; Ghanayem, Downing, & Sawalha, 2023).

However, despite the relatively high inflation and output volatility in SSA countries in comparison to other developing countries, little has been researched on the effects, particularly the non-linear effects of government size and institutional quality on these two variables of interest. Thus, these topics have remained unexplored for the SSA countries. This may suggest that policymakers in SSA countries do not know the ranges of government expenditure above or below which output volatility can be reduced, or the institutional quality threshold below or above which inflation rates can be mitigated by focusing on the quality of the institutions.

The study is underpinned by the Keynesian demand-pull, the fiscal theory of price level (FTPL), and the new institutional economics theories. These theories reflect the importance of fiscal policy, specifically government expenditure and institutional quality, on the economy, instead of focusing on monetary approaches. This approach is justified on the basis that in developing and emerging economies, there are low levels of financial market development and a low level of the central bank's independence to stabilize prices and enhance economic growth. The developing countries have relatively weak institutional quality compared to developed countries. This is, therefore, the characterization of the situation in SSA countries (Nguyen, 2019).

Becker and Mulligan (2003) also argued that the size of government may depend on the efficiency of taxes. A country without access to an efficient tax system will resort to money creation as a source of revenue, and this could be the situation in many SSA countries because their tax collection systems are poor. In this situation, revenue is mostly raised through seigniorage, which is inflationary. Further, inflation caused by the fiscal imbalance is persistent due to long-term government spending compared to cost-push shocks, which have transitory effects on inflation. This further motivates a case for studying the non-linear effects of government size and institutional quality on the variables of interest in SSA countries, and this is the area that has received little attention from researchers in this sub-region (Bianchi & Melosi, 2022).

1.1. Problem Statement

This section examines the problem statement regarding the threshold effects of government size on output volatility and asymmetry in inflation. The threshold effects of institutional quality on inflation are also discussed.

- The threshold effects of government size on output volatility in SSA countries

Achieving macroeconomic stability and fostering a stable environment for economic growth, investment, and decision-making is a central objective for policymakers. Macroeconomic volatility negatively impacts welfare and can hinder long-term economic growth. Figure 1.1, below, shows average output volatility in percentage for SSA countries as observed from 1997 to 2021. The output volatility differs from country to country. For example, Botswana, Chad, Sierra Leone, and Zimbabwe have the highest output volatility that exceeds 5% whilst Cameroon and Tanzania have the lowest output volatility. This high output volatility should be managed to improve the economic performance of the SSA countries. More discussion on this follows in the section on stylized facts about macroeconomic volatility in SSA.

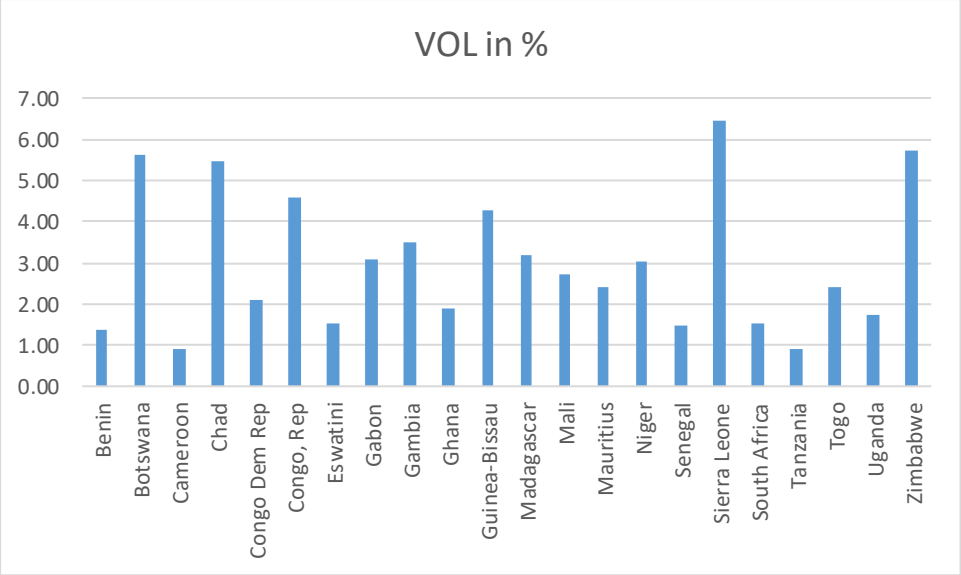


Figure 1.1. Output Volatility in SSA

Source: Data downloaded from the database of World Bank Development Indicators, Author's compilation using Excel, 2025.

As can be seen in the above figure, this challenge is particularly pronounced in Sub-Saharan Africa (SSA), which experiences relatively high output volatility compared to other developing regions (Grydaki & Fountas, 2010). In this context, government size emerges as a crucial policy instrument for mitigating output volatility in SSA. Proponents of the conventional Keynesian paradigm have advocated for increased government expenditure as an effective measure to address these challenges.

However, an ongoing debate exists about the appropriateness of increasing government size as a fiscal policy tool to mitigate economic volatility. For instance, proponents of the standard Real Business Cycle (RBC) and New Keynesian models argue that expanding government expenditures could be counterproductive. They contend that such measures may crowd out private sector activity, thereby exacerbating output volatility (Bernheim, 1989; Elmendorf & Mankiw, 1999; Mankiw, 2000). Further, compensation and efficiency hypotheses argue that economic volatilities are caused or dampened by trade openness and financial globalization, and eventually determine the sizes of governments and not the opposite (Aydogus & Topcu, 2013; Benarroch & Pandey, 2008, 2012, 2017; De Mendonça & de Oliveira, 2019; Rodrik, 1998). Empirical studies on the effects of government size on output

volatility have remained inconclusive (Badinger, 2009, 2012; Debrun & Kapoor, 2010; Debrun, Pisani-Ferry, & Sapir, 2008; Domenech, Andres, & Fatas, 2007; Fatás & Mihov, 2001, 2012; Gali, 1994; Iseringhausen & Vierke, 2018; Makin, 2013; Nwosa, Ehinomen, & Ugwu, 2020; Todorov & Ivanova, 2021). Furthermore, while extensive literature examines the relationship between trade openness, economic globalization, output volatility, external risk, and government size—as framed by the compensation and efficiency hypotheses—the findings remain mixed (Anderson & Obeng, 2021; Aregbeyen & Ibrahim, 2014; Aytaç, 2024; Dura & Yalçıntaş, 2022; D.-H. Kim, Suen, Lin, & Hsieh, 2018; Mehta, 2023; Tekin, Çınar, Sağdıç, & Yıldız, 2023).

This lack of consensus could be attributed to the different econometric frameworks used or the type and nature of the data used, the size of the samples used, the period in which the studies were undertaken, and the omission of the effects of economic globalization on economic volatility and the size of government. Moreover, the lack of consensus may stem from the assumption of a linear relationship between government size and output volatility. This assumption could bias the reported results if the actual relationship is nonlinear. Assuming linearity may also be highly misleading, as it implies that the effects of government size on output volatility are clear-cut—either negative or positive—and that the policymaking process is straightforward, requiring only an increase or decrease in government size to mitigate or amplify output volatility. Such oversimplification in policymaking risks disastrous outcomes, as it fails to account for the complexity of the relationship between these variables.

This study distinguishes itself from the existing empirical literature on the relationship between government size and output volatility by investigating the threshold effects of government size on output volatility in Sub-Saharan Africa (SSA) and offering policy guidance. This focus is motivated by the limited research on this topic in SSA, despite the region's pronounced macroeconomic volatility. However, a few studies have examined the asymmetric effects of fiscal policy on private consumption and private investment over the business cycle (Biolsi, 2017; Fazzari, Morley, & Panovska, 2015; Rich, 2022; Woldu, 2022). These studies suggest that fiscal spending multipliers are more effective during recessionary periods than during expansionary periods. Additionally, Collard, Dallas, and Tavlas (2017) found that while initial increases in

government spending reduce macroeconomic volatility, further increases eventually lead to heightened output volatility, as evidenced in the U.S. context.

As highlighted earlier, the existing literature on the threshold effects of government size on output volatility fails to address the specific experience of Sub-Saharan Africa (SSA). This oversight persists despite the region's fiscal dominance in economic activity and the prevalence of high output volatility. Moreover, SSA countries contend with relatively high unemployment, widespread poverty, and political instability compared to other developing regions. These challenges are further compounded by weak policies and institutions and a sizeable informal labour market (Woldu, 2022). Thus, it is essential to account for these unique characteristics by conducting an empirical study focused on SSA countries (Afonso & Kazemi, 2017).

The closest study examining the threshold effects of government size on output volatility is that of Collard et al. (2017) in the U.S. However, the econometric frameworks estimated at the country level by these authors may suffer from small sample bias if applied to the panel of countries used in the current study. Additionally, the findings of Collard et al. (2017) cannot be directly replicated in SSA countries due to the unique characteristics of the region, as discussed earlier. Given that both theoretical and empirical evidence highlight the significant role of large government expenditure in the economy, the critical empirical question is: What is the optimal size of government needed to either reduce or amplify output volatility in SSA?

- The asymmetric effects of government size on inflation in SSA countries

Inflation is one of the most important macroeconomic variables in policymaking because it affects the entire economy, and ultimately, society suffers. Although inflation levels differ from region to region or from one country to country, inflation is a problem in many of the SSA countries since it is relatively high and volatile compared to other developing countries (Olaoye et al. 2023). According to Olaoye et al. (2022), the high and volatile inflation in SSA exacerbates the already high poverty, unemployment, and inequality in these countries. Moreover, these countries have weak institutions to address many of the macroeconomic challenges

Further, many scholars (Azam & Khan, 2022; M. Khan & Hanif, 2020) have suggested that high and persistent inflation can be detrimental to economic growth since inflation increases uncertainty and leads to high interest rates. The increase in interest rates has the potential to discourage capital investment and ultimately slow down the economy. To control inflation, the conventional view is that the monetary authorities' objectives are to ensure a low and stable aggregate price level, which is commonly measured as the change in the consumer price index.

However, inflation that is fiscally rooted poses a serious challenge for the monetary authorities. For example, the governments worldwide had to intervene by deploying fiscal stimulus packages to provide relief to subdued economies following the aftermath of the 2008-2010 global financial crisis, and the 2020 COVID-19 pandemic has resulted in high inflation rates. The response of the monetary authorities in these situations has been to raise interest rates to control the soaring inflation. However, in many instances, such a response is often not effective. It is because the policy of increasing interest rates to control inflation can have dire consequences for economic activity (households, firms, and the government) (Ida, 2020; Omekara, Okereke, & Ehighibe, 2016)

The persistence of high inflation in SSA has sparked a debate on whether the fiscal policy or monetary policy is best suited to control inflation (Oyekele, 2021). Moreover, some critics argue that monetary policy alone is not adequate to bring about price stability; instead, the appropriate fiscal policy can control inflation better (Cochrane, 2021; Leeper & Yun, 2006; Sargent & Wallace, 1981; Woodford, 1995). Further, the lack of independence of the central banks to formulate appropriate monetary policies in SSA makes the fiscal policy a viable tool to control inflation. It has also been observed that in some SSA countries, the same executive who oversees the fiscal policies is also responsible for monetary policies. Therefore, the political interference in the central banks' policy mandate in most of the SSA countries suggests that there is fiscal dominance in such countries in economic activity (Olaoye et al., 2022; Strong, 2021). Hence, the focus of this study is on the asymmetric effects of government size on inflation in SSA.

However, the empirical evidence is contradictory about the direction of the relationship between government size on inflation in SSA countries. For instance, Onuoha and

Okorie (2020), Ezirim et al. (2014) found a positive long-run relationship between government size and inflation in SSA countries. Onuoha and Okorie (2020) applied the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) methods, whilst Ezirim et al. (2014) applied the generalised methods of moments (GMM) to analyse the data. In contrast, Atan and Effiong (2021) and Ogbonna (2014) applied error correction and vector error correction models (VECM), respectively, and reported the lack of a causal relationship between government size and inflation. On the other hand, Oyerinde (2019) employed VECM and found a bi-directional causal relationship between government size and inflation in Nigeria. The above inconsistencies in the literature could be attributed to the differences in the econometric frameworks applied and the size of the samples used (country-level studies versus panel studies).

In addition to the above studies, a few studies below have investigated the asymmetric effects of the fiscal policy on inflation in SSA.

The known country-level studies are by Osei and Ogunkola (2022) in Ghana and by Garba (2023) in Nigeria. the authors examined the fiscal deficit and budget deficit financing, respectively. Both Osei and Ogunkola (2022) and Garba, Tsaba, and Ya'u (2021) applied the NARDL technique to the data. In addition to the country-level studies mentioned above, Ahmad and Aworinde (2019) used threshold autoregressive (TAR) technique to investigate the asymmetric effects of fiscal deficits on inflation in a panel study of 12 African countries, while Olaoye et al. (2023) concentrated on the asymmetric effects of public debt on inflation in a sample of 44 SSA countries. Importantly, Olayungbo (2013), investigated the asymmetric effects of government expenditure on inflation in Nigeria. It was also reported that government expenditure changes have asymmetric effects on inflation in Nigeria. The study further revealed that contractionary government spending leads to higher inflation than expansionary one, a finding contrary to the findings of the above-mentioned studies.

The shortcomings of the above-mentioned country-level studies are that they focus on the effects of the asymmetry of fiscal deficit financing and budget deficit on inflation in Nigeria, respectively, instead of examining the asymmetric effects of government spending on inflation. Other panel studies closer to this study are Ahmad and Aworinde (2019) and Olaoye et al (2023). However, these studies examined the

asymmetric effects of fiscal deficits and public debt on inflation, respectively, instead of investigating the asymmetric effects of government size on inflation in SSA, which this study is all about. Again, the country-level study of Olayungbo (2013) might render the possibility of small sample bias if the country-level econometric framework is implemented in this current panel data study.

Gaps in the literature

Besides the lack of consensus on the relationship between government size and inflation for SSA countries as highlighted in the above paragraph, the existing literature has other significant shortcomings: -

First, there could be the assumption that the relationship between government size is linear. But recent evidence suggests that the relationship between fiscal policy and inflation is non-linear (Olaoye & Olomola, 2022; Tariq, Ahmad, & Amin, 2022; Tariq et al., 2023). The employment of the standard linear estimation techniques on the data that is potentially asymmetric in structure can lead to model misspecification and, hence, biased results. There is also a potential for the wrong policies to be developed based on the misleading results. The importance of the asymmetric structure of government size cannot be ignored. For instance, government size, in the long run, is also affected by a wide range of macroeconomic shocks that may lead to structural breaks or regimes, such as the aftermath of the COVID-19 pandemic (Granger & Yoon, 2002; Hansen, 2000; Hatemi-J, Al Shayeb, & Roca, 2017). This suggests that government size and inflation may have an asymmetric relationship.

Second, the research on the relationship between government size and inflation in SSA is scarce, particularly the asymmetric effects of government size on inflation. This oversight persists despite the relatively pronounced inflation in SSA, coupled with the unique characteristics of SSA that have been highlighted in the earlier section. Therefore, a study is recommended to account for the specific and unique characteristics found in SSA.

Third, if government size increases, the conventional view is that inflation will also increase. To fund excessive government expenditure in the context of low tax revenue due to poor tax collection systems, money creation is often an option. Therefore, the joint significance of the fiscal and monetary authorities in inflation control becomes important, and many studies have not considered this reality in SSA (Olaoye &

Olomola, 2022). This study is different in that it is aimed at investigating the asymmetric effects of government size on inflation in SSA and offers policy implications. The focus on the asymmetry is driven by the evidence that most of the macroeconomic indicators, such as inflation, respond to positive and negative shocks to fiscal policy with different magnitudes (Olaoye et al., 2022)

- The threshold effects of institutional quality on inflation in SSA

Although inflation levels differ from region to region or from one country to another, inflation remains a key macroeconomic problem in developing countries. For instance, in Sub-Saharan Africa (SSA) countries, it is relatively high and volatile compared to other developing countries (Ghanayem et al., 2023). Olaoye et al. (2024) succinctly state that high inflation has a serious negative impact on the economic performance of countries because it can cause uncertainty about future prices and make it difficult to plan for investments. Inflation hits the poor mostly, thereby exacerbating the already high poverty, inequality, and unemployment in SSA, and can even cause civil unrest. Therefore, reducing inflation to acceptable levels is still one of the key priorities of governments and policymakers in developing countries, including SSA countries.

The conventional approach in the analysis of inflation dynamics has been focusing on the macroeconomic factors as the direct causes of inflation, ignoring the importance of institutions and ideology on inflation performance in developing countries (Acemoglu et al., 2004; Acemoglu, Johnson, Robinson, & Thaicharoen, 2003; Aisen & Veiga, 2006, 2008). However, there is conflicting evidence on whether institutional quality increases or decreases inflation in developing countries. The empirical evidence suggests that countries that have economic institutions, such as the independent central bank, are associated with low inflation (Aisen & Veiga, 2006, 2008; De Haan & Kooi, 2000; Faust & Svensson, 2001; Garriga & Rodriguez, 2020; Kasseeah, 2011; Loungani & Sheets, 1997; Walsh, 1995). In contrast, Agoba, Abor, Osei, and Sa-Aadu (2017); Hielscher and Markwardt (2012); Klomp and De Haan (2010) and Campillo and Miron (1997) provided evidence that the central bank independence does not bring about price stability in Africa as seen in developed countries, instead, the impact of the central bank independence on inflation is insignificant due to political interference. Despite the above-mentioned contradictions, it can be deduced that institutions play an important role in macroeconomic

performance in developing countries because they also minimize the effects of economic shocks and price instability. (Acemoglu et al., 2003; Acemoglu et al., 2001; Acemoglu & Robinson, 2019; Bell, 2002; Cicen, 2023).

The conventional view is that countries with strong quality institutions have low inflation rates while countries with poor institutional quality do not, as argued by Aisen and Veiga (2006); Acemoglu et al. (2004); Barugahara (2015); Cicen (2023), and Mignamissi, Minkoé Bikoula, and Thioune (2023). In the African context, only three studies by Barugahara (2015), Ghanayem et al. (2023), and Franses and Janssens (2018) have examined the connection between institutional quality (proxied by political instability) and inflation. The authors found that political instability is associated with high inflation in Africa. Research on this topic seems to be scarce despite the persistently high inflation experienced in SSA, coupled with relatively weak institutions compared to the institutional quality found in developed countries. This study, therefore, distinguishes itself from the existing studies on the institutional quality-inflation nexus because it explores the threshold effects of institutional quality on inflation in SSA and offers policy guidance. To our knowledge, no study has examined the threshold effects of institutional quality on inflation in SSA countries

1.2. Research questions.

The above discussions have centred on the effect of government size and institutional quality on output volatility and inflation. Considering the above, the following research questions are formulated:

- Does the threshold level of government size on output volatility exist in SSA countries?
- What are the asymmetric effects of government size on inflation in SSA countries?
- What are the threshold effects of institutional quality on inflation in SSA countries?

1.3. Research Objectives

From the above research questions, the following objectives can be stated: -

- To estimate the threshold levels of government size on output volatility in SSA countries.
- To empirically investigate the asymmetric effects of government size on inflation in SSA countries.
- To estimate the threshold effects of institutional quality on inflation in SSA countries.

1.4. Contribution of the study

This section outlines the contribution of this study, considering the research gaps that have been identified in the earlier sections of this document.

The threshold effects of government size on output volatility in SSA

We estimate the threshold effects of government size on output volatility in a panel of 22 SSA countries spanning the 1997 to 2021 period. We use the parametric approach to isolate the threshold effects of the government size variable on output volatility from the possible effects of the control variables on output volatility in SSA. This is intended to enhance the precision of the threshold value estimation. In this regard, we employ Hansen's (1999) threshold methodology to estimate the threshold effects of government size on output volatility in SSA countries. Employing Hansen's (1999) method has an advantage over the quadratic threshold methods of Barro (1990), Pevcin (2004), Facchini and Melki (2011) and Scully (2003) because it does not suffer from multicollinearity and overestimation of the coefficients of threshold variables (Law & Singh, 2014). Further, the application of this technique to a relatively homogenous group of countries, such as SSA countries, coupled with the balanced data, yields consistent and unbiased results.

Our contribution to the empirical studies lies in the fact that the issue of threshold levels of government expenditure on output volatility has remained unexplored in the SSA sub-region. The scarcity of research on the threshold effects of government size on output volatility implies that policymakers (fiscal authority) in the SSA sub-region do not know the ranges of government expenditure at which output volatility can be

reduced or amplified. Without the knowledge of the threshold value, the fiscal authority can abruptly decrease or increase government size to the detriment of the achievement of the goal of economic growth, as output volatility becomes unmanageable. In this regard, policymakers could miss the opportunity to manipulate the fiscal policy for output stabilisation for the benefit of the entire society, particularly the investors. The latter prefer a stable economic environment to operate and take calculated risks.

Since most of the empirical studies argue that a large government size reduces output volatility and ultimately increases economic growth, the increase in government size or optimal government expenditures should also benefit the unemployed, the elderly, the disabled, and the children as social grants increase to smoothen their consumption levels. The research gap on this topic in the SSA sub-region lends this study to be the first to examine the threshold effects of government size on output volatility in the SSA sub-region; hence, this study makes a significant contribution to the empirical literature.

Moreover, following Wang and Gao (2011), a rich dataset has also been considered that allows the distinction between the impact of government consumption expenditure and government capital expenditure on output volatility. This distinction is crucial in analysing the possible varying effects of these components of government spending on output volatility. Identifying the threshold levels at which output volatility can be reduced is crucial for policymakers to adjust their public expenditures accordingly. The threshold levels of government consumption expenditure and government capital expenditure may differ, and this difference may suggest budget expenditure adjustments of one at the expense of the other. Therefore, the results of the threshold estimation of the disaggregated government size on output volatility will also be of interest to other researchers because the existing empirical literature is non-existent in the SSA sub-region.

The asymmetric effects of government size on Inflation in SSA

This study contributes as follows: -

The study aims to separate the effect of positive shocks from the negative shocks of the government size on inflation in SSA countries. We have adopted the non-linear estimation technique for this study. According to Hatemi-J, the separation of the

positive shocks from the negative shocks reveals the nature of the asymmetric structure in the data. Hence, we aim to investigate whether the response of inflation to the positive and negative changes in government size is of equal magnitude or not. This is done by applying the hidden cointegration analysis within the panel Non-Linear Autoregressive Distributed Lag (NARDL) framework to SSA countries. The choice of period has been influenced by the availability of data. Furthermore, the analysis will also be extended to test the causal relationships between government size and inflation. In this regard, three methods have been considered - the panel linear ARDL, the NARDL, and the Toda and Yamamoto (1995) Granger causality test. The intuition behind the use of many methods in this study is to improve the validity and plausibility of the estimated results, from which policy recommendations can be made.

Additionally, this study is different as it uses different and more refined panel data techniques. For instance, the advantage of employing the panel non-linear dynamic framework is its flexibility and the capability of simultaneously modelling asymmetries of both long-run relationships and patterns of adjustment between government size and inflation variables. Additionally, the dynamic error correction representation within the asymmetric long-run regression results in the NARDL model (Shin, Yu, & Greenwood-Nimmo, 2014). In contrast, the majority of the referred studies used VAR (Olayungbo, 2013); the threshold autoregressive (TAR) and momentum-TAR (Ahmad & Aworinde, 2019) and the non-linear GMM (Olaoye et al, 2023) models to analyse the non-linear effects of fiscal policy. However, these estimation models have been shown to have serious weaknesses, such as multicollinearity and exaggeration of threshold coefficients (Hatemi-J et al., 2017). Further, the non-linear GMM of Olaoye et al. (2023) is known to suffer from instrument proliferation, which may lead to misleading specification tests (Roodman, 2009b).

Again, employing Toda and Yamamoto's (1995) causality analysis test through augmented VAR overcomes the weaknesses of the conventional Granger Causality test of generating invalid estimates if the series is of a different order of integration and not stationary. Again, testing the causality between government size and inflation in a bivariate approach, excluding the possible influence of auxiliary variables, will strengthen the precision of causality between government size and inflation so that proper policy actions can be enabled. Additionally, the results of this study will also add to the extant literature.

Another important contribution to the empirical studies lies in the fact that the issue of the asymmetric relationship between government size and inflation in a panel framework has remained unexplored in the SSA sub-region. The scarcity of research on this topic implies that policymakers (fiscal authority) in the SSA sub-region have the risk of assuming that the relationship between the two variables is linear and symmetric, and this can lead to wrong policy choices to mitigate the effects of inflation. The research gap on this topic in the SSA sub-region lends this study to be the first to examine the asymmetric effects of government size on inflation in the SSA sub-region; hence, this study makes a significant contribution to the empirical literature

The threshold effects of institutional quality on inflation

Our contribution to the empirical literature is as follows: -

In this study, we aim to estimate the threshold effects of institutional quality on inflation in SSA. To do so, the authors first estimate the dynamic linear impact of institutional quality on inflation on the panel data of 27 SSA countries spanning the 1998-2021 period. The two-step first-difference generalised method of moments (FD-GMM) is employed after controlling for other determinants of inflation in SSA. The advantage of this technique is that it accounts for endogeneity, serial autocorrelation, and omitted variable bias; hence, it generates consistent and unbiased results (Roodman, 2009a). The SSA sub-region was chosen because of its relatively high inflation rates compared to other developing countries. Additionally, the poor economic performance of most of these SSA countries has driven their populations to high levels of poverty, inequality, and unemployment. Again, most of the SSA countries have weak institutional quality as manifested in pockets of military coups,[2] widespread corruption, and weak law and order maintenance.

Next, we employ the dynamic panel threshold model of Seo and Shin (2016) and Seo, Kim, and Kim (2019), which is based on the FD-GMM, to estimate the institutional quality threshold effects of each dimension on inflation. Notably, the authors use many dimensions[3] to compile the index of institutional quality, which is a combination of legal

[2] Sudan, Niger and Mali recently

[3] Control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law and voice and accountability estimates

institutions, political institutions, and economic institutions. Hence, this index is comprehensive and covers a wider spectrum of institutional quality, instead of focusing only on the political instability index, as is often the case with some researchers. It is important to know the exact threshold level of each dimension of institutional quality on inflation because they may differ, and this can require different responses from the policymaker. Thereafter, the overall institutional quality threshold on inflation is estimated. Hansen's (1999) panel threshold method can be used to estimate the threshold effects of institutional quality on inflation, and this method also accounts for the unobserved fixed country effects in the dataset. However, the key limitation of Hansen's (1999) model is that it requires all the regressors and the transition variable to be exogenous. Again, Hansen's (1999) model is used for static panel data, whereas inflation is a dynamic process. The other option could be the use of Kremer et al.'s (2013) dynamic panel threshold model, but the model assumes that the explanatory variables and or the transition variables are exogenous. This implies that if the institutional quality is endogenous to inflation, the use of the Kremer et al (2013) model can lead to biased estimates. Further, Kremer et al (2013) dynamic panel threshold model estimator does not account for the potential reverse causality as found in Minea, Tapsoba, and Villieu (2021) study. Therefore, Seo and Shin (2016) threshold model has advantages over other threshold models because it allows both the explanatory variables and the transition variable to be endogenous, and this attribute makes it relatively more efficient than other dynamic panel data threshold models in generating unbiased estimates of the threshold values.

1.5. The structure of the thesis

The structure of the thesis is as follows: The next chapter reviews the theoretical literature on the non-linearity of the effects of government size on output volatility in SSA countries. Hansen's (1999) threshold methodology has been applied to provide evidence of the existence of government size's threshold effects on output volatility in SSA. This has implications for policymakers to know the exact threshold levels of government expenditure on output volatility so that fiscal policy can be manipulated to reduce output volatility in the SSA sub-region. Further, policymakers will know whether there are differences in the effects and threshold levels between government consumption expenditure and government capital expenditure on output volatility in SSA.

Chapter 3 reviewed the existing empirical evidence on the influence of government size on inflation in SSA. Further, in this chapter, the asymmetric effects of government size on inflation have been estimated for the SSA countries by applying Shin et al (2014) non-linear autoregressive distributed model. The results of the estimation have shed light on the response of inflation to government expenditure changes. Inflation has responded more to the decrease in government expenditure than to the increase in government expenditure.

Chapter 4 reviewed the theoretical literature on the connection between institutional quality and inflation in SSA countries, focusing on the new institutional economics theory. The threshold effects of institutional quality on inflation in SSA have been estimated by employing the dynamic panel threshold technique of Seo and Shin (201

Chapter 5. has presents the summary of the results for the thesis, and policy implications have been provided. Conclusions have been made, including the areas for future research and the limitations of the study.

CHAPTER TWO

2. THRESHOLD EFFECTS OF GOVERNMENT SIZE ON OUTPUT VOLATILITY

2.1. INTRODUCTION

Achieving macroeconomic stability and fostering a stable environment for economic growth, investment, and decision-making is a central objective for policymakers. Macroeconomic volatility negatively impacts welfare and can hinder long-term economic growth. This challenge is particularly pronounced in Sub-Saharan Africa (SSA), which experiences relatively high output volatility compared to other developing regions (Grydaki & Fountas, 2010). In this context, government size emerges as a crucial policy instrument for mitigating output volatility in SSA. Proponents of the conventional Keynesian paradigm have advocated for increased government expenditure as an effective measure to address these challenges.

However, an ongoing debate exists about the appropriateness of increasing government size as a fiscal policy tool to mitigate economic volatility. For instance, proponents of the standard Real Business Cycle (RBC) and New Keynesian models argue that expanding government expenditures could be counterproductive. They contend that such measures may crowd out private sector activity, thereby exacerbating output volatility (Bernheim, 1989; Elmendorf & Mankiw, 1999; Mankiw, 2000). Further, compensation and efficiency hypotheses argue that economic volatilities are caused or dampened by trade openness and financial globalization, and eventually determine the sizes of governments and not the opposite (Aydogus & Topcu, 2013; Benarroch & Pandey, 2008, 2012, 2017; De Mendonça & de Oliveira, 2019; Rodrik, 1998). Empirical studies on the effects of government size on output volatility have remained inconclusive (Badinger, 2009, 2012; Debrun & Kapoor, 2010; Debrun et al., 2008; Domenech et al., 2007; Fatás & Mihov, 2001, 2012; Gali, 1994; Iseringhausen & Vierke, 2018; Makin, 2013; Nwosa et al., 2020; Todorov & Ivanova, 2021). Furthermore, while extensive literature examines the relationship between trade openness, economic globalisation, output volatility, external risk, and government size—as framed by the compensation and efficiency hypotheses—the

findings remain mixed (Anderson & Obeng, 2021; Aregbeyen & Ibrahim, 2014; Aytaç, 2024; Dura & Yalçıntaş, 2022; D.-H. Kim et al., 2018; Mehta, 2023; Tekin et al., 2023). This lack of consensus could be attributed to the omission of the effects of economic globalisation on economic volatility and the size of government. Moreover, the lack of consensus may stem from the assumption of a linear relationship between government size and output volatility. This assumption could bias the reported results if the actual relationship is nonlinear. Assuming linearity may also be highly misleading, as it implies that the effects of government size on output volatility are clear-cut—either negative or positive—and that the policymaking process is straightforward, requiring only an increase or decrease in government size to mitigate or amplify output volatility. Such oversimplification in policymaking risks disastrous outcomes, as it fails to account for the complexity of the relationship between these variables.

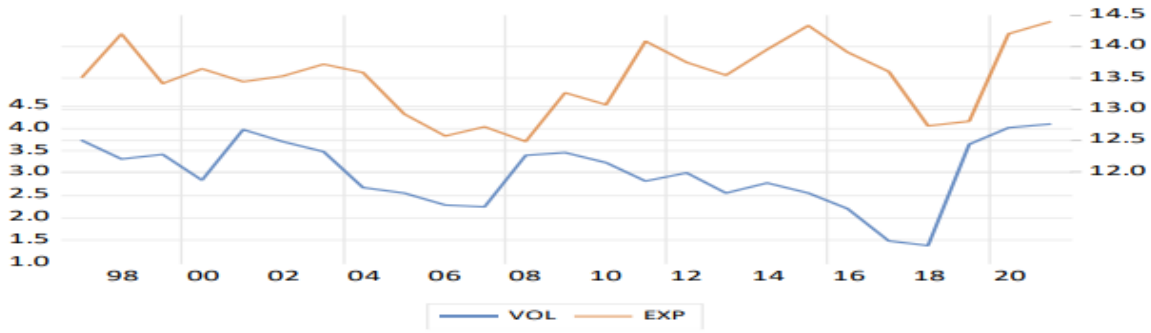


Figure 2.1. Government size and output v 1

Figure 2.1: Government Size and Output Volatility

Source: Author's compilation using Excel, 2024

Figure 2.1 depicts the relationship between government size and output volatility for the SSA countries over the study period. Although the two variables show a co-movement, with both showing spikes of increase from 2019 onwards due to the COVID-19 pandemic, they, however, appear non-monotonic. This non-monotonic relationship requires a non-linear estimation technique rather than the standard linear estimation techniques. Using the standard linear estimation technique on this data can bias the results, as mentioned in the above paragraph. It is therefore crucial to

investigate the threshold effects of government size on output volatility in SSA, which is the aim of this study.

Therefore, this study distinguishes itself from the existing empirical literature on the relationship between government size and output volatility by investigating the threshold effects of government size on output volatility in SSA and offering policy guidance. This focus is motivated by the limited research on this topic in SSA, despite the region's pronounced macroeconomic volatility. However, a few studies have examined the asymmetric effects of fiscal policy on private consumption and private investment over the business cycle (Biolsi, 2017; Fazzari, Morley, & Panovska, 2015; Rich, 2022; Woldu, 2022). These studies suggest that fiscal spending multipliers are more effective during recessionary periods than during expansionary periods. Additionally, Collard, Dallas, and Tavlas (2017) found that while initial increases in government spending reduce macroeconomic volatility, further increases eventually lead to heightened output volatility, as evidenced in the U.S. context.

As highlighted earlier, the existing literature on the threshold effects of government size on output volatility fails to address the specific experience of Sub-Saharan Africa (SSA). Further, the absence of central banks or the lack of independent central banks to formulate appropriate monetary policies in many SSA countries suggests that there is fiscal dominance in economic activity. Therefore, this oversight persists despite the region's fiscal dominance in economic activity and the prevalence of high output volatility. Moreover, SSA countries contend with relatively high unemployment, widespread poverty, and political instability compared to other developing regions. These challenges are further compounded by weak policies and institutions and a sizeable informal labour market (Woldu, 2022). Thus, it is essential to account for these unique characteristics by conducting an empirical study focused on SSA countries (Afonso & Kazemi, 2017).

The closest study examining the threshold effects of government size on output volatility is that of Collard et al. (2017) in the U.S. However, the econometric frameworks estimated at the country level by these authors may suffer from small sample bias if applied to the panel of countries used in the current study. Additionally, the findings of Collard et al. (2017) cannot be directly replicated in SSA countries due to the unique characteristics of the region, as discussed earlier. Given that both

theoretical and empirical evidence highlight the significant role of large government expenditure in the economy, the critical empirical question is: What is the optimal size of government needed to either reduce or amplify output volatility in SSA?

This study answers the question above. To do so, we estimate the threshold effects of government size on output volatility in a panel of 22 SSA countries covering the period from 1997 to 2021. We employ a parametric approach to isolate the threshold effect of government size on output volatility while controlling for the potential effects of other variables. This approach enhances the precision of the threshold value estimation. Specifically, we utilise Hansen's (1999) threshold methodology, which offers advantages over the quadratic threshold methods proposed by Barro (1990), Pevcin (2004), Facchini and Melki (2011), and Scully (2003). Hansen's method avoids issues such as multicollinearity and overestimation of threshold variable coefficients (Law & Singh, 2014). Moreover, applying this technique to a relatively homogenous group of countries, such as those in SSA, coupled with balanced data, ensures consistent and unbiased results.

Our contribution to the empirical literature lies in addressing the unexplored issue of threshold levels of government expenditure on output volatility in the SSA sub-region. The scarcity of research on this topic implies that policymakers (fiscal authorities) in SSA lack a clear understanding of the specific ranges of government expenditure that can either reduce or amplify output volatility. Without knowledge of the exact threshold, fiscal authorities risk abruptly adjusting government size, potentially hindering economic growth as output volatility becomes unmanageable. Such actions could prevent policymakers from leveraging fiscal policy for output stabilisation, ultimately affecting society, particularly investors, who prefer a stable economic environment to manage risks. Moreover, if large government size is shown to reduce output volatility and promote economic growth, increased government expenditure could also benefit vulnerable groups such as the unemployed, elderly, disabled, and children, as social grants would increase, smoothing their consumption levels.

The research gap in the SSA sub-region makes this study the first to examine the threshold effects of government size on output volatility, marking a significant contribution to the empirical literature. Additionally, following Wang and Gao (2011), we utilise a rich dataset that distinguishes between the impacts of government

consumption expenditure and government capital expenditure on output volatility. This distinction is crucial for analysing the potentially varying effects of these components of government spending. Identifying the exact threshold levels at which output volatility can be reduced is essential for policymakers to adjust public expenditures accordingly. These threshold levels may differ between government consumption and capital expenditure, necessitating adjustments in fiscal policy.

Therefore, the results of this threshold estimation for disaggregated government size on output volatility will be of great interest to other researchers, as no such empirical literature exists in the SSA sub-region. Moreover, the conflicting evidence in the existing literature has expanded the scope of research. We extend our contribution by estimating the two primary variables of interest while incorporating the impact of control variables on output volatility in the threshold regression. These control variables are standard determinants of output. This approach is vital given the diminishing influence of government size on output volatility globally since the era of Great Modernisation (Hakura, 2007). The magnitude and sign of some control variables may suggest they play a more significant role than government size in influencing output volatility. Therefore, this study benefits both fiscal and monetary policies, particularly if financial variables prove significant. Ultimately, this research contributes to the empirical literature on this topic in SSA countries.

This study provides additional evidence on the effects of government size on output volatility in SSA countries. Overall, a relationship between government size and output volatility is observed. The study reveals a threshold level of 4.33% for government size, beyond which the impact of government size on output volatility diminishes. Specifically, a smaller government size appears to amplify output volatility, while an increase in government size leads to a reduction in volatility. These results partially align with the Keynesian framework. Moreover, the findings remain robust even when government capital expenditure is used as a substitute for government consumption expenditure as the threshold variable.

The rest of this chapter is structured as follows: the next section presents the stylised facts about macroeconomic volatility in SSA. The survey of literature is discussed in section 2.3. The data used in the econometric estimation method and the empirical strategy are found in section 2.4 of the chapter. Results and discussions are in section

2.5. Section 2.6. discusses the summary, the conclusion, and policy recommendations.

2.2. STYLISED FACTS ABOUT MACROECONOMIC VOLATILITY IN SSA

SSA countries have the highest macroeconomic volatility, which is reflected in output volatility and other macroeconomic variables. The tables below show the stylised facts about economic fluctuations in SSA. Table 2.1. (i) and (ii) show that the SSA countries' income per capita is less than the income per capita of both high-income and non-SSA low-income countries. These countries have relatively high output volatility as measured by the standard deviation and high and volatile inflation rates. Moreover, as reported in Table 2.1. (iii), their investment levels are relatively low compared to investment levels for the high-income countries and the non-SSA low-income countries. They also import more than they export, and these imports make them vulnerable to foreign shocks.

Table 2.1: (i) Income per Capita (Median Values)

Country Groups	GDP per Capita (USD)
Sub-Saharan Africa (SSA)	
Resource Abundant	577.41
Non-Resource Abundant	300.56
Non-Sub-Saharan Africa	
High Income Countries (HIC)	19350.19
Low-Income Countries (LIC)	929.75

Source: Melina & Portillo, 2018 (adapted)

Table 2.1: (ii) Real Output-Median Volatility and Inflation Rates (1995-2007)

SSA	**Stdev %**	**Inflation-CPI (%)**
Resource abundant	3.35	6.13
Non-Resource abundant	3.53	7.67
Non- SSA		
HIC	1.65	2.19
LIC	2.19	6.94

Source: Melina & Portillo, 2018 (adapted)

Table 2.1: (iii) Demand Components in % of GDP (Median Values)

Country Groups	**Private consumption**	**Government consumption**	**Investment**	**Exports**	**Imports**
SSA					
Resource	70.21	11.84	18.71	23.75	32.11
Non-Resource	79.90	14.75	15.40	23.10	30.94
Non-SSA					
HIC	57.00	18.17	22.57	30.10	29.48
LIC	72.43	11.16	21.65	23.67	29.08

Source: Melina & Portillo, 2018 (adapted)

According to Portillo and Melina (2018) this relatively high output volatility is indicative of large shocks and the lack of mechanisms to deal with these shocks. Lack of economic diversification and financial sector development are often cited as the reasons for the severity of shocks in SSA countries whenever they are exposed to them. Large shocks contract investment and increase liquidity constraints, and this can eventually lead to asset destruction.

Increasing integration of the SSA countries to the global market economy through export expansions, foreign direct investment, and foreign aid has exposed them to

international shocks in addition to their domestic shocks. The external shocks could be brought about by the sudden stops in capital inflows due to disruptions in international financial markets or disturbances in international trade, which cause terms of trade volatility. SSA countries are also vulnerable to external shocks. For instance, most of the SSA countries export raw materials and import food and energy. The real exchange rates have larger volatility, and this may explain the magnitude of external shocks. Sometimes, the imports (food and energy) become expensive when the local currencies depreciate against the foreign currencies from which they make imports. Fluctuation of demand and prices of commodities such as oil and other minerals adversely affect the SSA countries since they are great exporters of raw materials (AFRICA, 2023)

However, the external shocks linked to international trade, financial aid and climatic changes contribute a small proportion of the overall macroeconomic volatility in developing countries. The developed countries, on the other hand, have relatively experienced overall smaller shocks in terms of economic growth and the size of output drops. They can also deal with the shocks better as compared to the developing countries because their economies are well-diversified (Loayza, Ranciere, Servén, & Ventura, 2007).

Developing countries can also experience persistent domestic shocks because of their specialisation in industries that use traditional methodologies that are operated by unskilled workers. It is stated that these industries are, by nature, more volatile. Furthermore, the SSA countries follow procyclical fiscal policies, expanding during the boom periods and contracting in recessions. In some cases, the governments finance the budget deficits through the volatile inflationary monetary policies. The political instability, coupled with the economic mismanagement, further contributes to the volatility of the economic growth of the SSA countries (Loayza et al., 2007). The developing countries also have weak measures to mitigate the effects of external shocks. Their financial markets are poorly developed to deal with external shocks by diversifying their economies.

In addition to the not well-developed and thin financial markets, their procyclical fiscal policies do not stabilise the economies as expected when exposed to external shocks, but instead, they amplify the output volatility (Hakura, 2007; Portillo & Melina, 2018).

Another notable feature about SSA economies is that there is a negative correlation between output and inflation, which is in contrast with the general view that output and inflation are positively related, as in advanced countries. In developed countries, output and inflation are positively correlated since the co-movement of the two variables is driven by aggregate demand factors. In SSA countries, the aggregate supply factors could be dominant (Portillo & Melina, 2018). In addition to the above, there is a lack of strong co-movement between private consumption and investment in SSA countries. The likely interpretation is that the SSA economies do not have a clear standard business cycle, or maybe there are sector-specific shocks that affect consumption and investment separately (Portillo & Melina, 2018)

2.3. LITERATURE REVIEW

This section discusses the theoretical and empirical literature that underpins the effects of government size on output volatility in SSA countries. Some of the major flaws of the main theories are also highlighted in the discussion.

2.3.1. Review of Theoretical Literature

Explanation of key concepts

Fiscal policy can be analysed in terms of its government spending dimensions, namely, automatic stabilisers and discretionary policy (Debrun & Kapoor, 2010). Automatic stabilisers are the budget balance component that responds spontaneously to fluctuations in the economy. Thus, they are generated by rules, and examples are social grants, unemployment insurance funds, old age pensions, disability grants, investment credits and tax credits.

The discretionary fiscal policy, on the other hand, is when there is discretion[4] by policymakers in its implementation, and this depends on the economic situation. Examples are fiscal stimulus packages and unemployment grants that are provided to businesses that are in distress and to unemployed individuals due to severe economic recessions. Sometimes, discretionary policy can be implemented for other reasons

[4] Choice of optimal policy actions based on the problem at that point in time.

unrelated to macroeconomic fluctuations, such as free food parcels to poor communities to buy votes by the governing parties for the upcoming general elections (Christiano, 1984; Fatas & Mihov, 2012). In most instances, both dimensions co-exist in policy formulations.

Fiscal policy can also be looked at in terms of cyclical behaviour. Fiscal policy is referred to as countercyclical when there is an increase in expenditure during recessions to stabilise the economy and a decrease in spending during booms. This fiscal policy action is prevalent in developed countries. On the other hand, there has been an observation that fiscal policy is commonly procyclical in many countries, particularly in developing countries. In procyclical fiscal policy, policymakers cut spending during recessions and increase spending when the economy is in full swing (Domenech et al., 2007).

The theoretical literature has identified two groups of factors that may lead to procyclical policy in developing countries. They are political and institutional factors that lead to high government spending during good times, and financial constraints and limited access to international capital markets during bad times. Tornell and Lane (1999) attributed this expenditure policy as a 'voracity effect'; thus, an increase in revenue collections increases the politicians' desire to spend more, and this is often associated with corruption. The absence of institutional controls will lead to overspending by the government. Portillo and Melina (2018) support the view that developing countries, especially the resource-rich countries of SSA, resort to procyclical fiscal policies due to their volatile revenues. They struggle to access international capital markets during recessions due to the huge debts they have incurred. The funders are not willing to lend credit because of potential default payments.

The cyclical behaviour of the fiscal policy affects the output. Countercyclical policy has been found to stabilise output volatility, and procyclical fiscal policy is known to increase output volatility. These procyclical fiscal policies often lead to debts and, eventually, unsustainable debts that lead to default in payments (Leiva-Leon & Ductor, 2019; Loayza et al., 2007). Similarly, fiscal policy can sometimes be inconsistent over time. An increase in public expenditure can also be a result of political reasons by the governing party (Szarowska, 2013). The Ricardian equivalence paradigm views the

actions of government, such as spending cuts or tax cuts, as neutral to the economy (Bernheim, 1989; Seater, 1993).

Conventional Keynesian theory

The essence of the conventional Keynesian theory (1936) is that private consumption, investment, output, and unemployment respond positively to government spending. An increase in government spending has a multiplier of more than one for economic growth and its components-private consumption and investment (Sedighi, Shaghaghi, & Woldu, 2021). Therefore, according to this theory, government size can stabilise output volatility. The original Keynesian theory was conceived and became dominant during the Great Depression of the 1930s. The proponents of this theory criticised the classical theories' view of non-state intervention in the economy through the latter's self-adjusting markets. The Keynesians believed that the causes of macroeconomic volatility were due to market failures, and the disequilibrium between supply and demand led to economic crises. Keynes (1936) advocated the active role of government to create demand for goods and services to stimulate output (Ampah & Kotosz, 2016; Mohr & Fourie, 2015). According to Keynes (1936), as cited by Ampah and Kotosz (2016) Nations should increase their public expenditure to increase their economic activities and save their countries from depression.

Keynes's views are that a significant proportion of the population is liquidity-constrained, and these people have a high propensity to consume out of their disposable income. Government spending will have large multipliers when resources are underemployed. Therefore, a temporary cut on income taxes or an increase in government spending funded by deficit will immediately create aggregate demand and therefore positively affect aggregate output, consumption, investment and increase in employment. Central to the theory were the sticky prices and wages to allow the economy and unemployment time to recover without increasing the prices of goods and wages. Furthermore, the theory proponents stated that government expenditure is autonomous and exogenous to economic growth, a hypothesis that differed completely from Wagner's law. For the Keynesians, economic growth is driven or caused by growth in government expenditure and not the opposite, as proposed by Wagner. Theoretically, a decrease in government spending will induce fluctuating

demand, a decline in output, consumption, and investment, and an increase in unemployment. Therefore, output volatility can be reduced if the government increases expenditure.

However, the Keynesian paradigm has received criticism for its failure to come out with a satisfactory theory to account for the presence of co-movement of high inflation and unemployment during the 1960s and 1970s. For instance, the author attributed fluctuations in unemployment to be caused by fluctuations in demand for investment. Investment was, in turn, influenced by the changes in real interest rates and prices. Critics argue that sometimes investment is determined by the availability of credit. The other weakness of this theory was that it lacked micro-theoretic foundations to explain some of the phenomena that are key to Keynes's theory (Plosser, 1989).

Despite the criticism, Keynes's theory has made a huge contribution to the development of macroeconomic theory. The theory has also influenced today's fiscal policy-making process across the world, such as the implementation of fiscal stimulus packages by the various fiscal authorities to revive the economies in recessions. Fiscal policy then becomes effective because during recessions, monetary policy may not be a better option, especially when the nominal interest rate has reached the zero nominal bounds, as happened during 2007-2009 in many developed countries. Related to the above is the success of Keynesian theory in addressing the unemployment problem by increasing government spending to create demand and create jobs, such as public works programmes in countries such as South Africa. In a nutshell, the government is sometimes desirable to stabilise the level of economic activity.

The conventional Real Business Cycle theory

In the 1960s, the Keynesian paradigm was still the dominant force in providing solutions to policymakers about economic problems. However, these Keynesian theories were viewed as static and lacked the details to explain many business cycle processes by critics (King, Plosser, & Rebelo, 1988). In response to the above situation, the real business cycle (RBC) models were revived to study the causes of business cycle fluctuations. The RBC models depart from the Keynesian macroeconomic models in that the analyses of business fluctuations are anchored on microeconomic theories. The basic neo-classical framework is often appropriate to explain the causes of business fluctuations. This theory focused on economic volatility

and argued that the cause of output volatility is large shocks to the production technology.

The origin of the concept of the business cycle can be traced back to the 19th century (Burns & Mitchell, 1946). The business cycle concept was originally viewed as the phase of the business cycle in which there was a dramatic crisis that followed prosperity, and in turn, this crisis is followed by depression. The causes of these events ranged from overproduction versus the demand for the products, discrepancy between production and wages, to price fluctuations of producers, to consumer prices (Burns & Mitchell, 1946). Business cycle, as understood today, refers to large-scale fluctuations in aggregate economic activity.

The studies on business cycles became dormant during the 1930s depression in the industrial countries and after World War 11. The business cycle theory was only revived in the 1980s, and today there is vast theoretical and empirical literature written on the RBC model. The fluctuations in economic activity are caused by large and persistent production technology shocks. Kydland and Prescott (1982) state that these models are based on the view that business fluctuations are indications of a well-functioning competitive economy with a stochastic shock to technology, and there is no welfare loss in the process. According to the authors, business fluctuations are just a temporary phenomenon. Therefore, it will be counterproductive for the government to try and stabilise the business fluctuations. Thus, an increase in government spending can even generate negative welfare effects.

In this model, economic agents respond to technology shocks by making trade-offs between leisure and labour, between consumption and investment about current and future periods, subject to the intertemporal budget constraint (Crosby & Otto, 1995; Mankiw, 1989). In the canonical RBC model, the behaviour of prices and aggregate economic variables is not influenced by monetary disturbances or government activity, but instead by large production shocks[5]. This model is often viewed as the benchmark for understanding economic dynamics and economic growth. Its main ingredients are assumptions of perfect competitive markets, flexible prices and wages, technology

[5] The modern RBC models have expanded shocks to technology, to include any appropriate shock such as fiscal shocks as the cause of business fluctuations.

shock or productivity disturbance, inter-temporary budget constraint and the existence of rational expectation agents, thus forward-looking economic actors.

The model provides an analysis of how aggregate variables will respond to or how a representative agent makes decisions on the optimal choices because of changes in the economic environment. According to King et al. (1988), other shocks can be chosen, and methods can be adjusted for analysis. Government policies, as an example, can be an exogenous shock in the model. Although the followers of RBC agree that temporary government purchases increase demand, output, and employment, they, however, argue that for the equilibrium to be achieved in the goods market, interest rates must rise, and this reduces employment and investment.

The RBC theory predicts that government spending crowds out private consumption due to the agents' expectation that an increased government expenditure implies current and future tax liabilities. This occurs because of the negative wealth effects of government spending increases that are funded by tax increases. In the process, labour supply increases and subsequently, the real wages fall. The decreased labour income reduces their consumption (Baxter & King, 1993). On the other hand, capital accumulation and private investment increase due to the high unit input of labour in the production process (Baxter & King, 1993). However, if the government spending increase is financed by increases in general income taxes, output reacts negatively to an increase in government spending. The private sector can also be crowded out when an increase in government spending is funded by debt. The increasing government debt raises interest rates, and this reduces the participation of the private sector in the credit market; hence, their consumption expenditure decreases.

Criticism of the RBC theory

The RBC theory has not escaped criticism. The assumption that business fluctuations are caused by shocks to production technology in the standard RBC model has been challenged. It is also argued that Total Factor Production (TFP) has endogenous components, which makes it an unreliable measure of technology shocks. The other controversy was that recessions are caused by technological regress; however, this is not supported by empirical evidence (Rebelo,2005). Mankiw (1989) also noted that the standard RBC assumption of labour supply as voluntary, and hence the fluctuation in unemployment is also voluntary, is far from reality. The standard RBC also failed to

explain why there is a high demand for leisure relative to consumption during recessions. Another point of contention is that the standard RBC model assumes that prices and wages are always flexible since they adjust to business fluctuations. Additionally, there is no information asymmetry, and labour markets are perfectly competitive. Empirical evidence does not, however, support these claims, and there is growing consensus amongst the researchers that prices and wages are sticky in the short run and that there is an existence of information asymmetry and imperfect markets (Linnemann & Schabert, 2003).

Recent Developments in the RBC Theory

Despite criticisms levelled against the RBC theory, the theory has provided the foundation for many theories, and hence, the basic RBC is taken as their point of departure. For instance, to explain the recessions, economists have looked at the role of oil shocks, fiscal shocks, investment-specific technical change, and monetary models within the RBC framework. The RBC theory is today widely used in macroeconomic analyses and is continuously being developed.

The are also sets of theories that are mainly extensions of the RBC and New Keynesian models since their analysis of the effects of government spending on other macroeconomic variables is based on the micro-theoretic foundation with optimising economic agents. These theories relax some of the features of the main theories but retain some. These features are rigid prices and wages, imperfect competitive markets, and the importance of government intervention in macroeconomic fluctuations. These theories retain some of the central assumptions of microeconomic theory, such as rational expectations by households and infinitely lived representative households whose decisions are based on the presence of an intertemporal budget constraint. Through optimising households, firms and government, the model is built to explain the behaviour of the macroeconomic phenomenon (Galí, 2018).

The standard new Keynesian model predicts that an increase in government spending will crowd out private consumption if the economic agents are Ricardian in behaviour. The Ricardian agents will decrease their consumption and increase their savings because government spending implies current and future tax liabilities, and this reduces their net wealth (Woldu, 2022).

However, when some of the assumptions of the standard New Keynesian model are relaxed, private consumption can be crowded in. For example, the New Keynesian model of Galí, López-Salido, and Vallés (2007) with the rule-of-thumb agents are an extension of the standard New Keynesian models in that they allow flexibility in prices and wages but retain the optimising assumptions of agents. With the positive income because of wages that are set by the unions, these rule-of-thumb agents can increase their consumption in response to government expenditure.

Galí et al. (2007)) modelled the effects of government spending on private consumption using the dynamic stochastic general equilibrium model with sticky prices and the inclusion of the rule-of-thumb (non-Ricardian) households, who cannot borrow and save, in coexistence with the Ricardian households. The rule-of-thumb households consume their labour income fully in each period. The model predicts that the interaction of the non-Ricardian households and sticky prices makes it possible for consumption to move positively with an increase in government expenditure.

According to the authors, sticky prices make it possible for real wages to increase, and in turn, the labour income increases. The increase in labour income stimulates the desire of non-Ricardian households to consume more. Since the non-Ricardian households' consumption depends solely on their labour income, the negative wealth effects of current and future taxes that finance increased government spending and thereby crowd out consumption are more than offset by the sensitivity of the rule-of-thumb households' labour income to an increase in government spending. In support of the model predictions, Galí (2004) outlines the following necessary conditions for aggregate consumption to increase in response to persistent government spending, namely,

- There should be a large fraction of non-Ricardian households compared to Ricardian households since the latter will decrease their aggregate consumption due to the negative dominant net wealth effect when the government spending increases. For the Ricardian households, government spending implies current and future tax increases to fund the current expenditure.
- There should be the existence of non-competitive labour markets so that both Richardian and the rule of thumb households work the same hours,

- High stickiness of prices. With persistent government expenditure expansion, hours of work will also increase, and real wages must also increase or at least contain the decline of real wages. The increase in real wages should positively impact the disposable income. This substantial increase in disposable income can encourage a rise in aggregate consumption of non-Ricardian households.
- Changes in income tax should be put on hold in the short run so that disposable income is not affected. This will hold if the persistent government spending is mainly financed by deficit instead of increases in income taxes, so that non-Ricardian households can increase consumption in response to an increase in government expenditure.

However, private investment can be crowded out in Gali et al (2007) new Keynesian model with the rule-of-thumb agents because of their smoothening consumption, which can raise interest rates. Therefore, larger government spending can stabilise aggregate consumption, output and employment and thus stabilise the economy and mitigate the effects of recessions if consumers are mainly the rule of thumb.

The theory of 'Deep Habits' predicts that an increase in government spending raises the consumption of households. According to Ravn, Schmitt-Grohé, and Uribe (2006) households are assumed to have preferences (form deep habits) over certain types of goods and become addicted to the consumption of certain goods. This assumption is made on models such as the 'Deep Habits' that have imperfect competitive product markets. This implies aggregate demand and supply dynamics. From the demand side, higher consumption of a particular good by the household implies that the household will be willing to buy that good in the future through the force of deep habit, all things equal. This characteristic of the demand function will alter the dynamic optimal pricing model of the firms. Firms will take into consideration past sales in setting today's prices, and the effect today's prices will have on the future demand for their goods. The deep habits assumption leads to the theory of time-varying and endogenous mark-ups of prices over marginal cost.

According to this model, aggregate consumption demand has two demand components, namely, the price-elastic demand and perfectly price-inelastic demand. The increase in government spending raises aggregate demand. Aggregate demand, in turn, raises the price-elastic component of the aggregate demand. The price-elastic

demand component induces the firms to lower the markup price over the marginal cost since there is an inverse relationship between the price elasticity of demand and the markup. This results in a countercyclical mark-up price over marginal cost. This increases labour demand, and if labour demand is sufficiently higher than the labour supply, real wages show upward movement due to an increase in government spending. The higher wages substitute consumption for leisure, and private consumption is increased (Zubairy, 2014). Therefore, a larger government will increase the welfare effects of the agents and stabilise their aggregate labour incomes.

The other strand of literature has looked at the government spending effect in the business cycle in an environment whereby government spending enhances the productivity of the private sector. Linnemann and Schabert (2006) argue in their model with sticky prices and with inter-temporal optimising households, that private consumption, real wages, and employment can rise if government spending is not viewed as wasteful but is an input into the production possibilities. Government spending is productive because it increases labour productivity and hence lowers the marginal cost of firms. The decrease in production costs due to an increase in government spending also lowers inflation.

In this situation, the cooperation of the fiscal and monetary authorities is very crucial. The model also assumes that consumption and interest rates are related to inflation. Since the assumption is that the monetary authority is active in the control of inflation through the policy rate, the monetary authority will reduce the nominal interest rate when inflation is low. Having both inflation and nominal interest rates low, households gain value in their disposable incomes, and this triggers their propensity to spend. The result is a rise in aggregate consumption, real wages, and employment. Therefore, the negative wealth effects of taxation are mitigated by government spending to improve the productivity of the private sector's production process.

However, for government spending to reduce the negative wealth effects that are associated with taxation income, there should be a fraction of spending by the government that is funded by lump-sum taxation and debt. If there are distortionary taxes, there will be a trade-off between the effects of expansionary productive spending and contractionary income taxes. Further, if the monetary authority is

passive in setting the interest rate in reaction to inflation or there is a budget balance, the results can be reversed.

Asimakopoulos, Lorusso, and Pieroni (2021) developed a new Keynesian theoretical model with nominal rigidities which resembles that of Linnemann and Schabert (2006) to analyse the response of private consumption to government spending shocks. In this model, the total government spending is distinguished into productive public spending and unproductive public spending components. The productive component enters the production function as an input. The model predicts that an increase in the productive public spending component will elicit a positive response from private consumption, irrespective of the form of productive public spending finance, whether through distortionary taxes or lump sum taxes.

This is because a positive shock to productive spending increases labour demand compared to labour supply. The increase in labour demand pushes up wage rates and inflation. The increased labour wages will cause private consumption to rise. However, unproductive public spending should decrease private consumption because it can raise labour and capital taxes, leading to a rise in labour supply relative to labour demand. An increase in labour supply will lower wages. Therefore, high taxes required to fund the unproductive public spending shocks will lead to strong negative wealth effects on consumers. The negative wealth effects will cause a decline in private consumption.

Bouakez and Rebei (2007) in an optimising RBC model have also looked at the crowding-in of private consumption. Their model makes assumptions that consumer preferences depend on government spending and that households are habit-forming in consumption. In this model, government spending enters the utility function. According to the authors, private consumption's positive response to government spending shock happens when government spending and private consumption are Edgeworth complementary. In this manner, when they are complementary, government spending increases the marginal utility of private consumption. The increase in the marginal utility of private consumption reduces the negative wealth effects. However, for private consumption to exhibit a strong and persistent response to government spending shocks, as in VAR, households should form habits in consumption.

Wang and Gao (2011) propose that another channel through which government spending can stabilise macroeconomic volatility is through the effect of interest changes on private wealth. A reduction in government debt or deficit will lower interest rates. Similarly, a reduction in the risk premium on the government debt will increase private wealth. Therefore, both effects will decrease interest rates and stimulate private sector consumption.

The other strand of literature has looked at the non-linear effects of fiscal policy. It is argued that government spending can yield non-Keynesian effects under certain circumstances. According to Keynes, fiscal expansions create aggregate demand and bring the economy out of recessions, whereas reductions in government spending reduce aggregate demand, output, and employment and eventually lead to macroeconomic instability. However, sometimes large fiscal consolidations can bring about non-Keynesian effects. Giavazzi and Pagano (1990) and Blanchard (1990) proposed a hypothesis of expansionary fiscal consolidations (EFC) as the reason for the non-linear effects of fiscal policy.

They argue that during 'normal' times, the economy will function according to the predictions of Keynesian effects, but when there is fiscal 'stress', the economy behaves in standard neo-classical predictions. The authors explain that fiscal 'stress' is when there are high levels of debts that are accompanied by drastic fiscal adjustments. Economic agents expect that drastic fiscal consolidations imply future tax cuts which affect their future labour and capital income. If these large fiscal contractions or expansions are long-lasting, the effects of government consumption will be nonlinear. These large fiscal adjustments are followed by booms in private consumption and economic growth, as happened in Denmark, Ireland, Sweden, and other European countries in the late 1980s (Giavazzi & Pagano, 1996).

Expectations theory is another branch of literature that has examined the nonlinear effects of government spending on economic fluctuations. According to Bertola and Drazen (1991), the absence of simple relations between macroeconomic variables can also be explained by the hypothesis of expectations. Economic agents make decisions based on expectations about future economic variables, for example, the likely changes in fiscal policy (Bertola & Drazen, 1991). These expectations about future fiscal policy changes do help in explaining the impact of the current fiscal policy

on the behaviour of economic agents. If, for instance, the private sector believes that the current increase in government spending will not be sustainable and the spending cuts are inevitable in the future, the effect can be expansionary to the private sector. Bertola and Drazen (1991) developed a model in which the expectations hypothesis played a prominent role in analysing economic relations. In this model, the government spending cuts happen only when the government spending ratio to GDP reaches a certain trigger point. Therefore, spending cuts are followed by a boom in private consumption as observed in the fiscal adjustments of Denmark, Ireland, and other European countries in the late 1980s.

The other strand of literature looks at the effects of trade openness and economic globalisation on output volatility and the determination of government size. Two competing theories, compensation and efficiency hypotheses, explain the relationship between trade openness or economic globalisation and government size. According to the compensation hypothesis, open economies are exposed to external risks, and these external risks increase economic volatility. Individuals will then demand higher government expenditure as a form of social insurance for protection against these external risks. Therefore, the compensation hypothesis predicts that government size will also increase as trade openness increases. The chain is from trade openness to volatilities and then to government size (Rodrik, 1998). The opposite of the compensation hypothesis is the efficiency hypothesis, which argues that the size of the government will be reduced, and external risks/output volatility will also be low, because of economic globalisation. This happens when the quest for the international competitiveness of domestic firms and the returns foreign investors require force the national government to lower tax rates and reduce labour market regulations to attract international capital and prevent capital flight from the national economies. In this manner, with reduced tax revenues, government expenditures will be reduced (Aytaç, 2024; Mehta, 2023; Mehta, Patel, Joshi, & Patel, 2024).

The Ricardian Equivalence paradigm

The neoclassical view of debt-financed government spending and tax cuts is perceived as a household's net worth. This positive net wealth increases households' consumption and output; hence, saving is decreased in the short run, and the tax liability is shifted to future generations to satisfy the intertemporal budget constraint.

However, persistent budget deficits crowd out private investment as interest rates rise. Output and consumption also decrease (Bernheim, 1989; Elmendorf & Mankiw, 1999).

In contradiction with the neo-classical view of the effects of government spending on the economy, the Ricardian equivalence paradigm posits that the effects of government spending are neutral to consumption, output, and interest rates. This theory has influenced the academic debate on the effects of government debt on the economy. Although this theory is based on the idea of the 19th-century economist (David Ricardo), the theory has recently found rigour and vigour through Robert Barro, and hence, it is associated with him (Elmendorf & Mankiw, 1999).

The Ricardian equivalence argument is based on the insight that the lower taxes and budget deficit today will require future taxes to pay interest and repayment of the principal debt. Thus, the issuing of government debt to finance government spending and tax cuts does not represent a reduction of the tax liability burden, but it is a postponement of it. The forward-looking consumers will understand that their total liability remains unchanged, and they will not respond to tax cuts by increasing consumption. Instead, they will save the entire tax cut to meet their future tax liability. In this manner, the total national savings and other macroeconomic variables remain unchanged because the decrease in public savings (budget deficits) is met by private savings of the same size (Elmendorf & Mankiw, 1999).

Barro (1974) further advanced his argument on the validity of Ricardian equivalence on the notion of government bonds as net wealth for households. According to the author, when a government bond is issued, it represents an asset to the bondholders but a liability to the taxpayers. Therefore, a debt-financed tax cut is like a gift to a bondholder as the bondholder becomes wealthier, but the taxpayers become poorer because of the increasing burden of future tax liability. On a net basis, thus, no wealth has been created. Since the households in total are not richer than they were, there is no need for them to alter their consumption patterns in response to the tax cut.

To further strengthen the theoretical argument on the validity of Ricardian equivalence, Barro (1974) proposed the intergenerational-altruism model as a condition for the preservation of Ricardian equivalence. In this model, future and current generations act as a family, and each generation is not viewed as an independent economic actor but instead, a family having infinite lives, which represents an economic actor.

Therefore, the current generations should behave altruistically toward future generations. For instance, a family member who is alive today will decide, based on his/her income and the income of the future members of the family, how much to consume. If there is a debt-financed tax cut, the individual member of the family will not consume the extra income, but he/she will save it and leave it as a bequest to future generations (descendants) to take care of the future tax liability. In this manner, debt-financed tax cuts do not influence consumption or resource allocations. The traditional Keynesian view that government spending increases aggregate demand is rejected.

However, the Ricardian equivalence assumptions have not been left unchallenged by some economists. For instance, Mankiw (2000) questioned the assumption that consumers have rational expectations and are forward-looking in making decisions about their consumption behaviour. According to the author, the general observation is that some consumers are non-Ricardian in their spending. Their current income significantly influences their consumption, and hence, they are likely to consume the entire income today without thinking about the future tax liability. Further, some individuals do not have bequest motives but consume the extra income, resulting in decreased savings. With increased consumption, interest rates rise, and private investment is crowded out.

Despite the criticisms of the Ricardian equivalence, the theory has ignited the debate on the conventional view of government debt. It has also provided a sound theoretical framework for further research and analysis on the impact of government debt on the economy (Elmendorf & Mankiw, 1999).

2.3.2. Review of the Empirical Literature

There is vast literature on the threshold effects of government size on output volatility in OECD and USA countries, but very little in SSA countries.

Woldu (2022) employed a panel VAR estimation in 18 SSA countries to examine the effects of government size multipliers on private investment and private consumption in a state of the business cycle. The study covered the 2000 to 2018 period. Private consumption and private investment seem to respond positively to positive exogenous

shocks of fiscal policy during recessions than during booms. Thus, fiscal multipliers are larger during recessions than during booms, and hence, the Keynesian effects are supported.

The other study in SSA is that of Nwosa et al (2020), which examined the effects of government size and oil prices on output volatility in Nigeria. The authors used time series from 1961 to 2017 and employed the ARDL estimation technique on the time series data after tests were conducted for the stationarity of the variables. Co-integration tests were also done to establish the long-term relationship between variables. Nwosa et al. (2020) found a negative but insignificant relationship between government size and output volatility in Nigeria. They also reported that government spending volatility and international oil prices were the significant determinants of output volatility in Nigeria.

The effect of government size on output volatility was empirically investigated by Barro (1981) in a time series of data for the USA from 1930-1978. The Ordinary Least Squares (OLS) estimator was employed, and the results showed that government purchases, especially temporary purchases, had a strong positive impact on the output. However, Karras (1993) instead, found that only permanent government purchases have a positive effect on output and employment in the panel data of 37 countries. The author undertook the study from 1957 to 1987 of countries with different periods falling within the range of 1957 to 1987. In the study of the effects of government spending on output and employment, government spending was decomposed into permanent and temporary, and government expenditure was entered as an input production factor in the equation. Employing the Two-Stage Ordinary Least Squares to counter the effect of endogeneity, the results showed that government expenditure increases output. A 1% increase in permanent government expenditure raises output by 0.5% whilst a 1% temporary government expenditure raises output by 0.1% only. These findings are also consistent with the theory that a permanent increase in spending reduces the net wealth of economic agents and raises the optimal labour supply due to current and future taxes that must finance the increasing government expenditure. Furthermore, the findings also revealed that output is inversely related to government size; the smaller the government size, the higher the output. According to the author, the optimal government size is 20% of the GDP for the representative sample.

Blanchard and Perotti (2002) examined the effects of fiscal policy on economic activity in the USA in the post-war period. The authors used sVAR and event methods on the US data. The findings revealed that positive government spending (both consumption and investment spending) shocks increase output and private consumption. On the other hand, positive tax shocks have a negative relationship with both outputs (private consumption and private investment). However, both government spending and tax shocks have small multipliers. Surprisingly, government spending shock causes a fall in private investment, a finding that is at odds with the predictions of the standard Keynesian and Neoclassical theories.

Zubairy (2010) tested the prediction of the deep habits model on the effects of government spending shocks on macroeconomic variables in the USA data from 1954 to 2008. The model was estimated using the Laplace-type estimator. The findings showed that output, real wages, hours worked, and private consumption responded positively to a government spending shock. However, private investment responded negatively and insignificantly to the government spending shock. The author used Ramey (200) and Blanchard and Perotti's (2002) identification schemes to capture the government spending shock.

The response of private consumption to a government spending shock was also estimated by Bouakez and Rebei (2007) on the USA quarterly data, covering the 1952 to 2001 period. The predictions of the standard RBC with consumer preferences depending on government spending and households that form habits in consumption were tested. The authors used minimum-distance and maximum likelihood estimation methods. The results showed Edgeworth complementarity between government spending and private consumption. Private consumption responds positively to an increase in government spending. Further, the stimulus-response functions generated by the model mimic those of the benchmarking VAR results.

Asimakopoulos et al. (2021) investigated the response of private consumption to government spending shocks on the US quarterly data spanning from 1963 to 2013. The authors developed and estimated the new Keynesian model with nominal rigidities. Government spending was disaggregated into the productive and unproductive components. The productive component enters the production process as an input. Employing the Bayesian techniques on the data, they found that private

consumption increases in response to the productive component of public spending when there are nominal rigidities. On the contrary, unproductive spending leads to the crowding-out effects, and private consumption also decreases. The unproductive spending is also seen to be highly persistent with prolonged high labour, capital taxes, and low lump-sum taxes. These high taxes lead to strong negative wealth effects, which reduce the consumers' wage rates. The reduced wage rates cause private consumption to decline due the unproductive government spending.

Monacelli and Perotti (2008) built a two-period model with sticky prices and optimizing agents to examine the effects of government spending on private consumption, real and product wages, and the markup. The authors employed the sVAR methodology on a quarterly data sample from 1947 to 2003. The findings confirm the existing evidence of many VAR studies that a positive government spending shock generates a rise in private consumption, consumption wage, product wage, and a fall in markup. Private investment is reported to fall with a positive government spending shock.

Fata's and Mihov (2012) carried out a study on 23 OECD countries about fiscal policy as an automatic stabiliser. OLS was employed, and the results showed that fiscal policy reacts to changes in output and is also countercyclical. The stabilising role of the government size was further confirmed by Mohanty and Zampolli (2009) in a study of 20 OECD countries. Domenech et al. (2007) examined the stabilising role of the government on the economy of a sample of 20 OECD countries within the context of the RBC. The results confirmed the negative relationship between government size and output volatility.

Gali (1994) undertook a similar study by analysing the effect of the government size on output variability in the context of the RBC model. The author used data for 22 OECD countries from1960-1990 period. In testing the predictions of the standard RBC model with augmented government size, empirical evidence showed that income tax and government purchases as ratios to GDP behave as automatic stabilisers. This contradicts the predictions of the model in which income tax is a destabiliser. Both income tax and government purchases, as ratios to GDP and government purchases representing government size, have an inverse relationship with output volatility. Another striking contrast between theory and evidence is that of the magnitude of the effects of government size on output volatility. The model predicts very small effects

of government size on output volatility, whilst the data points to significant effects. This incongruence could be attributed to some of the important factors that the model may not have considered that influence output volatility.

The negative relationship between government size and output volatility was also supported by studies undertaken on 20 OECD countries and the USA from 1960-1997. Fatás and Mihov (2001) employed OLS and Instrumental Variables (Stage Two OLS regressions) in OECD data and OLS estimator in the case of the USA, to counter any reverse causality of output volatility to government size as argued by Rodrick (1998). In both the OECD and USA studies, government size appeared to reduce output volatility.

Galí et al. (2007) built a New Keynesian model with the rule-of-thumb households and sticky prices to test the effects of government spending on private consumption. The authors used US quarterly data from 1954 to 2003 to test the prediction of the model. Employing the VAR technique on the data, the results complemented those of Blanchard and Perotti (2002) and Fatas and Mihov (2001). The consumption by the rule of thumb households rises as the government spending shock increases. With regards to private investment response to government spending increase, the effect is insignificant and sometimes falls as the government spending increases. This evidence on the response of investment to government spending shock is also like Blanchard and Perotti's (2002) and Fata and Mihov's (2001) findings, with a slight difference because, with Blanchard and Perotti (2002), the investment response has been negative.

Leibrecht and Scharler (2015) examined how the availability of credit influences the relationship between government size and business cycle volatility in a panel of 18 OECD countries. The period of study spanned from 1970 to 2007. Employing first-stage regression with various instruments, the findings show that government size has a dampening effect on output growth fluctuations when the credit is tight. The findings further show that with the increasing availability of credit, government size can be associated with pronounced output growth fluctuations, and this reduces the effectiveness of the fiscal policy macroeconomic stabilisation.

Stojanovikj (2022) employed a Two-stage OLS technique to estimate the effects of government size on business cycle volatility, inflation targeting, and private

consumption volatility for 61 developing countries. The period covered was from 1990 to 2018. The results showed that government size reduces business cycle volatility but does not have a significant effect on private consumption volatility. Ambler, Bouakez, and Cardia (2017) also built a New Keynesian model to predict the effect of public spending on private consumption. In this model, all the agents are optimising, including the government. Using the VAR estimate on artificial data, the results show that government spending crowds out private consumption.

Oz-Yalaman et al. (2019) used data containing both developing and developed countries within a set of different classifications of world economies according to income to investigate the effect of government size on macroeconomic volatility. The study covered the 1960 to 2017 period. The authors modelled the output volatility using GARCH models and employed the Granger Causality technique to detect the sign and the direction of the relationship between the two variables. The results showed that output volatility is affected by its own shocks and impacted by the exogenous government size. Furthermore, the results show that the causality moves from the direction of government size to output volatility.

Debrun et al. (2008) carried out a panel study of 20 OECD countries from 1960 to 2006. The authors analysed the panel data using OLS. Although they documented an inverse relationship between government size and output volatility, the relationship seemed, however, to be weakening since the 1990s. The stabilising role of the fiscal policy was further confirmed by Debrun and Kapoor (2010) in a panel study of 49 developing and industrialised countries. They examined the effect of the fiscal policy on output volatility and consumption volatility using three dimensions of fiscal policy, namely, automatic stabilisers, discretionary policy that is linked to the business cycle, and discretionary policy that is not associated with the business cycle. OLS and instrumental variables for the government size were used. The findings revealed that fiscal policy through automatic stabilisers is effective in stabilising the economy. However, the fiscal policy that is systematically linked to the business cycle, whether pro-cyclical or counter-cyclical, does not seem to have an impact on output volatility. Lastly, fiscal policy that is not associated with the business cycle seems to increase output and consumption volatility.

The other branch of literature found evidence of a positive relationship between government size and output volatility, and, hence, destabilising. The relationship between government expenditure and macroeconomic volatility seems to be positive and, in some instances, a non-linear or even very weak positive relationship. The positive effect of government size on volatility was also found by Carmignani, Colombo, and Tirelli (2007) in a panel study of 80 countries over the 1970 to 2000 period. To counteract potential endogeneity, the system GMM estimator was used in simultaneous equations. Government size showed a positive relationship to output volatility. Carmignani, Colombo, and Tirelli (2011) repeated their study on a panel of 80 countries using simultaneous equations. The authors employed a two-stage OLS estimator to tackle endogeneity in single equations and System GMM in simultaneous equations, covering over 1970 to 2000 period. The results still confirmed that government size destabilises the economy.

Thornton (2010) used the same variables as Fatas and Mihov (2001) to test the relationship between government size and output volatility in Emerging Market Economies (EMEs) from 1970 to 2006 in panel data. A pool fixed effects estimator was employed on the panel data. The findings contrasted with those of Fatas and Mihov's (2001) results, which were obtained from the study of OECD countries. Instead, Thornton found a statistically significant positive relationship between government size and output volatility. The larger government size seemed to destabilise the economy.

Badinger (2009)'s study on OECD countries concurred with Thornton (2010). The author also found a destabilising role of the fiscal policy on the economy. The cross-sectional annual data for 20 OECD countries from 1960 to 2000 were used. The author further employed OLS and instruments to mitigate endogeneity between output gap volatility and government size. In addition, quarterly panel data with GMM estimation were employed. Both regressions showed a positive relationship between government size and output volatility in the OECD sample countries.

Fatas and Mihov (2003) examined the effects of the volatility of the discretionary fiscal policy on output volatility and economic growth of 91 countries over the period 1960-2004 using cross-sectional data. They employed OLS together with instruments of institutional variables for discretionary policy and for government spending,

urbanisation rate, dependency ratio, and log of the total population. The findings show that aggressive fiscal policy leads to macroeconomic instability.

Badinger (2012) again followed the same methodology of Fatas and Mihov (2003) in a cross-sectional study of 88 countries over the period 1960 to 2004 on the effects of the cyclicality of fiscal policy on output volatility and economic growth. Employing the weighted two-stage least squares method, the results of the study showed that both procyclical and countercyclical fiscal policies amplify output volatility and indirectly affect economic growth negatively through the transmission channel of output volatility. In support of the destabilisation effect of government expenditure, Iseringhausen and Vierke (2018) found mixed results of the effect of fiscal policy on output in their study of the role of demographics and government size on output volatility in 22 OECD countries. The study was carried out from 1961 to 2014 using a Bayesian estimator. Demographics seemed to have a negative relationship with output volatility.

Guo and Harrison (2004) modelled the effects of government purchases and income taxes on output volatility within the framework of the one-sector real business cycle (RBC). In this model, a higher income tax rate increases the elasticity of the labour supply and lowers employment due to its negative effect on the after-tax real wage. The response of hours worked to a shock in technology is enhanced. Since the higher income tax discourages people from working, and productivity drops, high-income tax increases output volatility, thus destabilising it. Baxter and King (1993) also, show in a standard RBC model with lump sum taxes that an increase in government expenditure decreases private consumption and labour supply increases due to the negative net wealth effect of high taxes. An increase in labour supply, ultimately, leads to a real wage decrease, which results in reduced private consumption.

Kormilitsina and Zubairy (2018) evaluated the quantitative performance of five models on the effects of government spending shocks on private consumption. The models are deep habits (Ravn et al., 2006); the Rule of Thumb consumers (Galí et al., 2007), Government Spending in the Utility Function (Bouakez & Rebei, 2007); Productive government spending (Linnemann & Schabert, 2006); and the baseline model. The latter does not have the features of the other models. Employing the Bayesian approach and estimating the US quarterly data from 1954 to 2010, they found that

private consumption decreased in all estimated models in response to a rise in government spending. These findings do not support the existing empirical evidence of the positive response of private consumption to government spending shocks. The difference could be brought by too many restrictions in the VAR estimates, and the method of Blanchard and Perotti (2002) for government spending shocks could be misleading.

Cogan, Cwik, Taylor, and Wieland (2010) estimated the multiplier effects of government spending within the context of New Keynesian using the reduced form VAR regressions. They run the regression analysis on the US data. The results found that fiscal stimulus packages have less multipliers, a finding that is at odds with the old Keynesian model. The findings further suggest that permanent government spending crowds out private investment and consumption. The authors also tested the model using the old Keynesians' non-Ricardian households who consume fully their after-tax earnings in each period. The findings still suggest that the government spending shocks crowd out private consumption and investment; these findings also contradict Galí et al. (2007)' study in a New Keynesian model with the rule of thumb. On the other hand, Makin (2013) and Todorov and Ivanova (2021) found no relationship between government size and output volatility.

The empirical literature on the non-linear effects of fiscal policy on economic activity has grown since the early 1990s. However, the results of these studies have been mixed and sometimes contradictory. In addition to the growing literature on the non-linear effects of government spending on economic activity, another strand of literature has uncovered the non-Keynesian effects during large fiscal consolidations or high debt-to-GDP ratios in which output and private consumption rise. These non-Keynesian effects occur during periods of 'fiscal distress'. For instance, Giavazzi and Pagano (1990) carried out a study on the effects of fiscal policy on private consumption for the 19 OECD countries, and the authors found that if the magnitude of fiscal expansion or contraction is huge and persistent, the fiscal policy effects on private consumption become non-linear, and government spending cuts are followed by high consumption and high output. Alesina and Ardagna (1998) also found the existence of non-linear effects of fiscal policy on private consumption in the analysis of OECD data.

Perotti (1999) analysed the data of 19 OECD countries using VAR, and he found that fiscal expansions reflect Keynesian effects at low debt levels and non-Keynesian effects at high debt levels. Collard, Dellas, and Tavlas (2017) examined the effects of government size on output volatility by employing the standard New Keynesian model with multiple shocks. The model predictions were tested on the US data. The results showed that government size mitigates volatility that arises from preferences, technology, cost-push, and monetary shocks, but amplifies shocks emanating from government expenditure. Further, it was found that the relationship is negative at the current government size of the USA, but the relationship turns positive at higher levels of government size. The pattern becomes a U-shape, and the turning point is determined by the crowding-out of the private investment spending component of the GDP.

Wang and Gao (2011) and Hok (2020) also found that government spending effects are non-Keynesian on private consumption in China and in Cambodia, and the Markov-switching threshold models were employed respectively. Koskela and Viren (2004) found no statistical relationship between government size (proxied by the gross tax rate) and output volatility for both panel data and time series analysis for 91 countries, from 1980-1999. For time series data, they employed both OLS and Instrumental estimators to counter potential endogeneity between government size and output volatility. The Fixed Effects estimator was employed on the panel data. The findings also indicate that the relationship between government size and output volatility is non-linear [6]

Hogan (2004) carried out a study in 18 OECD countries to examine the effects of the expansionary fiscal contraction (EFC) hypothesis during times of crisis. Employing the Mean Group estimator on the annual panel data from 1970 to 1999, the author found limited evidence of EFC effects. When government spending is reduced, consumption should increase, as found in other similar studies. However, in this study, the EFC effects seemed to be very small and did not offset the falling output in response to government spending reductions. Further, the EFC effects were not driven by large fiscal consolidations as found in other studies, but by high levels of debt.

[6] The threshold value of TAX =30 was obtained by a relatively rough search procedure

In another strand of growing literature, the effects and magnitude of government spending on the state of the economy have been of much interest. For instance, researchers will be interested to know whether government spending multipliers are the same in magnitude between recessions and economic booms. In this regard, Fazzari, Morley, and Panovska (2015) found that the positive effects of government spending on output were found during times of economic slack in the USA. Therefore, multipliers are found to be large during high economic slack but small when there is also low economic slack. Rich (2022) also found similar results of large spending multipliers during the recession than during the expansions in the USA by employing the Markov-Switching Bayesian VAR technique.

Chian Koh (2017) investigated the size of fiscal multipliers on an annual panel data of 120 countries covering the 1960-2014 period. Using the SVAR estimator, the study showed that large multipliers are found in advanced countries, also when there is low public debt or the financial development level is high, or if there is a high level of financial development or if during the business cycle downturns, there is crisis in a financial system. Further, countries that are open to trade and capital flows with flexible exchange regimes also have large fiscal multipliers.

Ramey and Zubairy (2018) investigated whether the multiplier effects of government spending differ during the amount of slack in the US economy and when interest rates are near the zero lower bound. The US quarterly data was gathered from 1889 to 2013, and employing the structural VAR estimator, the results show no evidence of larger multipliers in the periods of slack and no evidence of larger multipliers near the zero lower bound. Recently, there has been growing interest in examining the effects of globalisation and trade openness on government size, particularly in testing the validity of the compensation and efficiency hypotheses. While the relationship between openness and government size was first identified by Cameron (1978), it was Rodrik (1998) who provided a more comprehensive investigation of this relationship. Rodrik found that open economies tend to have larger government expenditures to provide social insurance against external risks associated with trade openness, thus supporting the compensation hypothesis. However, the empirical findings of Rodrik (1998) have sparked debate among scholars, with some supporting the compensation hypothesis (Aytaç, 2024; De Mendonça & de Oliveira, 2019; Kılıçarslan, Dumrul, & Dumrul, 2021; Mehta et al., 2024; Meinhard & Potrafke, 2012), while others lend

support to the efficiency hypothesis (Dura & Yalçıntaş, 2022; Kim et al., 2018; Mehta, 2023; Mehta et al., 2024). Additionally, some studies found no evidence for either hypothesis (Benarroch & Pandey, 2008, 2012, 2017; Sener, Bayrakdar, & Hacioglu, 2015).

The mixed findings are further corroborated by Gemmell, Kneller, and Sanz (2008), who reviewed 19 research papers published between 1995 and 2006, noting an equal number of studies reporting positive and negative relationships between trade openness and government size. Similarly, Anderson and Obeng (2021) reviewed 13 articles published since 2006 and found mixed results. This suggests that with recent hyper-globalisation, the relationship between economic globalisation and government size has weakened, coinciding with a general decline in the welfare state. Furthermore, a more recent study by Nga and Thach (2024) found that the relationship between economic globalisation and the welfare state is non-linear and non-monotonic for ASEAN countries, supporting both the compensation and efficiency hypotheses.

The mixed and sometimes contradictory evidence on the government size-output volatility nexus, coupled with the debate over the validity of the compensation and efficiency hypotheses, highlights a gap in the existing literature. Moreover, there is a notable scarcity of research focusing on SSA countries, with most studies concentrating on the US, OECD, and other advanced economies. Furthermore, little to no research has explored the threshold levels of government size on output volatility in this context. This study provides evidence to fill this gap.

2.4. DATA AND EMPIRICAL STRATEGY

2.4.1. Data

This study follows a quantitative research approach and uses secondary data. The choice of the period has been dictated by the availability of data and the type of estimation technique used. The threshold estimation technique proposed by Hansen (1999) requires the data to be balanced. Therefore, a strongly balanced panel data of a large sample of SSA countries with period coverage of 1997-2021. The countries are Benin, Botswana, Cameroon, Chad, Congo Democratic Republic, Congo Republic, Eswatini, Gabon, Gambia, Ghana, Guinea-Bissau, Madagascar, Mali, Mauritius, Niger, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zimbabwe.

The data has the full sample of SSA countries, and for a robustness check, from the full sample, a sub-sample has been constructed for the SSA countries whose average output volatility is more than 10% per annum (Botswana, Chad, Congo Republic, Guinea-Bissau, Mauritius, Sierra Leone, and Zimbabwe). These countries that comprise the sub-sample also have government expenditures to GDP that are more than 10% per annum, except Chad, whose government size is on average less than 10%. The intuition behind breaking down the full sample into a sub-sample of high output volatility countries is to compare the estimated threshold value of the full sample with the estimated threshold value of the sub-sample to generalize the threshold effects of government size on output volatility in SSA countries. Additionally, the study employs a set of controls that are widely used as the standard determinants of output volatility. They are trade openness, financial development, foreign direct investment, institutional quality index, and Inflation. All the variables have been obtained from the World Development Indicators Database.

2.4.2. Empirical Strategy

Description of variables and their measurements

The dependent variable is the output volatility generated from univariate GARCH 1,1. process.

Output volatility (VOL): This stands for output volatility**.** This variable is dependent in the regression equation and was generated using the GARCH (1,1.) process of Bollerslev (1986). The use of the GARCH (1,1.) method in modelling volatility series deviates from the standard practice of measuring volatility by average rolling standard deviations of GDP. Following rolling standard deviations of GDP as a measure of volatility may result in the loss of several observations in the data analysis (Everaert & Vierke, 2016).

Government final consumption expenditure (EXP): This represents government size and is proxied by general government final consumption expenditure as a % of GDP, and it is the main explanatory variable. It is also the threshold variable in the threshold model. It refers to current spending by the government on goods and services, including compensation of government employees, but excluding military expenditures. This represents government size and is proxied by general government final consumption expenditure as a percentage of GDP; it is the main explanatory variable. It is also the threshold variable in the threshold model. It refers to the government's current spending on goods and services, including the compensation of government employees, but excluding military expenditures.

Trade openness (TOP): The regression captures trade openness as the first set of control variables. It is measured by total trade as % of GDP. Trade openness positively influences output volatility through government size, and hence its omission will lead to a significant bias in the results (Mohanty & Zampolli, 2009). The second set of control variables is inflation **(INF),** financial development **(FIN),** and foreign direct investment **(FDI);** these are the standard determinants of output volatility, and they may be or may not be associated with government size. They are also included to assess the relative importance of government consumption expenditure in influencing output volatility and excluding them can also lead to serious biases.

According to Rodrik (1998) **TOP** opens up countries to external risks, which can lead to domestic economic instability, and therefore, larger governments can act as insulators from global crises. On the other hand, trade openness can encourage diversification and cushion assets from risks that arise from domestic events. The effect of trade openness on output volatility is therefore ambiguous.

FDI. This is the total foreign investment, net inflows as a % of GDP. Capital inflows from advanced countries are known to have boosted the economic growth of developing countries for many years. However, the volatility of FDI can also adversely affect the macroeconomic stability of the local countries (Kapingura, Ikhide, & Tsegaye, 2018). In theory, there is a connection between FDI and output volatility. San Vicente Portes (2007) employs the Financial Accelerator Framework of Bernanke, Gertler, and Gilchrist (1999) to explain the connection between FDI and output volatility. According to the author, international diversification through FDI provides a good opportunity for economic agents to improve their earnings when there are capital market frictions, and this can reduce aggregate output volatility. In an imperfect capital market, the strength of the Financial Accelerator depends on the correlation between GDP changes and net worth.

When there is international diversification, economic agents should theoretically have a net worth made up of domestic and foreign assets. In a closed economy, their net worth is only domestic in origin, and there is the risk that the net worth will be vulnerable to domestic changes in GDP. In contrast, economic agents will be affected by risks of domestic origin only in integrated open economies. The relationship between FDI and output volatility is a *priori* negative.

Inflation (INF): This is the annual change in the consumer price index (CPI), and it is measured in %. A positive change in CPI from the previous period to the current period denotes an increase in inflation. Studies have argued that in the early 1980s, low inflation was responsible for low output volatility (Ćorić, 2020). In support of the view that inflation and output volatility are positively related, Clarida, Gali, and Gertler (2000) observed that the monetary policy in the USA was very aggressive in bringing down inflation levels in the 1980s, and hence, output volatility might have been reduced by the monetary policy action on inflation. High levels of price variations bring about uncertainty to the producers, resulting in variability in net investment and real

economic activity. Low inflation has a stabilizing effect on output volatility in the long run. Inflation has *a priori* a positive relationship with output volatility in SSA countries.

Financial development (FIN): This refers to the sophistication level of the country and the effectiveness levels of financial intermediaries. This is proxied by the total credit provided to the private sector as a % of GDP. The extent to which economic agents can use credit markets effectively to smooth consumption implies that financial development can substitute for government size and render government size stabilization efforts unimportant, *ceteris paribus*. Thus, financial development extends the credit limit of the firms, and they become less dependent on the internal cash flows. Aghion, Bacchetta, and Banerjee (1998) argue that the developed financial systems strengthen the economy's ability to absorb shocks and, in a sense, indirectly contribute to output volatility reduction. Therefore, it is hypothesized that financial development will reduce output volatility for SSA countries.

Institutional quality index (IQI): Institutional quality index refers to the rules that govern society, such as institutions by which authority is exercised in a country. The institutional quality index is represented by the composite indicators that reflect the broad dimensions of governance, such as the rule of law, governance effectiveness, political stability, and absence of violence/terrorism, control of corruption, the degree of regulatory quality and voice, and accountability (Kaufmann, Kraay, & Mastruzzi, 2011). From the estimates of the six composite indicators of the dimensions of governance, the institutional quality index is calculated. The overall institutional quality score ranges from -2.5 to 2.5. An overall score of -2.5 represents poor and weak institutions. A country that has a score of 2.5 on institutional quality implies that there is good governance, since a positive overall score means strong quality institutions (Kaufmann et al., 2011). It is hypothesized that weak institutions exacerbate output volatility in SSA countries.

Government capital expenditure (CAP): This is defined as Gross Fixed Capital Formation as a % of GDP. CAP is government capital expenditure, sometimes called public investment spending, as opposed to the government's final consumption spending. Therefore, CAP refers to the building of schools, clinics, roads, and other major outlays that the private sector cannot afford to build. Government capital expenditure is included in the model as a control variable. However, for robustness,

CAP substitutes for government size as a threshold variable to analyse its effects on output volatility. Government capital expenditure can be viewed as productive expenditure. In the standard RBC model, government consumption expenditure crowds out private consumption. On the other hand, capital accumulation and private investment increase due to the high unit input of labour in the production process (Baxter & King, 1993). It is therefore hypothesized that government capital expenditure (CAP) will stabilize private sector consumption and investment, and the relationship between the two variables may be non-linear.

2.4.2. Estimation Approach

The study first generated the output volatility variable using the GARCH model 1,1. This was followed by the basic linear model: Pooled Ordinary Least Squares. The results of the main model, Hansen's (1999), have been analysed in detail, and similarities with the basic model have been reflected.

Generating output volatility using the GARCH Model

Output volatility is a measure of the volatility series of the GDP and is used as the dependent variable in Eq. 4 below in the threshold estimation model. This study follows the approach of Oz-Yalaman et al. (2019) and Nwosa et al. (2020) who used GARCH 1,1 and E-GARCH models respectively to generate the volatility series of output (GDP) as a dependent variable in the model specification of the relationship between government size and output volatility. The employment of the GARCH framework in estimating the conditional variance of output is preferred since it captures well the volatility series of output.

The GARCH model was specified as follows:

GARCH Model

$$logOutput_t = \beta_0 + \beta_1 logOutput_{t-1} + \in \quad (1)$$

$\in_t$ ~ *iid* (0,1)

$$h_t = \beta_0 + \beta_1 h_{t-i} + \beta_2 \epsilon^2{}_{t-j} + v_t \quad (2)$$

h_t(output volatility) is derived from eq. (2), $\beta_1 and\ \beta_2\ are$ parameters of interest and β_0 is a constant. ϵ_t is an error term that is assumed to be normally distributed with zero mean.

The basic model: Pooled Ordinary Least Squares

The impact of government size on output volatility is specified as follows: -

$$VOL_{it} = \beta_0 + \beta_1 EXP_{it} + \beta_2 FIN_{it} + \beta_3 INF_{it} + \beta_4 FDI_{it} + \beta_5 IQI_{it} + \beta_6 TOP_{it} + \epsilon_{it} \quad (3)$$

VOL represents output volatility, and it is explained by the government consumption expenditure and other control variables (financial development, inflation, foreign direct investment, institutional quality, and trade openness). The $\beta_1 to\ \beta_6$ are the parameters to be estimated. The ϵ_{it} it an error term ~ *iid (*0,1), and *i and t* are the individual country and time, respectively. This model assumes a linear relationship between government size and output volatility in SSA.

The Hansen (1999) threshold method

Theoretical Framework

There could be significant changes in government policy over time, in which a researcher will be interested in the behaviour of the series. For example, there could be a switch of the sign of government expenditure at certain ranges of government expenditure. In such cases, linear models will not be appropriate to estimate the whole sample, and hence, threshold models are better suited.

Threshold models have been widely used in econometric literature, such as the threshold autoregressive (TAR) model of Tong and Tong (1983); Chan, Petruccelli, Tong, and Woolford (1985) ; Hansen (1999) ; Barro (1990); Pevcin (2004);Facchini and Melki (2011) and Scully (2003).

Therefore, this study employs Hansen's (1999) panel threshold model to estimate the threshold levels of government size on output volatility in SSA countries. Hansen's (1999) method is superior to many panel data methods because it eliminates the potential fixed effect in a dataset, which may bias estimations if present. Additionally, this method has advantages over the quadratic threshold methods of Barro (1990), Pevcin (2004), Facchini and Melki (2011), and Scully (2003) because it does not suffer from multicollinearity and overestimation of the coefficients of threshold variables. The technique is robust compared to linear models in that it allows the splitting of the observations into groups above or below the threshold value so that an exact inference can be made about the effect of government size on output volatility in SSA countries.

The method further allows for the statistical testing of the threshold value as non-linear (Nsiah, Yusif, Tweneboah, Agyei, & Baidoo, 2021). Moreover, Hansen's (1999) threshold method is widely used in finance and economics. For example, Nsiah et al. (2021) estimated the financial inclusion threshold level for poverty reduction in SSA. Kremer, Bick, and Nautz (2013) and Law and Singh (2014) extended Hansen's (1999,2000) model on inflation and finance threshold levels on economic growth. This method is also known to yield consistent and unbiased estimates of threshold levels compared to linear models. The significance of this study lies in the fact that the threshold effects of the government capital spending (CAP) component of government size on output volatility have been compared with those of the government consumption expenditure component. The separation of government spending components into consumption and capital expenditure, and their effects on output volatility, is important to inform economic policy since they can influence different policy actions from the government

To test for the threshold effect in a single threshold model as per Eq.4, the setting is: $H_0 : \beta_1 = \beta_2$ and the $H_1 : \beta_1 \neq \beta_2$. The nuisance parameter γ is not known under the Null hypothesis but is known under the Alternative hypothesis. If the γ is known, the model will not be different from an ordinary linear model. But since γ is an unknown parameter; it becomes a nuisance parameter problem because the asymptotic distributions become non-standard, and the Wald, F, and likelihood ratio tests become invalid. The critical values cannot also be tabulated. In this instance, Hansen (1996, 1999, 2000) recommends the application of the 'bootstrapping' procedure to achieve valid results. The p-values generated from the bootstrapping method become asymptotically valid.

Following Hansen (1999), the model is specified as follows:

$$VOL_{it} = \beta_{0i} + \beta_{1i} I\,(EXP_{it} \leq \gamma) + \beta_{2i}\, I(EXP_{it} > \gamma) + \beta_{3i} X_{it} + \epsilon_{it} \quad (4)$$

To estimate the threshold of government capital expenditure on output volatility, *EXP* is substituted by *CAP* in the formula as follows:

$$VOL_{it} = \beta_{0i} + \beta_{1i} I\,(CAP_{it} \leq \gamma) + \beta_{2i}\, I(CAP_{it} > \gamma) + \beta_{3i} X_{it} + \epsilon_{it} \quad (5)$$

The subscripts *i* denotes country *(i =1,…N)* and *t,* represents period ,and $\beta_1, \beta_2 \, and \, \beta_3$ are the parameters to be estimated, whilst β_0 is a constant. *VOL* represents output

volatility. *EXP* is the government size proxied by general government final consumption expenditure as % of GDP. EXP is the main explanatory variable, and *CAP* (government capital expenditure is defined as Gross Fixed Capital Formation as % of GDP. $I(*)\ and\ EXP$ or *CAP* are the indicators of the regime and threshold variables, respectively. The γ is the unknown parameter. X_{it} is a set of controls such as trade openness, financial development, foreign direct investment, institutional quality index, and inflation. This type of modelling allows the effect of the government size *to* differ depending on whether *EXP* or *CAP* is below or above a certain unknown variable, y.

Panel Unit Root Testing

There is a need to test the series for stationarity, particularly to check whether the series is of the integration order *I*(2), which can lead to misspecification of the model. Failure to do panel unit root testing can also lead to estimation results that show a spurious relationship with an insignificant R-squared. The study used Levin, Lin, and Chu (LLC) and Im, Pesaran, and Shin (IPS) (2003). These are widely used tests and are known for their power. All the tests formulate the Null Hypothesis of no stationarity. The Alternative Hypothesis states that the series is stationary. This study used the Schwarz Information Criterion to determine the optimal number of lags.

2.5. RESULTS AND DISCUSSION

2.5.1. Summary of Descriptive Statistics of the Variables

This section discusses the results of descriptive statistics, correlation matrix, and panel unit root testing of the variables used in the empirical model.

Table 2.5.1. Descriptive Statistics of the Variables Used in the Empirical Model

Variable	Mean	Standard deviation	Minimum	Maximum
VOL	21.7624	55.2357	0.0002	912.4602
EXP	13.4884	5.3803	2.05	36.22
CAP	20.4032	8.9101	-2.42	81.02
FDI	3.4353	5.0088	-18.92	46.28
FIN	17.6660	18.7818	0.4	104.89
TOP	67.5731	28.2802	23.98	175.8
IQI	-0.0114	1.0000	-2.4105	3.1815
INF	9.1657	40.1397	-8.97	557.2

Source: Author's computation using EViews 13, 2024

Note: (VOL is output volatility; EXP: government consumption expenditure; FIN: financial development; INF: inflation rate; FDI: foreign direct investment; IQI: institutional quality index; TOP: trade openness)

From Table 2.5.1, output volatility has a mean of 21.76 and ranges between 0.0002 and 912.46 with a standard deviation of 55.24. Government consumption expenditure as a share of GDP recorded a mean value of 13.49% and a standard deviation of 5.38%. The minimum and maximum values stood at 2.05% and 36.22% respectively. Evidence from the Table also indicates that the government capital expenditure as a share of GDP has a mean of 20.40% and a standard deviation of 8.91%, with the values ranging from -2.42% to 81.02%.

When analysing the average government consumption expenditure and average government capital expenditure to GDP ratios in SSA countries, one finds that SSA countries spend less on consumption, thus 13,49% mean compared to the mean of government capital expenditure of 20.40%. The rationale for less consumption expenditure by the government to GDP could be attributed to the low demand for public goods and services since most of the population is in near subsistence living (Portillo & Melina, 2018). This relatively high government capital expenditure compared to government consumption expenditure should be cherished in a developing region like SSA. High levels of public investment create the enabling environment and the space for the private sector, especially the manufacturing and service sectors, to thrive. Public investment in energy and road infrastructure, for instance, provides the right footing and solid ground for investment to take place in the private sector. This finding agrees with Frimpong and Marbuah (2010) and Şen and Kaya (2014), but in contrast with Ouattara (2004), who reports that public investment has a crowding-out effect on private investment.

However, SSA's average government size is relatively small compared to other regions such as the OECD. For instance, the average OECD government consumption expenditure to GDP is about 20 % whilst the SSA region is 13%, thus, a 7% difference (Afonso & Kazemi, 2017). Therefore, the empirical results found in the OECD countries may not be replicated in SSA countries due to the differences in the size of the governments between the OECD and the SSA regions. This underscores the importance of this study in contributing to knowledge. The results further show that the average value of the net FDI inflow to GDP ratio is 3.44% with a standard deviation of 5.01%. The minimum and maximum values stood at -18.92% and 46.28% respectively. Again, the results show that the average value of financial development proxied by credit provided to the private sector as a percent of GDP is 17.67% with a standard deviation of 18.78%. The minimum and maximum values stood at 0.4% and 104.89% respectively. This figure is more than 30% below the average of the credit provided to the private sector to GDP ratio in the OECD and other middle-income

countries. Also, the average value of trade to GDP ratio is 67.57% with a standard deviation of 28.28%. Evidence from the table also indicates that institutional quality has a mean of -0.0114 and a standard deviation of 1.00, with the values ranging from -2.41 to 3.18. Finally, the average inflation rate is 9.17% with a standard deviation of 40.14%.

2.5.2. Pairwise Correlation Matrix of Variables

Table 2.5.2. Pair-wise Correlation Matrix

Variable	FDI	INF	FIN	EXP	CAP	TOP	VOL	IQI
FDI	1.0000							
INF	-0.0479	1.0000						
FIN	-0.1045	-0.0912	1.0000					
EXP	-0.0931	-0.1528	0.3366	1.0000				
CAP	0.4172	-0.1337	0.0166	0.0981	1.0000			
TOP	0.1751	-0.0894	0.2771	0.2925	0.3074	1.0000		
VOL	0.0297	0.0369	-0.0610	-0.0286	-0.0687	0.0994	1.0000	
IQI	-0.0202	-0.1568	0.6172	0.2448	0.1008	0.0874	-0.2365	1.0000

Source: Author's computation using EViews 13, 2024

Note: (VOL is output volatility; EXP: government consumption expenditure; FIN: financial development; INF: inflation rate; FDI: foreign direct investment; IQI: institutional quality index; TOP: trade openness)

Table 2.5.2. shows the correlation matrix of the variables employed in the study. The essence of conducting a correlation test is to find out whether the dataset contains a problem of multicollinearity. A decision rule provided by Farrar and Glauber (1967)

indicates that the correlation between the independent variables should be lower than 0.8 or 0.9. It can be observed from Table 2.5.2. that the variables of this study satisfy this criterion, implying that multicollinearity does not pose a problem for this dataset.

2.5.3. Cross-Sectional Dependence Test

It is important to conduct cross-sectional dependence in a panel data study. It has been observed that failure to take into consideration the presence of common factors across the individual cross-sections in dynamic panel estimations may lead to inconsistency and invalid statistical inferences. The problem becomes serious when the errors correlate with the regressors, as this may generate inconsistent estimations from the regressions. The common factors may emanate from the responses of countries to similar economic, political, or spatial stimuli, or common unobserved factors (Gaibulloev, Sandler, & Sul, 2014).

The Lagrange multiplier (LM) test of Breusch and Pagan (1980) has been employed to test cross-section dependence in panel regressions. Breusch and Pagan LM test (1980) is appropriate for panel data of 22 countries and 24 years of observations (T>N). The test is also relatively simple to apply and robust to breaks in slope coefficients. The Null hypothesis is that there is no cross-sectional dependence of residuals. A 5% significance level of rejection rate is set. Values that are above the 5% level of significance cannot reject the null hypothesis of no cross-section dependence. The rejection of the null hypothesis implies that the residuals are independent.

Table 2.5.3. Cross-section dependence Test

Test	Statistic	D.F.	Prob.
Breusch-Pagan LM	24.08604	231	1.0000
Pesaran scaled LM	-9.626509		0.0000
Pesaran CD	0.026311		0.9790

Source: Author's computation using EViews 13, 2024

The above Table 2.5.3. shows the results of the cross-section dependence test. The table shows that two of the three tests are not significant and are also above the 5% level of significance set for rejection. Therefore, the null hypothesis of no cross-section dependence in the residuals cannot be rejected. It is concluded that the errors are not correlated in the panel but are independent of others.

2.5.4. Panel Unit Root Test Results

Table 2.5.4. LLC and IPS Panel Unit Root Test Results

Variable	LLC	IPS
FDI	-3.1554	-6.54323
INF	-8.5597	-14.0706
FIN*	-17.526	-17.0644
EXP	-3.15353	-4.23199
CAP	-2.21386	-2.33118
TOP	-3.98191	-3.50018
VOL	-5.20955	-5.48085
IQI	-2.89792	-2.64981

Note: 1st differencing is shown by an asterisk * (LLC is Levin, Lin & Chu; IPM is IM, Pesaran & Shin). (VOL is output volatility; EXP: government consumption expenditure;

FIN: financial development; INF: inflation rate; FDI: foreign direct investment; IQI: institutional quality index; TOP: trade openness)

Source: Author's computation using EViews 13, 2024

The study carried out a panel unit root test on both the independent and dependent variables using the approaches of LLC and IPS to check the stationarity or otherwise of the time series variables. The Null hypotheses of these tests state that the series have unit roots. The LCC and IPS tests reject the null hypothesis of the presence of unit roots. Both the LLC and IPS panel unit root results indicate that FDI, inflation, government consumption expenditure, government capital expenditure, trade to GDP ratio, output volatility, and institutional quality are stationary at the level. Financial development proxied by to total credit to GDP ratio is stationary at first difference. The variables are also significant at 1%, 5%, and 10% levels. Thus, the variables are integrated of order zero except for FIN. This fulfils Hansen's (1999) assumption that the variables should be stationary for the threshold estimation.

2.5.5. Panel Pedroni Cointegration Test Results

The essence of testing for cointegration in the variables is to make sure that variables move together and that there is an existence of long-term relationship between variables. Pedroni's (1996) test was used to test the existence of cointegration between output volatility and other variables. This test is residual-based; thus, it tests whether there are unit roots in the residuals, and it is popularly used in heterogeneous and homogenous panels. The Pedroni panel cointegration test has the advantage over many panel cointegration tests in that it uses many tests for a better verdict of rejection or non-rejection of the Null hypothesis of no correlation. It is also known for its power and consistency in the application.

Table 2.5.5. Pedroni panel cointegration test results

Test	Test-Statistic	P-value
Modified Phillips–Perron test	4.7068	0.0000***
Phillips–Perron test	-0.3554	0.3611
Augmented Dickey-Fuller test	-2.0539	0.0200**

Note: **/*** denote 5% and 1% level of significance

Source: Author's computation using Stata 18, 2024

The above Table 2.5.5. shows the results of the Pedroni panel cointegration test. The results are made up of three tests. Two out of three tests have test statistics and p-values indicate that government size and output volatility in SSA have a long-run relationship. Thus, two of the three tests indicate that the variables are significant at the 1% and 5% levels. The cointegration of the variables enables Hansen's (1999) threshold model to be applied to the variables, allowing for the estimation of the presence of thresholds (s).

2.5.6. Results of the POLS and Hansen's Models

The following Tables show the results of the POLS and government consumption expenditure threshold and government capital expenditure threshold estimates on output volatility, together with estimates of the effects of control variables on output volatility.

Table 2.5.6.(i) Pooled Ordinary Least Squares Results

Variables	Coefficient	Std Errors	T-Statistic	p-value
VOL				
EXP	0.396	0.375	1.06	0.291
FIN	-0.368	0.202	-1.82	0.069*
INF	0.006	0.003	1.39	0.165
FDI	0.039	0.027	1.41	0.160
IQI	-0.490	0.167	-2.93	0.004***
TOP	0.016	0.005	3.08	0.002***
Constant	1.928	0.928	1.79	0.073*

Note: */**/*** represent the significance levels at 10%/5%/1% respectively.

(VOL is output volatility; EXP: government consumption expenditure; FIN: financial development; INF: inflation rate; FDI: foreign direct investment; IQI: institutional quality index; TOP: trade openness)

Source: Authors' computation using Stata software, 2025

The results of the POLS model show that the influence of government consumption expenditure on output volatility in SSA is positive but statistically insignificant. This result may resonate with many studies that the linear relationship between government size and output volatility in SSA has yielded mixed evidence (Badinger, 2009, 2012; Debrun & Kapoor, 2010; Debrun et al., 2008; Domenech et al., 2007; Fatás & Mihov, 2001, 2012; Gali, 1994; Iseringhausen & Vierke, 2018; Makin, 2013; Nwosa et al., 2020; Todorov & Ivanova, 2021). Further, this result may suggest that the relationship between government size and output volatility in SSA is non-linear, and hence, the non-linear models are best suited for the kind of data.

For control variables, financial development and institutional quality are inversely related to output volatility and are significant at 10% and 1% levels, respectively. It means a unit rise in financial development and institutional quality decreases output volatility by 0.368 and 0.490 units, respectively. Trade openness is positively related to output volatility, and it is significant at 1% level. Its magnitude is, however, weak as represented by the size of the coefficient. A 1 % increase in openness results in an increase of 1.6 % output volatility in SSA. Inflation and foreign direct investment do not influence output volatility in SSA.

Table 2.5.6. (a) Threshold Estimate of Government consumption expenditure on output volatility

Model	Threshold	Lower	Upper	F-statistic	P-value
Threshold 1	4.3300	4.0050	4.5700	67.08	0.0933*

Table 2.5.6. (b) Fixed Effects Model Estimation Results for the Threshold of Government Size on Output Volatility

Variable	Coefficient	Standard error	t-statistic	p
FDI	0.0872173	0.4430724	0.20	0.844
FIN	-0.5915461	0.3201459	-1.85	0.065 *
TOP	0.0706147	0.1576891	0.45	0.654
INF	-0.0944165	0.0565321	-1.67	0.095*
IQI	-8.204396	5.615936	-1.46	0.145
EXP Threshold (0)	34.98746	5.322577	6.57	0.000***
EXP Threshold (1)	1.510176*	0.8608642	1.75	0.080*
Constant	5.749439	16.67176	0.34	0.730
No. of observations	550			
No. of groups	25			
F-test	0.000***			
R^2	0.1097			

Note: */*** denote 10% and 1% levels of significance

Source: Author's computation using Stata 18, 2024

The study successively estimates the model with one and two thresholds to identify the number of thresholds. Hansen's (1999, 2000) method suggested a "bootstrap" method to compute the asymptotic distribution of test statistics using the likelihood ratio test to test the significance of threshold effects. The P-values derived from the bootstrap become asymptotically valid.

The F-test statistic of 67.08 (bootstrap p-value = 0.0933) in Table 2.5.6 (a) above has a 10% significance level. The study revealed a single-threshold model to determine the threshold value. The government consumption expenditure to GDP ratio indicates a threshold estimate by which a rise in this ratio may have an impact on SSA's output

volatility. This study provides additional evidence on the effects of government size on output volatility in SSA countries. Overall, a relationship between government size and output volatility is observed. The study reveals a threshold level of 4.33% for government size, beyond which the impact of government size on output volatility diminishes. Specifically, a smaller government size appears to amplify output volatility, while an increase in government size leads to a reduction in volatility. These results partially align with the Keynesian framework. The impact of government size below the threshold is more than the government expenditure above the estimated threshold. With the low level of government expenditure (government expenditure below 4.33%) impacting output volatility in SSA, the result coincides with Oz-Yalaman et al. (2019)' findings which also found that small government size increases output volatility for selected countries in the world. Again, government consumption expenditure above 4.33% shows that increases in government expenditure increase output volatility in SSA. The result implies that a lower level of government expenditure makes the output more volatile than a higher level of government expenditure. This finding is also consistent with empirical evidence found in other studies (Badinger, 2009, 2012; Carmignani et al., 2011; Koskela & Viren, 2004; Thornton, 2010). This is in line with Debrun and Kapoor (2010) who found that the relationship between the variables is non-linear and government expenditure is already large in the euro area, exceeding 45 percent of GDP on average, a range in which any further increase in size does not appear to yield any meaningful benefit in terms of automatic stabilization.

The various schools of thought make the effect of government expenditure on output volatility somewhat ambiguous. It depends on the economy planners whether they follow Keynesian, Classical, or Ricardian paradigms. If they follow the Keynesian paradigm, continued expansion of government size will stabilize output in the short run. In contrast, Classical economists believe that the continued spending by the government will drive away investments and increase output volatility, whilst government spending is inconsequential for the Ricardian followers (Foresti & Napolitano, 2017). The result found in SSA partially supports the Keynesian argument that a low level of government spending increases output volatility, and increasing government size dampens output volatility. However, the weakening impact of government consumption expenditure above the 4.33 % threshold may indicate that the influence of government consumption expenditure to GDP on output volatility is

counteracted by high inflation in SSA, which has been found to have a negative effect on output volatility as per the estimation results in Table 2.5.6. (b).

Portillo and Melina (2018) argue that SSA economies have a relatively small share of government consumption expenditure to GDP ratio since there is a low demand for public goods, as most people are dependent on subsistence living. The results of this study can be generalized among the SSA countries since their average expenditures are far above the estimated threshold, and probably the reason for the relatively high output volatility compared to other developing regions. For instance, despite the relatively small size of an average SSA country compared to OECD countries, some countries such as Cameroon, Chad, Congo Republic, Senegal, and Tanzania have expenditures above the threshold value, indicating that those countries might be spending beyond the optimum, which could have inflationary pressures on their economies.

Among the control variables, both TOP and FDI show positive signs of their coefficients but exert an insignificant effect on output volatility even at the 10% level of significance. This means that FDI inflows do not contribute to output volatility in SSA. Foreign investors are likely to be cautious in investing in SSA countries, given the high occurrence of ethnic conflicts coupled with unstable economies. The weak, positive, and insignificant relationship between TOP and output volatility is likely to indicate that SSA countries are not well integrated into global markets and therefore, not highly vulnerable to global shocks. However, financial development exerts a significant effect on output volatility at the 10% level of significance in SSA. The magnitude of the coefficient shows that a unit increase in financial development reduces output volatility by 0.59 units. This means that the financial sector reduces the volatility of output in SSA and can be a substitute for government size. The result of this study is consistent with some strands of literature.

The first, which relates to finance and development, argues that developed financial systems enhance the economy's ability to absorb shocks and help reduce output volatility. For instance, Aghion et al. (1999) built a macroeconomic model that combines financial market imperfections with unequal investment opportunities. Their model predicts high volatility in the absence of a developed financial sector. They argue that savers and investors are separated when the financial sector remains

underdeveloped, and credit supply and demand are more cyclical. Investors are likely to be locked out of the credit market when the economy faces an adverse shock and to rush into the credit market when the economy absorbs a positive shock. In such situations, volatility is bound to increase.

Acemoglu and Zilibotti (1997) point out another important connection between the development of the financial sector and volatility by highlighting the importance of diversification in reducing risk. They argue that diversification is not possible in the early stages of development, given the indivisibility of capital. However, once wealth accumulates, diversification becomes possible, and investment increases. In this situation, investment volatility and risk are reduced.

Again, inflation has a significant effect on output volatility at the 10% level of significance in SSA. The results indicate that a 1% increase in inflation reduces output volatility by 0.09%. The result is a surprising one, as argued in Logue and Sweeney (1981). It is contended that a high inflation rate makes it more difficult for producers to distinguish between nominal and real demand shifts and thus causes higher fluctuations in relative prices than are seen in a low-inflation regime. As relative price variations create additional producer uncertainty, the result shows more variability in real investment and economic activity. However, Portillo and Melina (2018) argue that this surprising negative relationship between inflation and output volatility could be attributable to the aggregate supply factors instead of demand-driven inflation rates in SSA countries. Further, they posit that SSA countries do not have a clear business cycle as seen in advanced countries. Nevertheless, this result deviates from the findings of Coric (2020), who found a positive effect of inflation on output volatility.

Finally, institutional quality has an insignificant effect on output volatility even at a 10% significance level in SSA. This finding is at odds with the theoretical framework of Acemoglu et al (2003), which argues that there is a strong connection between institutional quality and output volatility in developing countries, particularly in SSA countries. Weak institutions result in poor macroeconomic policies, which in turn lead to macroeconomic instability.

2.5.7. Threshold Estimate of Government Capital Expenditure on Output Volatility-Results

Tables 2.5.7 (i) and (ii) below report the results of the threshold estimation of government capital expenditure (CAP) on output volatility.

Table 2.5.7 (i) Threshold Estimate of Government Capital Expenditure on Output Volatility

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	20.4700	20.4400	20.7700	6.50	0.5400
Threshold 2	20.5900	20.5700	20.6000	45.72	0.0433

Table 2.5.7. (ii) Fixed Effects Model Estimation Results for the Threshold of Capital Expenditure on Output Volatility

Variable	Coefficient	Standard error	t-statistic
FDI	-0.1102349	0.4765558	-0.23
FIN	-0.557125*	0.3155354	-1.77
TOP	0.0836037	0.166183	0.50
INF	-0.0321645	0.0545532	-0.59
IQI	-13.35777**	5.574658	-2.40
CAP Threshold (0)	0.625437	0.5748965	1.09
CAP Threshold (1)	6.79657***	1.010719	6.72
CAP Threshold (2)	0.2345132	0.3695143	0.63
Constant	16.88802	14.21999	1.19
No. of observations	550		
No. of groups	25		
F-test	0.000		
R^2	0.0953		

Note: */**/*** denote 10%, 5% and 1% significance level

Source: Author's computation using Stata 18, 2024

The study successively estimates the model with one and two thresholds to identify the number of thresholds. The F-test statistic of 45.72 (bootstrap p-value = 0.0433) is significant at 5% level. (See threshold effect test table in Table 2.5.7. (i) and (ii) for the threshold test results.

The study calculates the double-threshold model to determine the threshold values. The government capital expenditure to GDP ratio is the threshold estimate by which a rise in this ratio may have an impact on SSA's output volatility. According to the findings, the government capital expenditure to GDP ratio below 20.47% has an insignificant impact on output volatility in SSA countries. This contrasts with the findings on the threshold effect of the government consumption expenditure to GDP ratio on output volatility, in which government consumption expenditure to GDP ratio of below 4.33% has a large impact on output volatility, but little impact above 4.33%. The effect of government capital expenditure to GDP value between 20.47% and 20.59% is positive and significant for the government capital expenditure to GDP ratio Threshold (1). Finally, for the government capital expenditure to GDP ratio, the effect of government capital expenditure to GDP value greater than 20.59% is insignificant (Threshold (2)).

The results show that a low level of government capital expenditure (government capital expenditure below 20.47%) has an insignificant effect on output volatility, even at the 10% level of significance in SSA countries. However, government expenditure between 20.47% and 20.59% shows that an increase in government capital expenditure increases output volatility in SSA countries. Again, when government expenditure is above 20.59%, increases in government expenditure do not affect output volatility in the sub-region. There is a lack of empirical evidence on the association between government capital expenditure and output volatility. However, the theoretical literature argues that if government expenditure is viewed as productive, thus as input into the production process, it can dampen output volatility. Linnemann and Schabert (2006) built a model with nominal rigidities, and government spending was regarded as productive. They predicted that productive government spending increases private consumption and investment, increases wages, and

lowers unemployment. Overall, there is weak evidence that government capital expenditure increases output volatility, as shown by the data above the 20.59% threshold.

2.5.8. Threshold Estimate of Government Consumption Expenditure on Private Investment

The study successively estimates the model with one and two thresholds to identify the number of thresholds. Tables 2.5.8 (a) and (b) below show the results of the estimated threshold of government consumption expenditure on private investment.

Table 2.5.8 (a) Model Results for the threshold of government expenditure on private investment

	Model 1				
Model	**Threshold**	**Lower**	**Upper**	**F-statistic**	**P-value**
Threshold 1	4.9500	4.7400	5.4000	15.95	0.2100
Threshold 2	22.3800	21.3650	25.1000	23.52	0.0567

Table 2.5.8.(b) Fixed Effects Model Estimation Results for the Threshold of the Government Expenditure to GDP Ratio for Private Investment

Variable	Coefficient	Standard error	t-statistic
FDI	0.4531979***	0.0430189	10.53
FIN	0.1520384***	0.0307441	4.95
TOP	0.1187211***	0.015233	7.79
INF	-0.0000246	0.0053799	-0.00
IQI	0.5102328	0.5410483	0.94
EXP Threshold (0)	0.0373027	0.0897048	0.42
EXP Threshold (1)	0.9564287***	0.1598252	5.98
EXP Threshold (2)	0.0760793	0.0866173	0.88
Constant	2.191091	1.660294	1.32
No. of observations	550		
No. of groups	25		
F-test	0.0000		
R^2	0.1442		

Note: *** represents a 1% level of significance

Source: Author's computation using Stata 18, 2024

This study also estimated the threshold levels of government consumption expenditure on private investment and private consumption. The study calculates the double-

threshold model to determine the threshold values. The government consumption expenditure to GDP ratio is the threshold estimate by which a rise in this ratio may have an impact on SSA's private investment. Table 2.5.8. (a) and (b) show the threshold estimated results of the government expenditure to GDP ratio on private investment expenditure. According to the findings from the above Tables 2.5.8 (a) and (b), the government consumption expenditure to GDP ratio below 4.95% has an insignificant impact on private investment in SSA. The effect of government expenditure to GDP value between 4.95% and 22.38% is positive and significant for the ratio of government consumption expenditure to GDP Threshold (1). Finally, for the government consumption expenditure to GDP ratio as indicated in Threshold (2), the effect of government expenditure to GDP value greater than 22.38% is insignificant.

The results show that a low level of government expenditure (government expenditure below 4.95%) has an insignificant effect on private investment, even at the 10% level of significance in SSA. However, government expenditure between 4.95% and 22.38% shows that increases in government expenditure increase private investment in SSA. The result aligns with the neoclassical arguments that there is a complementarity relationship between government consumption expenditure and private investment. The complementarity hypothesis emphasizes that government spending on infrastructure and human capital is likely to raise the marginal productivity of private capital and therefore induce more private investment, i.e., it may lead to a crowding-in effect. Again, when government expenditure is above 22.38%, increases in government expenditure do not affect private investment in SSA. The likely interpretation could be that government expenditure that is above the 22.38% threshold may signal future increases in taxes or unsustainable debts, which can cause the response of the private sector to be muted or even be crowded out.

Among the control variables, the results show that FDI exerts a significant effect on private investment at the 1% level of significance in SSA. The magnitude of the coefficient shows that a 1% increase in FDI and private investment increases by 0.58%. This means that FDI inflows contribute significantly to the private sector investment in SSA. As some multinational firms acquire labour and raw materials locally, they are potential sources of new demands for local inputs to local firms and the creation of labour income that stimulates local demand and encourages domestic

investment. FDI inflows can also be a source of network effects and agglomeration economies, which attract additional foreign investors and create complementarities with domestic firms (Glaister, Driffield, & Lin, 2020; Markusen & Venables, 1998). Domestic firms may respond to FDI inflows by renewing and increasing their capital stock to face competition (De Mello Jr & Fukasaku, 2000). Massive FDI inflows may also trigger large local or regional investments in infrastructure that increase the profitability of domestic investment (Cardoso & Dornbusch, 1989).

Also, financial development exerts a significant effect on private investment at 1% level of significance in SSA. The magnitude of the coefficient shows that a 1% increase in credit to GDP ratio increases private investment by 0.15%. Jalilian and Kirkpatrick (2005) and Owusu and Odhiambo (2012) highlighted some benefits of a developed financial sector, such as facilitating domestic enterprises' access to local funds that will enable them to purchase new equipment, adopt advanced technology, attract skilled labour, ease the credit constraint encountered by foreign companies, and the ability to guide foreign direct investment in creating backward linkages with the rest of the economy.

The results further show that trade openness has a significant effect on private investment at the 1% level of significance in SSA. The magnitude of the coefficient shows that a 1% increase in trade to GDP ratio increases private investment by 0.05 %. This means that liberalisation of trade stimulates investment in the private sector in SSA. This suggests that trade openness has an important role in improving investment through boosting exports and making the importation of intermediate, capital goods, and new technology much easier, which motivates investment in the country. The study agrees with the results of Naa-Idar, Ayentimi, and Frimpong Magnus (2012). However, inflation and institutional quality have insignificant effects on private investment even at the 10% level of significance in SSA.

2.5.9. Threshold Estimate for countries with high output volatility

The tables below show the results of threshold estimates for countries with high output volatility.

Table 2.5.9 (a) Threshold Estimate for countries with high output volatility.

Model	Threshold	Lower	Upper
Threshold -1	4.1600	3.6000	4.2700

Source: Author's computation using Stata 18, 2024

Table 2.5.9 (b)Threshold Estimation (Hansen, 1999) Results

Variable	Coefficient	Standard Error	T-Statistic
IQI	-22.139	14.681	-1.51
TOP	0.079	0.445	0.18
FIN	-0.422	0.666	-0.63
INF	0.030	0.141	0.21
FDI	0.319	0.854	0.37
EXP Thres (0)	61.761*	12.457	4.96
EXP Thres (1)	3.231	1.951	1.66

No of observations: 175

No of groups: 7

F-Test: 0.0002

R-squared: 0.1575

Note: * represents a 10% level of significance

Source: Author's computation using Stata 18, 2024.

As a robustness check, Tables 2.5.9. (a) and (b) show the threshold estimate of the SSA countries that have relatively higher output volatility compared to other SSA countries in the full sample. They are Botswana, Chad, Congo Republic, Guinea-Bissau, Mauritius, Sierra Leone, and Zimbabwe. Their output volatility over the observed period is more than 10% per annum. The threshold estimate is 4.1% and

significant at 1%, and it is also not much different from the average threshold value of the full sample, which is 4.33%. The findings further indicate that government expenditures below 4.1 % of the countries with relatively high output volatility have a greater impact on output volatility than when their expenditures are above 4.1 % of the GDP. These results also resonate with the findings of the full sample regarding the effect of government size changes on output volatility at lower levels of government expenditure. These results further confirm that smaller government size aggravates output volatility in SSA, and a larger government size potentially has little impact on or moderates output volatility in this sub-region.

2.5.10. Causality Analysis: Toda & Yamamoto's (1995) Test

We also estimated the causal relationship between government size and output volatility for the individual SSA countries using Toda & Yamamoto's (1995) Causality Test. Table 2.5.10 shows the results of the Causality Test. Of the 22 countries, 13 SSA countries show a long-run causal relationship between government size and output volatility. Further, there is a one-way causal relationship running from government size to output volatility for 8 SSA countries, and 5 countries have a causal relationship running from output volatility to government size. There is no causal relationship between government size and output volatility for the 9 SSA countries.

While causality varies, reflecting country-specific dynamics, such as unique structural and economic conditions across SSA, we could note that this does not detract from the robust threshold relationship found across SSA. Moreover, as pointed out by Hamilton (1990), economic variables respond differently to time dynamics and fluctuate during the business cycle's expansion and contraction phases. The presence of the threshold effects of government size on output volatility has also been supported by the study of Collard et al. (2017) in the USA. The authors found that the relationship between government size and output volatility is U-shaped. Again, Woldu (2022) also found the non-linear effects of government spending multipliers in the different phases of the business cycle in 18 SSA countries. Therefore, the diversity in causal directions offers additional context rather than validating the threshold effect.

Table 2.5.10.(a) Causality Test Results of Toda & Yamamoto (1995)

Country	Direction of causality	Country	Direction of causality
Benin	EXP → VOL	Mali	EXP — VOL
Botswana	EXP → VOL	Mauritius	EXP ← VOL
Cameron	EXP → VOL	Niger	EXP — VOL
Chad	EXP ← VOL	Senegal	EXP — VOL
Congo Dem	EXP — VOL	Sierra Leone	EXP — VOL
Congo Rep	EXP ← VOL	South Africa	EXP → VOL
Eswatini	EXP → VOL	Tanzania	EXP → VOL
Gabon	EXP — VOL	Togo	EXP — VOL
Gambia	EXP → VOL	Uganda	EXP — VOL
Ghana	EXP — VOL	Zimbabwe	EXP → VOL
Guinea-Bissau	EXP ← VOL		
Madagascar	EXP ← VOL		

Note: The lines with arrows show the direction of a causal relationship, and lines without arrows represent the absence of a causal relationship between EXP and VOL. *Source*: Author's compilation using EViews 13, 2024.

Panel Toda and Yamamoto's (1995) Causality Test Results for TOP and EXP; TOP and VOL

There is an ongoing debate about the effects of trade openness and economic globalisation on the size of government and output volatility via the compensation hypothesis and efficiency hypothesis. We also add to the ongoing debate by estimating the causal relationships between trade openness and government size on one side and trade openness and output volatility on the other side. The results of the panel Causality test of Toda and Yamamoto (1995) table below, show that the causal relationship between government size and trade openness does not exist. However, a one-way causal relationship seems to exist from the direction of trade openness and output volatility. This finding supports the compensation hypothesis.

Table 2.5.10 (b) Panel Causality Analysis: TOP and EXP; TOP and VOL

Variable	Direction of causality
TOP and EXP	TOP ⟷ EXP
TOP and VOL	TOP → VOL

Source: Author's compilation using EViews 13, 2024

2.6. SUMMARY OF THE FINDINGS, CONCLUSIONS, AND POLICY RECOMMENDATIONS

2.6.1. Summary of the findings and Conclusion

This study has investigated the threshold effects of government consumption and government capital expenditures as ratios to GDP on output volatility in Sub-Saharan Africa (SSA). Regarding the threshold levels of the government consumption expenditure to GDP ratio, the results indicate the presence of a single threshold level. The findings further reveal that a government consumption expenditure to GDP ratio below the estimated threshold has a more significant impact on output volatility than when it exceeds the threshold. Therefore, an increase in government expenditure below the threshold amplifies output volatility more than government consumption expenditures above the threshold. In contrast, the government capital expenditure to GDP ratio shows a dual threshold effect on output volatility in SSA. The two thresholds have distinct effects on output volatility: the first threshold has no significant impact, while the higher (second) threshold increases output volatility.

Empirical evidence on the relationship between government capital expenditure and output volatility is limited. Among the control variables, the effects of foreign direct investment (FDI), financial development, inflation, trade openness, and institutional quality on output volatility were also examined. Of these five variables, only financial development and inflation exhibit negative effects on output volatility and are statistically significant. The other variables show weak positive relationships and are

insignificant to output volatility. The negative coefficient of financial development suggests that it may be a more important factor in ensuring macroeconomic stability in SSA countries than government size, ceteris paribus. The results of the Causality test indicate that of the 22 countries, 13 SSA countries show a long-run causal relationship between government size and output volatility. Further, there is a one-way causal relationship that runs from government size to output volatility for 8 SSA countries. But 5 countries have a causal relationship running from output volatility to government size. Moreover, there is no causal relationship between government size and output volatility for the remaining 9 SSA countries.

2.6.2. Recommendations

Policymakers should consider increasing social security spending to provide relief to the unemployed, elderly, and disabled in response to external risks exacerbated by globalisation. SSA governments should also prioritise investing in the development of the financial sector to foster sustainable economic growth, as financial development appears to have a more substantial impact on output volatility. Economic diversification is another key strategy to mitigate both domestic and global risks. A practical approach would involve attracting private sector investment by strengthening governance and focusing on the development of financial intermediaries, which have proven effective in allocating resources between lenders and borrowers. Additionally, tax concessions and other investor-friendly policies could serve to attract foreign direct investment.

2.6.3. Limitations of the study and future areas of research

A limitation of this study is the relatively small sample size of SSA countries used. The unavailability of data over a longer time frame and the inability to include more countries prevent a comprehensive analysis of the dynamics between government size and output volatility in SSA. Additionally, the results are generalised across the SSA region, despite the small sample size. Future research should extend the time horizon and explore the threshold effects of government size on output volatility for individual SSA countries. This would allow for the estimation of country-specific thresholds, enabling the customisation of fiscal policy for each nation.

CHAPTER THREE

3. THE ASYMMETRIC EFFECTS OF GOVERNMENT SIZE ON INFLATION

3.1. INTRODUCTION

Inflation is one of the most important macroeconomic variables in policymaking because it affects the entire economy, and ultimately, society suffers. Although inflation levels differ from region to region or from one country to another, inflation is a problem in many of the SSA countries since it is relatively high and volatile compared to other developing countries (Olaoye et al. 2023). According to Olaoye et al. (2022), the high and volatile inflation in SSA adds to the already high poverty, unemployment, and inequality in these countries. Further, these countries have weak institutions to address many of the macroeconomic challenges. For the illustration, figure 3.1 below compares the average inflation rates for SSA with the Middle East and North Africa (MENA), a sub-region that shares developing characteristics with SSA over the period from 1998 to 2021. The SSA countries show higher average inflation rates than MENA. They are also relatively more vulnerable to economic shocks than the other MENA countries, as shown by inflation spikes during the 2007-2009 global financial crisis and the recent COVID-19 pandemic.

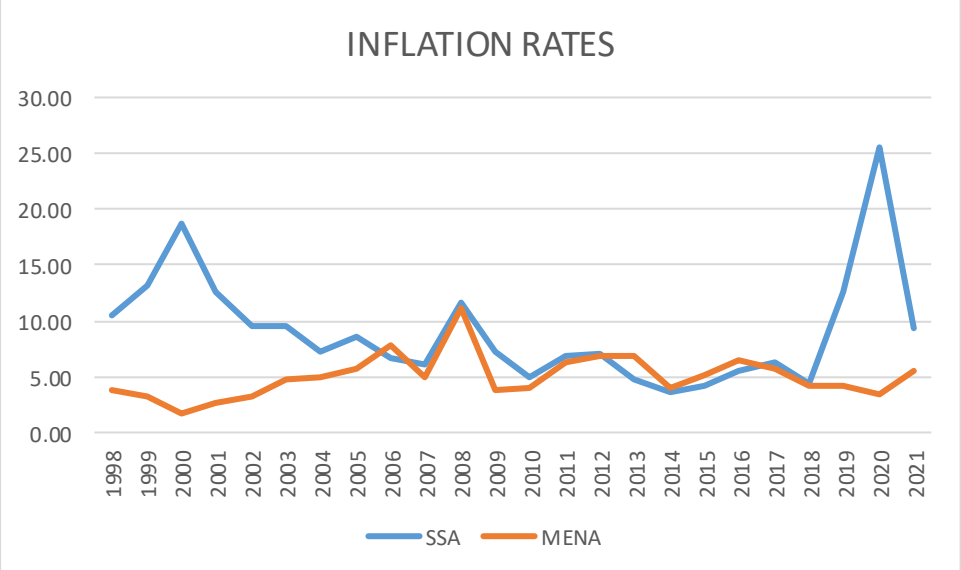


Figure 3.1. Inflation in SSA and MENA

Source: Data obtained from the database of World Bank Development Indicators, Author's computation using Excel, 2025.

Further, many scholars (Azam & Khan, 2022; M. Khan & Hanif, 2020) have suggested that high and persistent inflation can be detrimental to economic growth since inflation increases uncertainty and leads to high interest rates. The increase in interest rates has the potential to discourage capital investment and ultimately slow down the economy. To control inflation, the conventional view is that the monetary authorities' objectives are to ensure a low and stable aggregate price level, which is commonly measured as the change in the consumer price index.

However, inflation that is fiscally rooted poses a serious challenge for the monetary authorities. For example, the governments worldwide had to intervene by deploying fiscal stimulus packages to provide relief to subdued economies following the aftermath of the 2008-2010 global financial crisis, and the 2020 COVID-19 pandemic has resulted in high inflation rates. The response of the monetary authorities in these situations has been to raise interest rates to control the soaring inflation. However, in many instances, such a response is often not effective. It is because the policy of increasing interest rates to control inflation can have dire consequences for economic activity (households, firms, and the government) (Ida, 2020; Omekara et al., 2016)

The persistence of high inflation in SSA has sparked a debate on whether the fiscal policy or monetary policy is best suited to control inflation (Oyekele, 2021). Moreover, some critics argue that monetary policy alone is not adequate to bring about price stability; instead, the appropriate fiscal policy can control inflation better (Cochrane, 2021; Leeper & Yun, 2006; Sargent & Wallace, 1981; Woodford, 1995). Further, the lack of independence of the central banks to formulate appropriate monetary policies in SSA makes the fiscal policy a viable tool to control inflation. It has also been observed that in some SSA countries, the same executive who oversees the fiscal policies is also responsible for monetary policies. Therefore, the political interference in the central banks' policy mandate in most of the SSA countries suggests that there is fiscal dominance in such countries in economic activity (Olaoye et al., 2022; Strong, 2021). The focus of this study is on the asymmetric effects of government size on inflation in SSA.

However, the empirical evidence is contradictory about the direction of the relationship between government size on inflation in SSA countries. For instance, Onuoha and Okorie (2020)Ezirim et al. (2014) found a positive long-run relationship between government size and inflation in SSA countries. Onuoha and Okorie (2020), applied the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) methods. Ezirim et al. (2014) applied the generalised methods of moments (GMM) to analyse the data. However, Atan and Effiong (2021) and Ogbonna (2014) applied error correction and vector error correction models (VECM), respectively, reported the lack of a causal relationship between government size and inflation. On the other hand, Oyerinde (2019) employed VECM and found a bi-directional causal relationship between government size and inflation in Nigeria. The above inconsistencies in the literature could be attributed to the differences in the econometric frameworks applied and the size of the samples used (country-level studies versus panel studies).

In addition to the above studies, a few studies below have investigated the asymmetric effects of the fiscal policy on inflation in SSA.

The known country-level studies are by Osei and Ogunkola (2022) in Ghana and by Garba (2023) in Nigeria. the authors examined the fiscal deficit and budget deficit financing, respectively. Both Osei and Ogunkola (2022) and Garba et al. (2021) applied the NARDL technique to the data. In addition to the country-level studies mentioned above, Ahmad and Aworinde (2019) used threshold autoregressive (TAR) technique to investigate the asymmetric effects of fiscal deficits on inflation in a panel study of 12 African countries, while Olaoye et al. (2023) concentrated on the asymmetric effects of public debt on inflation in a sample of 44 SSA countries. Importantly, Olayungbo (2013) investigated the asymmetric effects of government expenditure on inflation in Nigeria. It was also reported that government expenditure changes have asymmetric effects on inflation in Nigeria. The study further revealed that contractionary government spending leads to higher inflation than expansionary one, a finding contrary to the findings of the above-mentioned studies.

The shortcomings of the above-mentioned country-level studies are that they focus on the effects of the asymmetry of fiscal deficit financing and budget deficit on inflation in Nigeria, respectively, instead of examining the asymmetric effects of government

spending on inflation. Other panel studies closer to this study are Ahmad and Aworinde (2019) and Olaoye et al (2023). However, these studies examined the asymmetric effects of fiscal deficits and public debt on inflation, respectively, instead of investigating the asymmetric effects of government size on inflation in SSA, which this study is all about. Again, the country-level study of Olayungbo (2013) might render the possibility of small sample bias if the country-level econometric framework is implemented in this current panel data study.

Gaps in the literature

Besides the lack of consensus on the relationship between government size and inflation for SSA countries as highlighted in the above paragraph, the existing literature has other significant shortcomings: -

First, there could be the assumption that the relationship between government size and inflation is linear. But recent evidence suggests that the relationship between fiscal policy and inflation is non-linear (Olaoye & Olomola, 2022; Tariq et al., 2022; Tariq et al., 2023). The employment of the standard linear estimation techniques on the data that is potentially asymmetric in structure can lead to model misspecification and, hence, biased results. There is also a potential for the wrong policies to be developed based on the misleading results. The importance of the asymmetric structure of government size cannot be ignored. For instance, government size, in the long run, is also affected by a wide range of macroeconomic shocks that may lead to structural breaks or regimes, such as the aftermath of the COVID-19 pandemic (Granger & Yoon, 2002; Hansen, 2000; Hatemi-J et al., 2017). This suggests that government size and inflation may have an asymmetric relationship.

Second, the research on the relationship between government size and inflation in SSA is scarce, particularly the asymmetric effects of government size on inflation. This oversight persists despite the relatively pronounced inflation in SSA, coupled with the unique characteristics of SSA that have been highlighted in the earlier section. Therefore, a study is recommended to account for the specific and unique characteristics found in SSA.

Third, if government size increases, the conventional view is that inflation will also increase. To fund excessive government expenditure in the context of low tax revenue due to poor tax collection systems, money creation is often an option. Therefore, the

joint significance of fiscal and monetary authorities in inflation control becomes important, and many studies in SSA have not considered this reality (Olaoye & Olomola, 2022). This study is different in that it is aimed at investigating the asymmetric effects of government size on inflation in SSA and offers policy implications. The focus on the asymmetry is driven by the evidence that most of the macroeconomic indicators, such as inflation, respond to positive and negative shocks to fiscal policy with different magnitudes (Olaoye et al., 2022).

The study contributes to the literature in many ways:-

The study aims to separate the effect of positive shocks from the negative shocks to inflation in SSA countries. This is done by adopting the non-linear estimation technique. According to Hatemi-J, the separation of the positive shocks from the negative shocks reveals the nature of the asymmetric structure in the data. We aim to investigate whether the response of inflation to the positive and negative changes in government size is of equal magnitude or not. This is done by applying the hidden cointegration analysis within the panel Non-Linear Autoregressive Distributed Lag (NARDL) framework to SSA countries. The choice of period has been influenced by the availability of data. Furthermore, the analysis will also be extended to test the causal relationships between government size and inflation. In this regard, three methods have been considered - the panel linear ARDL, the NARDL, and the Toda and Yamamoto (1995) Granger causality test. The intuition behind the use of many methods in this study is to improve the validity and plausibility of the estimated results, from which policy recommendations can be made.

Additionally, this study is different as it uses different and more refined panel data techniques. For instance, the advantage of employing the panel non-linear dynamic framework is its flexibility and the capability of simultaneously modelling asymmetries of both long-run relationships and patterns of adjustment between government size and inflation variables. Additionally, the dynamic error correction representation within the asymmetric long-run regression results in the NARDL model (Shin et al., 2014). In contrast, the majority of the referred studies used VAR (Olayungbo, 2013); the threshold autoregressive (TAR) and momentum-TAR (Ahmad & Aworinde, 2019), and the non-linear GMM (Olaoye et al, 2023) models to analyse the non-linear effects of fiscal policy. However, these estimation models have been shown to have serious

weaknesses, such as multicollinearity and exaggeration of threshold coefficients (Hatemi-J et al., 2017). Further, the non-linear GMM of Olaoye et al. (2023) is known to suffer from instrument proliferation, which may lead to misleading specification tests (Roodman, 2009b).

Again, employing Toda and Yamamoto's (1995) causality analysis test through augmented VAR overcomes the weaknesses of the conventional Granger Causality test of generating invalid estimates if the series is of a different order of integration and not stationary. Again, testing the causality between government size and inflation in a bivariate approach, excluding the possible influence of auxiliary variables, will strengthen the precision of causality between government size and inflation so that proper policy actions can be enabled. Additionally, the results of this study will also add to the extant literature.

Another important contribution to the empirical studies lies in the fact that the issue of the asymmetric relationship between government size and inflation in a panel framework has remained unexplored in the SSA sub-region. The scarcity of research on this topic implies that policymakers (fiscal authority) in the SSA sub-region have the risk of assuming that the relationship between the two variables is linear and symmetric, and this can lead to wrong policy choices to mitigate the effects of inflation. The research gap on this topic in the SSA sub-region lends this study to be the first to examine the asymmetric effects of government size on inflation in the SSA sub-region; hence, this study makes a significant contribution to the empirical literature.

The main findings are that both government size increases and decreases have negative effects on inflation in SSA. Further, the results show that there is strong evidence of long-run asymmetric and bi-causal relationships between government size and inflation. Government size increase exerts a significant impact on inflation at 5% level of significance in both conventional panel ARDL and panel NARDL results. The results also show that government size increases reduce inflation, and when government expenditure decreases, inflation rises. This finding is a surprising one. Nevertheless, the finding concurs with the country-level study of Olayungbo (2013) in which contractionary government leads to an increase in inflation.

However, the result is different from a *priori* expectation in that increases in government expenditure should lead to high inflationary pressures, and decreases in

government expenditure are expected to lower inflation. The finding also contradicts most of the existing predictions of the theoretical literature and empirical evidence in which an increase in government expenditure increases the price level. The likely interpretation is that with more government spending aimed at creating employment, production may increase, and with more available supply than demand, prices will fall. The converse can also be true, in that a decrease in government spending can depress output. With a relatively less aggregate supply of goods and services than the aggregate demand, the general prices of goods and services are likely to rise.

The structure of the chapter is as follows: the next section covers the literature review. Data and the Empirical strategy are covered in Section 3.3. Results and discussion are in Section 3.4. Section 3.5. discusses conclusions and makes policy recommendations.

3.2. LITERATURE REVIEW

3. 2.1. Review of the Theoretical Literature

Inflation is understood to be the persistent general rise in the prices of goods and services. Inflation is normally expressed as an index relative to a base year. An inflation rate is then calculated as a percent increase from the base year. Two kinds of inflation are normally used in economics, the producer price index (PPI) and the consumer price index (CPI). PPI measures the cost of production, and CPI is a measure of consumer prices (Mishkin & Eakins, 2021). There is a scarcity of research on the asymmetric relationship between government size and inflation; instead, the existing theories focus on fiscal dominance in the determination of inflation in developing and emerging economies as discussed below (Kamila,2022; Tran, 2019; Beckwork, 2021).

According to Keynes's (1936) demand-pull theory, inflation is caused by the aggregate demand for goods and services. Aggregate demand then raises investment and consumption in both the public sector and private sector due to public spending. The assumption in this theory is that public spending stimulates aggregate demand when there is underemployment of resources. Once the resources are in full employment,

further increases in public spending beyond full employment will still stimulate aggregate demand but push up prices. This pushing up of the price level of goods and services leads to high inflation, provided aggregate supply is inelastic in the short term (Onuoha & Okorie, 2020).

In some situations, fiscal and monetary authorities can be both active in the determination of inflation. The fiscal theory of trend inflation by Bianchi, Faccini, and Melosi (2022) proposes the co-existence of a fiscally-led and monetary-led policy mix in the determination of inflation. In this theory, monetary and fiscal authorities are equally active at the same time but with different roles; the monetary authority responds to business cycle shocks by controlling inflation, and the fiscal authority stabilizes debt to control fiscally induced inflation. In this approach, the persistent movements of inflation caused by unfunded fiscal shocks and shocks from the business cycle can be minimised.

The authors argue that government spending shocks not backed by future fiscal adjustments cause persistent movements of prices, interest rates, and output. Although the unfunded fiscal shocks, such as the fiscal stimulus packages, are used to sustain economic recovery in times of recessions, the downside of the fiscal stimulus packages is the unavoidable inflation. These unfunded fiscal shocks in the presence of nominal rigidities have real effects, also affect real interest rates, and cause persistent movements of inflation, leading to the fiscal theory of trend inflation. The funded fiscal spending shocks, on the other hand, have transitory inflationary effects and do not affect real activity. If the fiscal authority is not willing to stabilize the unfunded debt, inflation will be high and persistent. The monetary authority's response is to accommodate this fiscal trend inflation (Bianchi & Melosi, 2022).

Another development in the determination of inflation is the theory of FTPL. The proponents of the FTPL posit that fiscal authority can determine the price level in the economy independently of the monetary authority. This theory states that fiscal solvency requirements will force the monetary authority, whether legally independent or not, to accommodate the path chosen by the fiscal authority in setting the primary budget surplus. In this situation, the interaction between monetary policy and fiscal policy will unfortunately be at the expense of price instability.

The theory has its roots in Sargent and Wallace (1981), Leeper (1991), Woodford (1995), and also the recent contributions by Cochrane (2021) and D'Ecclesiis (2021). This theory advances the role of fiscal policy in inflation dynamics. The proponents assert that fiscal authority can also play an important role in price level determination (Leeper, 1991; Leeper & Yun, 2006; Woodford, 1995).

The thrust of the theory lies in the notion of the existence of the government intertemporal budget constraint or fiscal solvency requirements. There should be maintenance of equality between the real value of government nominal liabilities and the present discounted value of future government surpluses (net of tax revenue from expenditures) plus seigniorage.

Fiscal solvency requires that the government maintain the expected future budget surplus to be equal to the current debt, a view called Monetary Dominance (MD). The view of the proponents of the FTPL is that the government budget constraint is an equilibrium condition, including the determination of the price level. Any disturbance to the equilibrium, for instance, if the solvency conditions do not hold, the price will jump to restore the equilibrium. This can happen when the government sets the future primary budget surplus regardless of the level of public debt.

Therefore, in this new approach, the fiscal authority is active in that the primary budget surplus will be set sometimes arbitrarily without meeting fiscal solvency requirements. The monetary authority in this instance will be passive, and the money supply becomes endogenous to mitigate potential inflation. In this situation, primary budget surplus is exogenous, and this is referred to as a non-Ricardian or 'fiscal dominant' (FD) regime (Bajo-Rubio, Díaz-Roldán, & Esteve, 2009).

The role played by fiscal policy in determining the price level in the economy has been further studied by Surjaningsih, Utari, and Trisnanto (2012). According to them, the fiscal theory of price level can be explained in terms of weak and strong forms of the fiscal theory of price level. In the weak form of fiscal theory, the fiscal policy is dominant relative to the monetary policy. Their interaction is through seigniorage as one of the sources of government revenue in funding the government deficit in the absence of tax revenue and borrowing either through bond issues to the economic agents or from the normal credit markets.

In this weak form of the fiscal theory of price level, the fiscal policy will take the lead by setting the primary government budget debt/ surplus and expect the central bank (monetary) authorities to create money (seigniorage) to keep the solvency of the government intact. If the monetary authority is reluctant to create money to finance the debt, the ratio of the government debt to GDP will increase and become unsustainable. This will increase the interest rate as lenders demand a high premium for the perceived risky debt. The monetary authority will be forced to create seigniorage, and this increases the supply of money in response to the action of the fiscal authority, resulting in future inflation. In the weak form of the theory, the fiscal policy action is exogenous, and the movement of the supply of money is endogenous since it must respond to the government budget constraint set by the fiscal policy. In the strong form of fiscal theory, both fiscal policy and monetary policy are exogenous, and the price levels adjust to maintain the government's solvency requirements. The determination of the price level, therefore, considers the equilibrium in the government budget balance (intertemporal budget constraint).

In the 'some unpleasant monetarist arithmetic' approach Sargent and Wallace (1981) argue that fiscal authority can drive inflation even though there is a connection between the monetary base and price level. This scenario arises when the fiscal and monetary policies are coordinated in a certain form. This line of thinking is also like the weak and strong forms of fiscal theory discussed earlier. According to them, the monetary authority's control of inflation can be limited. For example, in one coordination form where the monetary authority dominates, the monetary authority independently sets the monetary policy by announcing the growth rates of money for the current and future periods. This implies that the monetary authority determines the amount of money through seigniorage that will be supplied to the fiscal authority. This action by the monetary policy will impose constraints on the fiscal policy because if the demand for bonds by the public does not generate sufficient revenue to fund the government deficit, the gap has to be filled by the seigniorage that has been announced and set by the monetary policy, in this manner the government budget has to be set within the constraints of the demand for government bonds and seigniorage from the monetary authority. In this form, then, the monetary authority has permanent control over inflation because it imposes constraints on the fiscal policy.

If, on the other hand, the fiscal authority independently sets the budget in terms of current and future deficits and surpluses to be financed by bond sales and seigniorage, the monetary authority will be forced to continue creating money to satisfy the budget constraints even if inflation is growing. This is often the case if the deficit cannot be solely financed by the bond sales, since the latter depends on the public demand. In this form, the growth in money supply will cause additional inflation because of government is running a deficit.

If the demand for bonds rises because interest rates are higher than the economy's interest rate, the monetary authority will be faced with the control of both money growth and inflation forever. In these circumstances, the monetary policy can only try to control the growth of the supply of money and let the stock of bonds held by the public grow, since there is no support from the budget surplus. The situation can also become more complex for the monetary authority if the principal and interest payments on the bond are financed by the issuance of more bonds, which become even more attractive to the public due to their high interest rates compared to the economy's interest rates. This will eventually force the monetary authority to create more money to finance the newly issued principal and interest payments due. This leads to additional inflation, and this monetization of debt can cause hyperinflation, as has happened in Zimbabwe (Mishkin & Eakins, 2021).

The Critical limit theory of Clark (1945) has examined the effects of non-linearity in the government size-inflation nexus. Clark (1945) argues that the action of the fiscal authority can cause inflation in certain ranges of government expenditure. According to the author, there is the existence of optimal government expenditure on inflation. In other words, there is a limit on government expenditure for inflation to be stable. If government expenditure is above a certain limit, inflation will arise. If the ratio of government expenditure to national income is 25% or less, inflation is not likely to rise, but beyond the limit of a 25% ratio, there is scope for inflation to rise. The critical limit theory is, according to Clark (1945), only valid during peace times, thus in the absence of extreme fluctuations such as wars or trade cycles. The biggest negative effect of inflation is that it reduces the value of money (Magazzino, 2011).

3.2.2. Empirical Literature Review

The empirical literature below is divided into studies that pertain to SSA countries and studies surveyed in other jurisdictions. It should also be mentioned that empirical research on the asymmetric effects of government size on inflation is scarce.

Studies specific to SSA countries

Few empirical studies have examined the asymmetric effects of government size; instead, the research has focused on the asymmetric effects of public debt on inflation in SSA countries. The rest of the existing empirical studies have examined mainly the linear relationship between government size and inflation in SSA countries.

Olayungbo (2013) used a Vector Autoregression (VAR) model to analyse the impact of the positive and negative changes in government spending on inflation in Nigeria. It was reported that government expenditure changes have asymmetric effects on inflation in Nigeria. The study further revealed that contractionary government spending leads to higher inflation than expansionary one, a finding contrary to the findings of other studies. The finding also contradicts most of the existing theoretical predictions in which an increase in government size increases inflation. The possible interpretation is that with more government spending aimed at creating employment, production may increase, and with more available supply than demand, prices will fall. The converse can also be true, in that a decrease in government spending can depress output. With relatively less aggregate supply of goods and services than aggregate demand, the general prices of goods and services are likely to rise.

Olaoye et al.(2023) examined the asymmetric effects of public debt on inflation in SSA countries. The study covered 44 SSA countries from 2003 to 2020. The Non-linear system GMM and a dynamic panel threshold technique of Seo and Shin (2016) were employed. It was revealed that a positive shock to public debt has a positive and statistically significant impact on inflation, whilst a negative shock to public debt has a statistically insignificant impact on inflation. Again, the public debt was further reported to have a threshold on inflation and suggested that debt accumulations above 60.59% of GDP will worsen the inflationary pressure in SSA countries.

The country-level studies of Osei & Ogunkola (2022) in Ghana and Garba (2023) in Nigeria investigated the fiscal deficit and budget deficit financing, respectively, while

Ahmad and Aworinde (2019) investigated the asymmetric effects of fiscal deficits on inflation in a panel study of 12 African countries. Both the country-level studies of Osei & Ogunkola (2022) and Garba (2023) and a panel data study of Aworinde (2019) found that fiscal/budget deficits and public debt have asymmetric effects on inflation. They reported that positive changes in fiscal deficits and public debt lead to higher inflation, while negative changes in fiscal deficits lead to less inflation.

Atan and Effiong (2021) empirically tested the critical limit theory of Clark (1945) by looking at the effect of government expenditure on inflation in Nigeria . The study used time series data from 1991 to 2019 and applied an error correction model and bounds testing within the ARDL approach to examine whether there are both long-run and short-run relationships between the two variables. The results show that there is the existence of relationship (long run and short run) between government spending and inflation in Nigeria. However, both long-run and short-run relationships do not cause inflation in Nigeria. The results of the error correction model further indicate that the short-run disequilibrium is corrected 56.17 % annually. The conclusion is that the government spending to GDP ratio has not reached the critical limit in Nigeria.

A similar study was also undertaken by Ogbonna (2014) in Nigeria, using time series data, covering the period from 1981 to 2013. The study applied the VECM method and causality tests to examine both long and short-run relationships between government size and inflation. The study documented a long-run equilibrium relationship between the two variables of interest. However, no causal relationship was found between them; instead, the results showed that expectations, inflation, and the exchange rate of the domestic currency were the causes of inflation. The results of the study confirmed the findings of Atan and Effiong (2021)

The relationship between government expenditure and inflation was further investigated by Ezirim et al. (2014) in Nigeria. The government expenditure was divided into recurrent and capital expenditure components to assess the effect of each component on inflation. The GMM estimation method was employed for short-run relationships, while the trace and the maximum eigenvalue tests (Unrestricted Johansen cointegration rank test) were employed for the long-run relationships between variables. The estimation period ran from 1986 to 2011. The results pointed to the existence of a long-run relationship between government expenditure and

inflation. In the short run, there was a positive and significant relationship between recurrent government expenditure and inflation. However, the existence and significance of the relationship between capital expenditure and inflation could not be confirmed by the results of the estimation, and hence, the conclusion is that inflation and capital expenditure bear no significant relationship with each other.

In another study, Oyerinde (2019) also employed the Johansen Cointegration analysis and vector error correction (VEC) model to analyse the impact of government expenditure on inflation in Nigeria. The results showed both strong short-run and long-run relationships between the two variables. The author further employed the Granger causality test to determine which of the variables causes the other. It was further revealed that there is an existence of a bi-directional relationship between inflation and government size in Nigeria.

Onuoha and Okorie (2020) investigated the long-run relationship between disaggregated public expenditure and inflation rate in a panel of African countries. The study covered the 1990-2019 period, and Pedroni's (2004) cointegration analysis was employed. The cointegration relationship was estimated using fully modified OLS and dynamic ordinary least squares (DOLS) techniques. The findings reported the existence of long-run cointegration between the variables. Further, the estimates of DOLS show that capital and defence expenditures are associated with an increase in the inflation rate. Education expenditures have a positive relationship with inflation, but are statistically insignificant, while expenditure on health is inversely related to inflation, though insignificant with the inflation rate.

Asymmetric effects of government size on inflation: Other studies

Nademi and Winker (2022) employed the panel linear technique with a quadratic term and panel threshold methodology of Hansen (1999) to estimate the non-linearity in a government size-inflation nexus in OPEC countries. The results of both the static and dynamic panel techniques show that there is a non-linear relationship between government size and inflation in OPEC. The study further reported a threshold value of 17.76 % of government size. Government spending above this threshold leads to a positive impact on inflation, whilst government spending below the threshold impacts inflation negatively. Tariq et al. (2022) also investigated the non-linear relationship between government size and inflation in India using the smooth transition

autoregressive model (STAR). They found that government size causes inflation beyond a certain threshold level.

Catão and Terrones (2001) investigated the relationship between fiscal deficit and inflation in a panel of 23 emerging market countries from 1970 to 2000. The Pool Mean Group (PMG) estimator within the framework of autoregressive distributed lag was employed to capture the rich relationship dynamics between the two variables. The study reported a positive and statistically significant long-run relationship between fiscal deficits and inflation. The finding also revealed that a 1 % reduction in fiscal deficits leads to a 1.5% to 6% decrease in long-run inflation, depending on the size of the inflation tax.

Lin and Chu (2013) also examined the relationship between fiscal deficits and inflation in panel data of 91 countries. The study covered the 1960-2006 period and employed the dynamic panel quantile regression technique within the ARDL specification. The findings show that fiscal deficits have a stronger impact on inflation in higher inflation episodes and a weak impact on inflation in low inflation episodes. This can also be suggested that when inflation is already high, faster money creation will cause very high inflation.

From the above paragraphs, it is evident that there is a connection between government size and inflation. However, there is a lack of consensus on the direction of the relationship between government size and Inflation. This lack of consensus can be attributed to the potential asymmetry between the two variables, which might have been ignored by many authors. In addition to mixed evidence, research is scarce in SSA regarding this topic, and this is despite the fiscal dominance in the economy. In this context, this study aims to fill the existing research gap by investigating the asymmetric effects of government size on inflation in SSA.

3.3. DATA AND EMPIRICAL STRATEGY

3.3.1. Data

To estimate both the long-run and short-run relationships, including asymmetry and the causal relationship between government size and inflation, this study used annual panel data comprising 27 SSA countries. The period of study covered 1998 to 2021. The choice of the period is based on the availability of data. In addition to the availability of data as the criterion for the choice of the period, the choice of countries has been influenced by the fact that SSA countries share a common colonial history, have similar economic structures, and are also characterized by relatively high levels of macroeconomic volatility compared to other developing countries. Therefore, there are more elements of homogeneity than heterogeneity (Woldu,2022). This degree of homogeneity of SSA countries improves data quality compared to a dataset that is made up of a mix of developed and developing countries, which many researchers use. The countries in the sample are, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Congo Rep, Eswatini, Gabon, Gambia, Ghana, Guinea, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tanzania, Togo, Uganda, and Zimbabwe. The countries and data were downloaded from the World Bank database, 2024.

The variables that are known to be the determinants of inflation are the following: - government size (GOV), money supply (BMS), food production index (FPI), nominal interest rate (INT), Nominal exchange rate (EXR), Annual economic growth rate (GDP), and Institutional quality index (IQI). The variables referred to in the above are all found in the World Bank Development Indicators' (WDI) database. However, the source of the institutional quality index components is the World Governance Indicators of WDI. The variables, description, and measurement are discussed below:

***Inflation rate (INF*)**: This is the general rise in the prices of goods and services, and inflation is measured by the consumer price index (CPI). It is measured annually; that is, monthly averages of CPI are annualized. An increase in CPI implies increases in the general price level of goods and services. The inflation variable enters the equation as a dependent variable. It is hypothesized that the magnitude of the response of inflation to changes in government size will not be identical in the long run.

***Government size (GOV*).** This represents the final government consumption expenditure as a % of GDP. It is the main explanatory variable. In economic theory, the size of the government is important for macroeconomic stability. Larger government tends to reduce output volatility and inflation through the operation of automatic stabilizers (Gali, 1994; Mohanty & Zampolli, 2009; Oz-Yalaman et al.,2019).

Olayungbo (2013) used a Vector Autoregression (VAR) model to analyse the impact of the positive and negative changes of government spending on inflation in Nigeria. It was reported that government expenditure changes have asymmetric effects on inflation in Nigeria. Osei & Ogunkola (2022) in Ghana and Garba (2023) in Nigeria investigated the fiscal deficit and budget deficit financing, respectively, while Ahmad and Aworinde (2019) investigated the asymmetric effects of fiscal deficits on inflation in a panel study of 12 African countries. It is reported that in the long run, fiscal/budget deficits and public debt have asymmetric effects on inflation.

A *priori* is the presence of asymmetric effects of government size on inflation in SSA.

Broad money supply (BMS): In economics, money supply or money stock is the total amount of monetary assets available in the economy (Mishkin & Eakins, 2021; Ofori, Danquah, & Zhang, 2017). The supply of money is one of the standard determinants of inflation. It is measured as a % of GDP, and it captures the effectiveness of monetary policy. If the monetary policy is effective in controlling inflation, the need for fiscal policy will be insignificant. According to the quantity theory of money, the growth of the money supply is generally associated with a general increase in prices of goods and services in response to increasing demand (Friedman, 1989). The evidence of money supply causing inflation was also confirmed by Mbongo, Mutasa, and Msigwa (2014) in a similar study in Tanzania. Therefore, monetary authorities can control the price level in the country by controlling the supply of money in circulation (Batarseh, 2021). It is hypothesized that growth in the money supply is positively correlated with inflation in SSA countries.

Food production index (FPI): This is the index of food production in terms of 2014-2016 = 100, constant prices. Inflation is relatively volatile in SSA countries due to the highest contribution of food items in the CPI. It is estimated to contribute about 50 % of the CPI. The volatility of food prices and unstable agricultural production fuel the volatility of inflation in SSA countries. SSA countries are also the highest food and

energy importers, and these items make up about 56 % of the consumer basket. Therefore, global shocks in food prices add to high inflation (Deaton, 1999).

There is also increasing demand for food production since most of these SSA countries have very high population growth rates that are higher than their economic growth rates. With increasing urbanisation, the continuous increase in demand for food puts more pressure on food production, and hence upward pressure on food prices (Ofori et al., 2017). Stable agricultural production and food prices can play a vital role in lowering inflation in SSA countries. It is hypothesized that unstable food production will increase inflation in SSA.

Currency exchange rate (EXR): The nominal exchange rate is the price of the domestic currency in terms of the foreign currency. The real exchange rate, on the other hand, is the price of domestic goods in terms of foreign goods (Garcia & Restrepo, 2001) The theoretical literature advances many factors that affect the price levels of countries, such as the fiscal and monetary policies, the global prices, and the mark-up prices over costs, including price discrimination (Ha, Stocker, & Yilmazkuday, 2020). Further, the depreciation and appreciation of the local currencies against the foreign currencies do affect the price levels.

If, for instance, the domestic currency depreciates against the foreign currency, the imported goods that form part of the basket of CPI will be expensive, and this will lead to domestic inflation. Therefore, the bigger the share of imported goods within the basket of CPI, the more the effect of exchange rate is on domestic prices, *ceteris paribus* (Garcia & Restrepo, 2001).

The other channel through which depreciation can have a direct effect on domestic inflation is when there are imported input costs to domestic production. These input costs will be passed through to the consumers by way of the increased price of the final good in the final stage of the production process. It is hypothesized that the depreciation of the local currencies of the SSA countries against their foreign currencies will lead to an increase in domestic prices.

Short-Term Interest Rate (INT)*:* The interest rate is the cost of borrowing, and it also serves as income to the savers or investors. It is expressed in %. Economists have long been interested in the interaction between short-term interest rates and inflation rates. This interest culminated in the development of a theory by Irvin Fisher (1930),

and hence, afterward, the theory is referred to as the Fisher hypothesis in explaining the relationship between the two variables.

The intuition behind the Fisher equation or hypothesis is that there is a one-to-one relationship between the nominal interest rate and inflation (Ayub, Rehman, Iqbal, Zaman, & Atif, 2014). This Fisher framework has been largely used to explain the connection between the nominal interest rate and expected inflation. It is for this reason that most of the monetary authorities use short-term interest rates, instead of money supply as a policy instrument to control inflation in their inflation-targeting policy frameworks. Generally, when the inflation rate rises above the inflation targeting range, the monetary authority increases the short-term repurchase offer rate (repo)[7] to lower the aggregate demand for credit by individuals and businesses (Mishkin & Eakins, 2021).

However, the aggregate demand depends on the long-term interest rates according to the expectation theory of the term structure of interest rates. This theory defines long-term interest rates as the weighted average of future short-term interest rates plus a term premium. Therefore, a decrease in the short-term rates should also apply to long-term rates. This justifies the use of short-term interest rates by the monetary policy to manage the aggregate demand and therefore control inflation (Kose, Emirmahmutoglu, & Aksoy, 2012). The expectation is that an increase in the nominal interest rate will lower inflation in SSA countries.

Annual Economic Growth (GDP): This represents the measure of annual economic growth in %. The expectations augmented Phillips curve states that inflation will vary relative to its expected level in response to economic activity. Therefore, raising activity through demand stimulus will increase expected inflation since inflation is endogenous (Laxton, Meredith, & Rose, 1995) It is expected that the sign of the coefficient will be positive.

Institutional quality index (IQI): Institutional quality refers to the rules that govern society, such as institutions by which authority is exercised in a country. The institutional quality index is represented by the composite indicators that reflect the broad dimensions of governance, such as the rule of law, governance effectiveness,

[7] The short-term interest rate used by the Central Banks, for example in South Africa to lend commercial banks

political stability, and absence of violence/terrorism, control of corruption, the degree of regulatory quality, and voice and accountability (Kaufmann et al., 2011). From the estimates of the six composite indicators of the dimensions of governance, the institutional quality index is calculated. The overall institutional quality score ranges from -2.5 to 2.5. An overall score of -2.5 represents poor and weak institutions. A country that has a score of 2.5 on institutional quality implies that there is good governance, since a positive overall score means strong quality institutions.

Acemoglu et al. (2003) argue that different institutions that were set up by the European colonizers, particularly in Africa, are responsible for the current uneven development across African countries. Further, macroeconomic volatility, such as high inflation, output volatility, and crises, is rooted in weak institutions. Lack of restraints on the executives will lead to poor macroeconomic policies, which will lead to high inflation rates. Aisen and Veiga (2006), in support of Acemoglu et al. (2003), argue that economies with weak institutions and a high degree of political instability struggle to have efficient tax systems and may rely on seigniorage as a source of revenue. However, this form of tax is believed to lead to a higher rate of inflation. It is hypothesized that weak institutions are positively correlated with high inflation rates in SSA countries.

3.3.2. Empirical Strategy

Inflation is a dynamic process since the past values of inflation are relevant for the analysis of the current and expected inflation rates. Hence, this relationship can be better analysed by using dynamic models. Therefore, in this study, several econometrics methods are used to investigate the symmetric and asymmetric long-run and short-run relationships between government size and inflation in SSA countries. The study further extends the analysis to the causal relationship between government size and inflation in a bivariate approach.

To examine the short-run and long-run relationships, the conventional panel ARDL was initiated by Pesaran and Shin (1998), and Pesaran, Shin, and Smith (1999) is used. However, to analyse the response of inflation (dependent variable) to government expenditure changes (independent variable), thus increases and decreases of the government size over time, the conventional panel ARDL method is not suitable to analyse these asymmetric effects; instead, panel non-linear ARDL

method is more suitable in this regard. Therefore, following Shin et al. (2014), who first applied the panel NARDL estimation technique in the cointegration process, this study has adopted this technique as the main method in the analysis. In analysing the causality between government size and inflation, Toda and Yamamoto's (1995) causality test is employed, and this forms method 2 in this study.

The panel NARDL

Studies on the non-linear relationships between macroeconomic variables began around the mid-1990s, with the regime-switching models of Balke and Fomby (1997) and later Psaradakis, Sola, and Spagnolo (2004) and Kapetanios, Shin, and Snell (2006) dominated the field. This interest in non-linear studies is the recognition of the fact that estimated results provided by linear regression models may not be sufficiently rich to lead to strong inference or yield reliable forecasts. Further, it has been recognised that many macroeconomic variables and processes are non-linear, and the assumption of linear relationships between macroeconomic variables may yield misleading results when the actual relationship is non-linear (Shin et al., 2014). To overcome such weaknesses of the panel linear models, panel NARDL models are the most appropriate to estimate non-linear relationships between macroeconomic variables.

The other justification for the employment of panel NARDL in this study is that studies that use panel linear ARDL have the assumption that once the parameters are estimated, the negative or positive parameters will remain so over the range of data used. Thus, it is assumed that the parameters are constant. The panel NARDL, on the other hand, explores both the symmetric and asymmetric nature of relationships between government size and inflation. The other advantage of panel NARDL over other dynamic models is that it isolates the influence of an increase in government expenditure on inflation from the decrease effect. In that way, better analysis of the possible asymmetric effects of increases and decreases in government size can be achieved because the coefficients of the underlying variables can be statistically tested for the presence of asymmetry in both long-run and short-run relationships. Shin et al. (2014) state that another important feature of panel NARDL is that the technique can combine non-linearities in the long-run relationships and the error-correcting mechanisms coherently. This important feature of NARDL is lacking in regime-

switching models since the complexity rises with the selection of regime-switching variables to cater for both non-linearities in the long-run relationship and the error correction mechanism coherently.

Lastly, panel NARDL, like the panel linear ARDL of Pesaran and Shin (1998) and Pesaran et., (2001), has other features over most of the techniques. These methods allow for mixed orders of integration among the variables in cointegration analysis. The researcher must only establish whether the variables are not in *I*(2) to avoid spurious long-run relationships. Further, problems of serial correlation and endogeneity of variables are addressed in panel ARDL models as compared to many techniques.

In this study, both the linear panel ARDL and non-linear panel ARDL have been applied in the study, but more focus has been placed on the panel NARDL for analysis. Parallels have been drawn between the two techniques in terms of the estimated results. The panel linear ARDL with its extension, panel NARDL form method 1 in this study, and the Toda and Yamamoto (1995) Causality analysis is method 2.

Panel Unit Root Testing

It is important to test for the presence of a panel unit root to ascertain that no variable is *I* (2). Failure to ascertain that there is no variable in *I* (2) through panel unit root testing can lead to estimation results that show a spurious relationship with an insignificant R-squared. The study used two tests, namely, Levin, Lin, and Chu (LLC) (2002) and Im, Pesaran, and Shin (IPS) (2003), to ensure the reliability of verdicts on stationarity. These are widely used tests and are known for their power. All the tests formulate the Null Hypothesis of no stationarity. The Alternative Hypothesis states that the series is stationary.

Cross-section dependence testing in dynamic panels.

Earlier dynamic panel estimations assumed that errors were independently distributed across sections of observations. However, it has been observed that failure to take into consideration the presence of common factors across the individual cross sections in dynamic panel estimations may lead to inconsistency and invalid statistical inferences. The problem becomes serious when the errors correlate with the

regressors, as this may generate inconsistent estimations from the regressions. The common factors may emanate from the responses of countries to similar economic, political, or spatial stimuli or common unobserved factors (Gaibulloev et al., 2014). Tests for cross-sectional dependence are based on the estimated averages of pair-wise correlation coefficients of the residuals (ρ_{ij}) (Gaibulloev et al., 2014; Im, Pesaran, & Shin, 2003; Pesaran, 2015).

In this study, the Cross-section Dependence (CD) test of Pesaran (2004) was employed to test the presence of error dependence in the panel data. The justification for employing the CD test of Pesaran (2004) is that the number of countries under study is more than the period of study, thus N >T. Therefore, the Lagrange multiplier (LM) test of Breusch and Pagan (1980) which is generally employed to test cross-section dependence in panel regressions, is not appropriate for panel data from 27 countries and 22 years of observations. The test is also relatively simple to apply and robust to breaks in slope coefficients as long as the errors are symmetrically distributed (Pesaran, 2004). The hypothesis is that there is no cross-sectional dependence of residuals. The rejection of the null hypothesis implies that the residuals are independent. Where there is cross-sectional dependence of residuals, the Beck and Katz (1995) Panel corrected standard errors (PCSE) method is used to correct them. Further, this method is also useful to correct for autocorrelation and heteroscedasticity.

Panel Cointegration Testing

Generally, cointegration in variables is tested in ARDL models, whether time series or panel ARDL. The essence of testing for cointegration in the variables is to make sure that variables move together and that there is an existence of long-term relationship between variables. If there is no cointegration between variables in their long-run relationship, it is advisable that no further analysis of long-run coefficients is made, and only the short-run equations can be analysed. In panel non-linear ARDL, this implies that testing for the asymmetric effects of partial sums of increases and decreases of government size on inflation over the long horizon would be futile if cointegration does not exist

Asteriou, Pilbeam, and Pratiwi (2021) applied Kao (1999) and Westerlund (2007) cointegration tests in their study on public debt and economic growth using

the asymmetric ARDL method on panel data. Following Asteriou et al. (2021), Kao (1999), and Westerlund (2007), cointegration tests are employed in this study. These tests are residually-based tests; thus, they test whether there are panel unit roots in the residuals, and they are popularly used in heterogeneous and homogenous panels (Westerlund, 2007). They are also known for their power and consistency in the application. However, Kao (1999) superimposes the common factors to be the same both in the long-run and short-run adjustment processes (Westerlund, 2007). In this case, the Westerlund (2007) cointegration test is added to the analysis to complement the Kao test to avoid common factor restriction and to achieve better prediction. All these tests have the null hypothesis of no cointegration. The rejection of the null hypothesis implies the existence of cointegration between variables.

The null hypothesis of no cointegration is tested by employing Westerlund's (2007) cointegration test. This is done by inferring the sign of the error correction term in a conditional error correction model. If the null hypothesis is rejected, it implies that there is no error correction and therefore, no cointegration (Fatai, 2014). The error correction model is specified below:

$$\Delta INF_{it} = \varphi_i(INF_{i,t-1} - \rho_i GOV_{it} - \vartheta_i X_{it}) + \sum_{j=1}^{p-1}\sigma_{ij}\Delta INF_{i,t-1} + \sum_{j=1}^{q-1}\phi\,\Delta GOV_{i,t-1} + \sum_{j=1}^{q}\lambda_{ij}\Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (7)$$

φ in Eq. (8) is the error correction parameter that determines the speed of adjustment back to the equilibrium after a sudden shock. If $\varphi < 0,$ then there is error-correcting, and it implies that $INF_{it,}\ GOV_{it}\ and\ X_{it}$ are cointegrated. However, if φ = 0, there is no error correction, and by implication, there is no cointegration between variables. H_0 : φ_i = 0 for all *i* = 1,…,N

$H_1 : \varphi_i = \rho_i = \vartheta_i > 0$ for all *i*, and some panels are cointegrated but not all.

Following Pesaran, Shin, and Smith (2001) to establish the joint significance of lagged level variables in the asymmetric model, the Null hypothesis is set as follows:- $H_0 : \rho_1 = \rho_2^+ = \rho_3^- = 0.$

Therefore, the rejection of the null hypothesis means that there is a presence of cointegration. To reject the null hypothesis, the computed p-value should be less than a 5% significance level.

Model 1: Panel ARDL

The symmetric panel ARDL

The analysis starts with the assumption that the response of inflation to government size changes is symmetric, and thereafter, this assumption is relaxed to allow the effects of positives and negatives of government size on inflation.

The symmetric version of the panel ARDL is specified as follows:

$$\Delta INF_{it} = \beta 0_i + \beta 1_i INF_{i,t-1} + \beta 2_i GOV_{i,t-1} + \beta 3_i X_{i,t-1} + \sum_{j=1}^{p} \gamma_{ij} \Delta INF_{i,t-j} + \sum_{j=1}^{q} \delta_{ij} \Delta GOV_{i,t-j} + \sum_{j=1}^{q} \theta_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (8)$$

$i = 1\ (1,\ldots,\ N)$ denotes country and t represents period $(1,\ldots,T)$. β_0, β_1 to β_3 are the long-run parameters. $\gamma_{it,}\ \delta_{it}\ and\ \theta_{it}$ are the short-run parameters, μ_i is a group-specific fixed effect and $\epsilon_{it}$is a stochastic disturbance term that is assumed to be normally distributed and independent from the other errors and regressors. The coefficient for $GOV_i = -\frac{\beta 2_i}{\beta 1_i}$ p and q are lag orders of the corresponding dependent and independent variables, respectively. INF_{it}- *Inflation* is a dependent variable, and the lag of it is also part of the regressors and GOV_{it} represents the log of government size as the main explanatory variable. X_{it} captures control variables that are the standard determinants of inflation.

Eq. (8) is reparametrized into an Error Correction Model.

$$\Delta INF_{it} = \varphi_i(INF_{i,t-1} - \rho_i GOV_{it} - \vartheta_i X_{it}) + \sum_{j=1}^{p-1} \sigma_{ij} \Delta INF_{i,t-1} + \sum_{j=1}^{q-1} \phi \Delta GOV_{i,t-1} + \sum_{j=1}^{q} \lambda_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (9)$$

The equation in parentheses denotes long-run relationships, and the parameter φ is the error-correcting speed of adjustment term. This parameter should be negative and significant to imply that there is a long-run relationship between inflation and government size, including other independent variables; otherwise, the results will be invalid. The other part of the model with differenced variables represents short-run relationships.

Asymmetric panel ARDL model

Unlike the symmetric panel ARDL, the asymmetric panel ARDL, usually referred to as the Non-linear panel ARDL, assumes that the response of inflation to positives and

negatives of government size will not be identical. Following the literature on non-linear panel ARDL, the starting point is the decomposition of the explanatory variable into partial sums of positives and negatives. In this case, government size is decomposed into the partial sums of positives and negatives as variables that enter the equation as explanatory variables. Since the Non-linear ARDL model is an extension of the linear ARDL of Pesaran et al. (1999), therefore, following Shin et.al (2014), Non-linear ARDL(p,q) regression takes the following form:

$$Y_t = \gamma * + \sum_{j=1}^{p} \phi j * + Y_{t-j} + \sum_{j=0}^{q} (\theta_{j*}^{+1} X_{t-j}^{+} + \theta_{j*}^{-1} X_{t-j}^{-}) + \epsilon_{t,} \quad (10)$$

Where

$\chi_t^+ = \sum_{j=1}^{t} \Delta X_{j,}^{+}$ $X_t^- = \sum_{j=1}^{t} \Delta X_t^-$, $\Delta X_{t:}^{+}$:= max [0, ΔX_t] $and\ \Delta X_t^- := min$ [0, ΔX_t].

A distinction is made between changes in the signs of the growth of X_t and $\theta_{j*}^{+}\ and\ \theta_{j*}^{-}$ These are parameters that capture the asymmetric effect of $x_{t-j}^{+}\ and\ x_{t-j}^{-}$ on Y_t in the long-run and short-run relationship. ϕ is the autoregressive parameter. ϵ_t is an error term, ε ~NID (0, σ^2).

The existing empirical evidence documents inconclusive results on the direction of the government size-inflation nexus, and sometimes, no relationship has been found. The argument in this study is that the failure to reach a consensus regarding the effects of government size changes on inflation may be due to the assumption that these effects are symmetric. Once increases in government expenditure are separated from decreases and their effects on inflation are tested separately, it could be possible that increases in government expenditure could have significant effects on inflation, and decreases may have less effect, or the opposite can be true. Thus, the relationship may be asymmetric.

Following Shin et al. (2014) and Bahmani-Oskooee and Fariditavana (2016), Eq. (8) and Eq.(9) and the Non-linear ARDL in Eq. (10), the movement of the *GOV* variable is decomposed into its negative and positive partial sums as : $GOV = GOV_0 + GOV_t^{+} + GOV_t^{-}$ where $GOV_t^{+}{}_{and}\, GOV_t^{-}$ are the partial sum processes of positive and negative changes in GOV. Thus:

POS = $GOV_t^{+} = \sum_{j=1}^{t} \Delta\, GOV_j^{+} = \sum_{j=1}^{t} \max\ (\Delta GOV_{j,}\, 0)$

NEG =$GOV_t^{-} = \sum_{j-1}^{t} \Delta GOV_j^{-} = \sum_{j-1}^{t} \min\ (\Delta GOV_{j,} 0)$

Given the two newly generated variables, Eq. (11) is the version of Eq. (8). The asymmetric panel ADRL model format is as follows.

$$\Delta INF_{it} = \alpha + \sum_{k=1}^{n1} \beta_{ik} \Delta INF_{i,t-k} + \sum_{k=0}^{n2} \delta ik^{+}{}_{1k} \Delta GOV^{+}{}_{i,t-k} + \sum_{k=0}^{n3} \delta ik^{-}{}_{2k} \Delta GOV^{-}{}_{i,t-k} + \sum_{k=0}^{n4} \partial_{ik} \Delta BMS_{i,t-k} + \sum_{k=0}^{n5} \theta_{ik} \Delta EXR_{i,k-k} + \sum_{k=0}^{n6} \varphi_{ik} \Delta INT_{i,k-k} + \sum_{k=0}^{n7} \pi_{ik} \Delta IQI_{i,t-k} + \sum_{k=0}^{n8} \gamma_{ik} \Delta GDP_{i,t-k} + \sum_{k=0}^{n9} \vartheta_{ik} \Delta FPI_{i,t-k} + \rho_{i1} INF_{i,t-1} + \rho^{+}{}_{i2} GOV^{+}{}_{i,t-1} + \rho_{i3}^{-} GOV^{-}{}_{i,t-1} + \rho_{i4} BMS_{i,t-1} + \rho_{i5} EXR_{i,t-1} + \rho_{i6} INT_{i,t-1} + \rho_{i7} IQI_{i,t-1} + \rho_{i8} GDP_{i,t-1} + \rho_{i9} FPI_{i,t-1} + \mu_i + \epsilon_{it} \quad (11)$$

Eq. (11) can be re-parameterised in an Asymmetric Error Correction Model format as follows:

$$\Delta INF_{it} = \psi_i \left(INF_{i,t-1} - \varpi_1^{+} GOV^{+}{}_{i,t-1} - \varpi_2^{-} GOV^{-}{}_{i,t-1} - \varpi_3 BMS_{i,t-1} - \varpi_4 EXR_{i,t-1} - \varpi_5 INT_{i,t-1} - \varpi_6 IQI_{i,t-1} - \varpi_7 GDP_{i,t-1} - \varpi_8 FPI_{i,t-1} \right) + \sum_{k=1}^{n1} \beta_{ik} \Delta INF_{i,t-k} + \sum_{k=0}^{n2} \delta ik^{+}{}_{1k} \Delta GOV^{+}{}_{i,t-k} + \sum_{k=0}^{n3} \delta ik^{-}{}_{2k} \Delta GOV^{-}{}_{i,t-k} + \sum_{k=0}^{n4} \partial_{ik} \Delta BMS_{i,t-k} + \sum_{k=0}^{n5} \theta_{ik} \Delta EXR_{i,k-k} + \sum_{k=0}^{n6} \varphi_{ik} \Delta INT_{i,k-k} + \sum_{k=0}^{n7} \pi_{ik} \Delta IQI_{i,t-k} + \sum_{k=0}^{n8} \gamma_{ik} \Delta GDP_{i,t-k} + \sum_{k=0}^{n9} \vartheta_{ik} \Delta FPI_{i,t-k} + \mu_i + \epsilon_{it} \quad (12)$$

Δ represents the first difference and *n1-n9* are respective lag orders. The terms and their coefficients in parenthesis represent the long-run relationships. The long-run slope asymmetric coefficients in Eq. (12) are computed as follows, $GOV_i^{+} = -\frac{\rho_{i2}^{+}}{\rho_{i1}}$ and $GOV_i^{-} - \frac{\rho_{i3}^{-}}{\rho_{i1}}$ The short-run asymmetric effects of government size on inflation are $\sum_{k=0}^{n2} \delta ik^{+}$ and $\sum_{k=0}^{n3} \delta ik^{-}$. The Wald test is used to statistically test the null hypothesis of $-\frac{\rho i2^{+}}{\rho i1} = -\frac{\rho i3^{-}}{\rho i1}$ for the long-run asymmetry and $\sum_{k=0}^{n2} \delta ik^{+} = \sum_{k=0}^{n3} \delta ik^{-}$ for the short-run asymmetry. If the null hypothesis is rejected, then the conclusion is that there is an asymmetric effect of government size on inflation for SSA. Lastly, this study

estimates Eq. (8) and (11) for the symmetric and asymmetric effects of government size on inflation, respectively.

The pool mean group (PMG) and the mean group (MG) are the dominant estimation methods for nonstationary dynamic panels within the ARDL framework. The MG does estimation by averaging coefficients across the groups. The PMG, on the other hand, constrains the long-run coefficients to be the same while allowing the short-run intercepts, short-run coefficients, and error variances to differ across the groups (Pesaran & Shin, 1995; Pesaran et al., 1999). Following Salisu and Isah (2017) and Blackburne III and Frank (2007), the mean group (MG) and pool mean group (PMG) model versions of panel ADRL are estimated for both symmetric panel ARDL and panel Non-Linear ARDL. Hausman (1978) test is employed to choose the most efficient and consistent method. The Null hypothesis states that PMG is accepted, and the Alternative hypothesis states that PMG is not accepted. The acceptance of 5% significance level is set, and if the computed value is greater than 5% the null hypothesis is accepted, and the PMG estimator is employed in the analysis.

Optimal lags on each first-differenced dependent and independent variable have been selected by Akaike's Information Criteria (AIC) (Bahmani-Oskooee, Miteza, & Tanku, 2020; Cho, Greenwood-Nimmo, & Shin, 2019).

Test for asymmetry (statistical significance)

In the NARDL framework, as advised by Shin et al. (2014) and Bahmani-Oskooee et al. (2020), the Wald test is employed to find the long-run asymmetric parameters, $H_0 : \rho_2^+ = \rho_3^-$ and short-run asymmetric parameters $H_0 : \sum_{k=0}^{n} \delta_1^+ = \sum_{k=0}^{n} \delta_2^-$ in Eq. (11), The Null hypothesis states that the parameters have the same effect on inflation. The rejection of the null hypothesis implies that there is an asymmetric relationship between the parameters.

Model 2. Causality Analysis (Toda & Yamamoto, 1995)

The relationship between government size and inflation has been widely investigated. The focus of many studies has been on the existence of a relationship between government size and inflation, as discussed in the literature review section of this

study. However, the presence of cointegration between the two variables of interest does not imply any causality between the two variables. Thus, cointegration tests only confirm the existence of long-run relationships between variables but do not give information as to whether one variable helps to predict another. Therefore, causality between the variables must be tested.

The analysis of causality between government size and inflation is very critical from the policymaking perspective. The direction of causality may begin with government size and move to inflation or a reversal. An understanding of this causality is very relevant in controlling inflation to be at acceptable levels by adjusting government spending if the direction is from government expenditure to inflation. However, empirical studies on the causality of direction between government size and inflation in SSA countries have been scarce, to the author's best knowledge.

It is in this context that this section investigates the causal relationship between government size and inflation in 27 SSA countries covering the period from 1998 to 2021. Toda and Yamamoto (1995) state that traditionally, Granger Causality tests have been widely used in the prediction of direction between variables. However, the traditional Granger causality test may not be valid if one or both variables of interest are non-stationary or if they have different orders of integration. The results of the test will not be valid because the normal asymptotic chi-square distribution of the Wald test statistic does not follow under the null hypothesis. As an alternative, the Toda and Yamamoto (1995) method of Granger causality testing procedure is used in this study.

To overcome the shortcomings of the Granger Causality test, extra lags must be added to the causality regression model, denoted by dmax in the augmented vector autoregressive vector (VAR) (k+dmax) model. This is the maximum order of integration of the time series variables in the augmented VAR(k+dmax) equation to make sure that the asymptotic Wald test statistic chi-square distribution still holds. This approach necessitates the testing of both the panel unit root for stationarity and determining the maximum order of integration. The cointegration tests are also applied for verification of the long-run relationship, but they do not affect the Toda and Yamamoto Granger causality test. In a nutshell, the procedure entails the determination of the maximum order of integration by testing the non-stationarity of the series. This is followed by the selection of optimal lag length by the information

criteria to be included in the augmented VAR model. In this study, Final Prediction Error (FPE), Akaike, and Hannan-Quinn (HQ) information criteria have been used to select the optimal lag length.

The traditional approach is to use the Augmented Dickey Fuller (ADF) test for stationarity at first difference to determine the maximum order of integration, but the ADF test is meant for a single time series, and application of it in panel data and a small sample like in this study may suffer from low statistical power (Ajaga & Nunnenkamp, 2008). To overcome the weakness of ADF, Im et al. (2003) which is based on ADF and Levin, Lin, and Chu (2002) tests are employed in this study. These tests are widely used and have power. They both set the null hypothesis as the series has a unit root, and the rejection of the null hypothesis implies that the series is stationary. The highest order of integration between inflation and government size serves as the additional lag to be included in the augmented VAR model for testing causality. Kao (1999) and Westerlund (2007) panel cointegration tests have been employed to find out whether the two variables move together over time. The preferences and the advantages of these tests have already been outlined in the earlier section of this study.

Once the maximum order of integration and the optimal lag have been determined, the last step is to estimate an augmented vector autoregressive (VAR) model (k+dmax). The augmented VAR(k+dmax) derives the asymptotic Wald statistic in the form of a Chi-square distribution. The null hypothesis assumes that government size does not Granger-cause inflation. The rejection of the null hypothesis implies that there is either a unidirectional causal relationship or a bi-directional causal relationship between government size and inflation in SSA countries. The approach in this study is therefore restricted to a bivariate relationship between government size and inflation. Many recent studies have also used a bivariate approach, as shown in Ajaga and Nunnenkamp (2008); Dritsaki (2018) and Fatai (2014). Dufour and Renault (1998) argue that the preference for a bivariate approach in Granger causality literature is to avoid complications arising from indirect causality once the auxiliary variables are accounted for in a multivariate framework. Hence, the standard bivariate approach is followed in this study. Following Ajaga et al (2008), the identification of the precise direction of causality between government size and inflation is emphasized, rather than identifying the relative importance of possible determinants of inflation.

The Toda and Yamamoto (1995) model is formulated as follows:

For Inflation (INF) Eq. (13)

$$\ln INF_t = \omega_0 + \sum_{i=1}^{\kappa} \beta 1_i \, ln\, INF_{t-i} + \sum_{j=\kappa+1}^{dmax} \beta 2_j \ln INF_{t-j} + \sum_{i=1}^{k} \theta 1_i \ln GOV_{t-i} + \sum_{k+1}^{dmax} \theta 2_j \ln GOV_{t-j} + \epsilon_{t1}$$

For Government size (GOV) Eq. (14)

$$\ln GOV_t = \varphi_0 + \sum_{i=1}^{k} \gamma 1_i \ln GOV_{t-i} + \sum_{j=k+1}^{dmax} \gamma 2_j \ln GOV_{t-j} + \sum_{i=1}^{k} \delta 1_i \ln INF_{t-i} + \sum_{j=k+1}^{dmax} \delta 2_j \ln INF_{t-j} + \epsilon_{t2}$$

i is the index of country (*1,…,N*), *t* denotes period (*1,…,T). GOV* and *INF* are both independent and dependent variables, respectively. All variables have been transformed into natural logs. *k* and dmax are lags and the maximum order of integration, respectively. $\beta, \theta, \gamma, \delta, \omega, and\ \varphi,$ are the parameters. ϵ_{it} is a stochastic disturbance term that is assumed to be normally distributed and independent from the other observations. The model can be estimated to find out the causal directional relationship between government size and inflation.

3.4. RESULTS AND DISCUSSION

3.4.1. Summary of Descriptive Statistics

This section discusses the descriptive statistics of the variables used in the empirical model. It includes the mean, standard deviation, minimum, and maximum values of the variables. Table 3.4.1 below shows these results.

Table 3.4.1. Descriptive Statistics of the Variables Used in the Empirical Model

Variable	Mean	Standard deviation	Minimum	Maximum
INF	9.006	30.575	-3.233	557.202
GOV	15.255	6.115	0.952	39.451
EXR	844.878	1557.161	0.024	9686.772
INT	8.980	12.491	-34.174	103.417
FPI	89.652	22.955	28.770	181.330
GDP	4.000	4.186	-17.669	21.452
IQI	-0.036	1.000	-2.949	2.907
BMS	31.211	22.087	5.143	159.329

Note: (INF-inflation; GOV-government consumption expenditure; EXR-nominal currency exchange rate; INT-short-term interest; FPI-food production index; GDP-gross domestic product; IQI-institutional quality index and BMS-money supply)

Source: Author's computation using EViews 13, 2024

From Table 3.4.1, the magnitude of the standard deviations shows that the observations are dispersed from the means, particularly for inflation, government consumption expenditure, exchange rate, and food production index. This implies that the means of the variables may not be reliable to inform policy. However, the

dispersion of observations from the means for GDP, institutional quality index, interest rate, and money supply is less pronounced and hence can be relied upon for the policy-making process.

The descriptive statistics further show that the average inflation rate in the SSA countries is relatively very high compared to other developing countries, despite the overall decline in inflation rates across the world since the start of the *Great Moderation* era. Most of the SSA countries are sitting at double-digit inflation rates, with Angola, Ghana, and Zimbabwe leading with high values. On the other hand, South Africa and Botswana experienced single-digit inflation rates over the study period. The maximum inflation rate for the SSA countries is 557% compared to the 27.53% inflation rate in the OECD countries as observed over a period spanning from 1973 to 2019 (H. Kim, 2023). Again, the OECD and advanced countries' average inflation rates range between 2% and 4.29% respectively, compared to the mean of 9% in the SSA countries.

The average standard deviation is approximately 4.53% in the OECD countries compared to 30.58 % in the SSA countries. The high average standard deviation of inflation in SSA countries explains its volatility due to SSA countries' dependence on commodities. The unreliability of the domestic supply of agricultural products due to frequent droughts, coupled with the subsistence methods of farming, are also important factors affecting the stability of the inflation rates in the SSA sub-region. These factors cause the food prices to fluctuate (Portillo & Melina, 2018). According to H. Kim (2023), the stable and low inflation rates observed in the OECD countries are attributed to the recent less pronounced social conflict, which is usually seen as a price-propagating mechanism. The other factor that has stabilized inflation rates in the

OECD countries is the recognition of the monetary authority's role in managing inflation through the inflation-targeting policies.

Government consumption expenditure to GDP ratio recorded a mean value of 15.25% and a standard deviation of 6.11%. The minimum and maximum values stood at 0.95% and 39.45% respectively. In comparison with the OECD countries, government consumption expenditure as a share of GDP in SSA countries is very small but relatively more volatile. According to Haelg, Potrafke, and Sturm (2022), the OECD government spends an average of 20.22 % which is above the average spend by SSA countries by 5%. The OECD average standard deviation of 4.81% is also less than the SSA's average standard deviation of 6.11% and this confirms the relative stability of government consumption expenditure of the OECD countries over time. The large size of governments in the OECD is attributed to huge social transfers, unlike in most of the SSA countries, in which there is little or no government spending on social benefits. Tariq et al. (2023) further point to the fact that large government sizes in developed countries have an efficient tax system that funds large public expenditures and hence can only cause moderate inflationary pressures. In contrast, increasing government expenditure in developing countries will likely be funded by increasing debts because of poor tax systems. The mounting debt can, over time, increase inflation in developing countries.

Evidence from Table 3.4.1. also indicates that the exchange rate has a mean of 844.88% and a standard deviation of 1557.16 %, with the values ranging from 0.02 % to 9686.77 % in SSA. The exchange rate fluctuations are mainly attributed to the fluctuation of commodity prices since SSA countries depend on the exports of raw materials and importers of energy, food, and other materials for domestic use. The fluctuation of the SSA's exchange rates also adds to the high volatility of the inflation

rates in this sub-region. The political climate also render SSA's currency purchasing power against major currencies to weaken as investors take their capital assets to stable political environments (Nguyen, Dridi, Unsal & Williams, 2017) The fluctuation of exchange rates in SSA countries also poses a threat to the future economic growth of these countries since there is a link between economic growth and exchange rates (Oseni, 2016).

The lending interest rate recorded a mean value of 8.98% and a standard deviation of 12.49% in SSA countries. The minimum and maximum values stood at -34.74% and 103.16 % respectively. Recently, interest rates have shown a downward spiral across the globe but are still in double-digit figures in SSA. The theoretical predictions are that low interest rates imply low economic activity, and the opposite is also true. Further, high indebtedness should cause real interest rates to rise. However, there is weak empirical evidence that high debts, as seen in SSA countries, have caused real interest rates to rise. Instead, the risk of default on debt payments, together with other factors, could be the reason for the relatively high real interest rates in SSA (Bismut & Ramajo, 2021). Except for South Africa, most SSA countries have double-digit real interest rates, perhaps explaining the low economic activity due to the high cost of borrowing, as most of the inhabitants resort to informal semi-subsistence living.

The results further show that the average value of the food production index is 89.65 with a standard deviation of 22.95. The minimum and maximum values stood at 28.77 and 181.33, respectively. The shown figures confirm the relatively high food prices and high food price volatility in Africa compared to other regions in the world. For instance, Minot (2014) reports that the monthly average standard deviation of food prices in SSA countries is about 0.116 compared to the monthly standard deviation of international food prices of 0.06. This difference in the food price and its volatility

explains much of the high inflation rates, including the highly volatile general price level in SSA. Again, the results show that the average value of GDP growth is 4.00% with a standard deviation of 4.19%. The minimum and maximum values stood at -17.67% and 21.45% respectively. Also, institutional quality has a mean of -0.036 and a standard deviation of 1.00, with the values ranging from -2.95 to 2.91. Finally, the average value of the broad money to GDP ratio is 31.21% with a standard deviation of 22.09%.

3.4.2. Correlation Analysis Results

Table 3.4.2. shows the matrix of correlation of the variables employed in the study.

Table 3.4.2 (a) Pair-wise Correlation Matrix

Variables	INF	GOV	GDP	FPI	EXR	INT	IQI	BMS
INF	1.000							
GOV	0.251	1.000						
GDP	0.133	0.615	1.000					
FPI	0.250	0.621	0.657	1.000				
EXR	0.148	0.406	0.357	0.489	1.000			
INT	-0.287	0.467	0.408	0.528	0.313	1.000		
IQI	-0.156	0.101	0.036	0.032	-0.311	0.074	1.000	
BMS	0.190	0.746	0.481	0.541	0.282	0.428	0.303	1.000

Source: Author's computation using EViews 13,3024

The results of the correlation matrix are important for two reasons. First, the importance of the correlation matrix analysis is to find out about the nature of correlation between variables. From the table 3.4. 2 (a) above, government size (GOV) has a positive relationship with inflation. This agrees with the a *priori* expectation that an increase in government size stimulates aggregate demand and ultimately increases

the propensity of households to consume, and hence general prices rise. This correlation between government size and inflation implies that government size has an impact on inflation in SSA. Again, GDP is positively correlated with inflation in SSA. This indicates that GDP impacts inflation in SSA, and the sign agrees with the expectation. Interest rate and institutional quality indexes have a negative relationship with inflation, and this concurs with the theoretical predictions that increases in interest rate and institutional quality index will lower inflation in SSA countries.

On the other hand, the food production index and exchange rate have a positive relationship with inflation in SSA. Increases in the food production index and exchange rate should lower inflation as expected but appear to be positively correlated. More analysis of these two variables will be done in later sections of the study.

The second reason for conducting a correlation matrix analysis is to find out whether the dataset contains multicollinearity. The interaction between independent variables may lead to wrong conclusions, as it will be difficult to identify the variable whose impact on the dependent variable is statistically significant. Multicollinearity can also distort the standard errors (Ishioro, 2020). A decision rule provided by Imdadullah, Aslam, and Altaf (2016) indicates that the correlation between the independent variables should be lower than 0.8 if multicollinearity does not exist. It can be observed from the table above that no variable has a 0.8 correlation with the other. Therefore, the variables of this study satisfy this criterion, implying that multicollinearity does not pose a problem for this dataset.

3.4.3 Panel Unit Root Test Results

The study carried out a unit root test on both the independent and dependent variables using the approaches of Levin-Lin-Chu and Im, Pesaran, and Shin (IPS) to check the stationarity or otherwise of the time series variables. The results are presented in Table 3.4.3. below.

Table 3.4.3. Levin-Lin-Chu and Im, Pesaran and Shin (IPS) Panel Unit Root Test Results

	LLC		IPS	
Variable	Level	First Difference	Level	First Difference
INF	-10.197***	-	-13.094***	-
GOV	-2.128**	-		--2.414***
EXR	2.410	-14.470***	5.383	-11.500***
INT	-9.832***	-	-10.544***	-
FPI	2.101	-20.871***	5.194	-20.799***
GDP	-13.637***	-	-14.202***	-
IQI	-2.150**	-	-2.099**	-
BMS	2.741	-21.246***	5.157	-18.755***

Notes: *, **, *** significance at 10%, 5% and 1%

Source: Author's computation using EViews 13, 2024

The results from the table above indicate that the exchange rate, food production, and broad money supply are not stationary at the level. The panel unit root test shows that the variables are stationary at the first differences. This indicates that exchange rate, food production, and money supply are integrated of order one *I*(1). In other words, they are *I* (1) series. Inflation, interest rate, GDP, institutional quality, and government

consumption expenditure are stationary at the level (government consumption expenditure is stationary at the first difference under the IPS panel unit test). This indicates that the variables have zero-order *I*(0) integration. Since there is a mixed order of integration and no series of integration of order *I*(2) advocated by Pesaran and Shin (1995), Pesaran et al. (1999), and Pesaran et al. (2001), the panel linear ARDL with its extension, panel NARDL, is more suitable for this study. The short-run and long-run relationships were therefore estimated using both symmetric and non-linear panel ARDL estimation techniques.

3.4.4. Residual Cross-section Dependence Test Results

Table 3.4.4. Pesaran CD test results

Test	Statistic	d.f.	p-value
Breusch-Pagan LM	74.388	351	1.0000
Pesaran scaled LM	-10.440		0.0000
Pesaran CD	0.237		0.8126

Source: Author's computation using EViews 13, 2024

The Pesaran CD test was conducted to check the presence of a correlation of errors in the panel study. The results of Table 3.4.4. show that 2 of the 3 tests are statistically non-significant. This suggests that there is no cross-sectional dependence in the residuals, and the null hypothesis cannot be rejected. It is concluded that the errors are not correlated in the panel but are independent of others.

3.4.5. Panel Cointegration Results

The tables below show the results of the cointegration tests.

Table 3.4.5 (a) Kao panel cointegration test results

	Statistic	p-value
Modified Dickey-Fuller test	-16.607	0.0000***
Dickey-Fuller test	-12.821	0.0000***
Augmented Dickey-Fuller test	-10.457	0.0000***
Unadjusted modified Dickey-Fuller test	-20.864	0.0000***
Unadjusted Dickey-Fuller t	-13.462	0.0000***

Notes: *** significance at 1%

Source: Author's computation using EViews 13, 2024.

Table 3.4.5. (b) Westerlund panel cointegration test results

Name	**Within Group Panel**	**All panels**
Statistic	-2.389	0.0085***
p-value	-2.409	0.0080***

Notes: *** significance at 1%

Source: Author's computation using EViews 13

The results of the cointegration test are in Tables 3.4.5. (a) and (b) show that the variables have a long-run relationship. The test statistics values are large and negative in both cases to accept the alternative hypothesis. Furthermore, the p-values show that variables are cointegrated and statistically significant at 1% level in all the cointegration tests.

3.4.6. Hausman Test Results

Table 3.4.6. Hausman test results

	(b)	(B)	
Variable	**MG-Coefficient**	**PMG-Coefficient**	**Difference**
GOVdecrease	-0.341	-0.187	-0.152
GOVincrease	-0.362	-0.170	-0.192
GDP	-0.312	-0.063	-0.248
EXR	-0.021	-0.001	-0.020
BMS	0.120	0.011	0.107
IQI	1.801	0.423	1.374
FPI	-0.024	-0.015	-0.009
INT	-0.604	-0.353	-0.248

Note: MG represents Mean Group, and PMG is Pool Mean Group

Source: Author's computation using Stat 18, 2024

Test: H_0: difference in coefficients not systematic

X^2 = 0.33

Prob = 1.0000

The Hausmann test was conducted to choose an efficient estimator between MG and PMG. The results of the Hausman test are shown in Table 3.4.6. above. The computed p-value is 1.000. Therefore, the Null hypothesis of homogeneity cannot be rejected since the computed value is more than a 5% significance level. Based on the computed value, PMG is chosen as the most efficient and consistent estimator. The PMG method has been applied in this study for analysis, both on the traditional panel linear ARDL and the panel NARDL.

3.4.7. Panel ARDL Estimation Results (a)

In Tables 3.4.7. (a) and (b) present the panel results of the panel linear ARDL and panel non-linear ARDL models.

Table 3.4.7. (a) Panel linear ARDL (PMG) Results

	D.INF	Coefficient	Std. Err.	z	P>z
LR					
	GOV	-0.186	0.0741	-2.51	0.012**
	GDP	-0.032	0.056	-0.56	0.577
	EXR	-0.001	0.001	-1.90	0.058*
	BMS	-0.001	0.030	-0.04	0.970
	FPI	-0.010	0.008	-1.33	0.185
	IQI	0.383	0.371	1.03	0.303
	INT	-0.322	0.042	-7.62	0.000***
SR	**__ec**	**-0.682**	**0.072**	**-9.48**	**0.000*** **
	D1.GOV	0.077	0.242	0.32	0.751
	D1.GDP	-0.257	0.228	-1.13	0.259
	D1.EXR	0.325	0.230	1.42	0.157
	D1.BMS	-0.252	0.106	-2.39	0.017**
	D1.FPI	-0.025	0.124	-0.20	0.841
	D1.IQI	0.426	2.522	0.17	0.866
	D1.INT	-0.117	0.129	-0.90	0.366
	_cons	8.443	0.943	8.95	0.000***

Notes: *, **, *** significance at 10%, 5% and 1% and D1 is the first difference, LR is long run, and SR stands for short run.

Source: Author's computation using Stata 18, 2024

The empirical results in Table 3.4.7. (a) show that government size exerts a significant impact on inflation at 5% in the long run. The magnitude and sign of the coefficient indicate that a 1% increase in government size reduces inflation by 0.19 % in the long run in SSA countries. With regards to control variables, only exchange rate and short-term interest rates exert a significant influence on inflation. The magnitude and signs of the coefficients suggest that a 1% increase in the exchange rate and a 1% increase

in the interest rate reduce inflation by 0.001% and 0.322% respectively, in the long run. An appreciation of the exchange rates of the local currencies exerts a significant influence on inflation at a 10% significance level in the long run.

However, the growth rates, institutional quality, money supply, and food production do not impact inflation in the long run, even at a 10% level of significance. The empirical results further show that the error correction model has a negative error correction term and is significant at 1% level of significance. This indicates that the model converges to a long-run relationship, and the speed of adjustment is about 68% per annum after deviation from the equilibrium. All the variables in the short-run model do not exert a significant influence on inflation, even at a 10% level of significance, except for money supply. This suggests that a 1% money supply increase reduces inflation by 0.25 % at 5% level of significance in the short run.

3.4.7. Panel NARDL Results (b)

Table: 3.4.7. (b) Panel NARDL Results (PMG)

Variable	Coefficient	Std. Err	Z	p-Value
LR				
D.INF				
GOVdecrease	-0.187	0.078	-2.37	0.018**
GOVincrease	-0.169	0.077	-2.22	0.027**
IQI	0.423	0.343	1.23	0.219
GDP	-0.063	0.056	-1.12	0.261
BMS	0.011	0.030	0.37	0.708
EXR	-0.001	0.001	-1.73	0.083*
FPI	-0.015	0.007	-2.05	0.040**
INT	-0.353	0.040	-8.75	0.000***
SR				
ec	**-0.667**	**0.075**	**-8.95**	**0.000*** **
GOVdecrease D1.	-0.321	0.256	-1.25	0.211
GOVincrease D1.	-0.209	0.239	-0.88	0.381
IQI D1.	0.269	1.859348	0.15	0.885
GDP D1.	-0.254	0.223	-1.14	0.254
BMS D1.	-0.252	0.089	-2.81	0.005**
EXR D1.	0.347	0.252	1.38	0.169
FPI D1.	0.031	0.068	0.46	0.648
INT D1.	-0.104	0.125	-0.83	0.405
_cons	8.413	0.966	8.71	0.000***

Notes: *, **, *** significance at 10%, 5% and 1%

Source: Author's computation using Stata 18, 2024

This section of the study discusses the regression results of the inflation model based on the panel non-linear ARDL. The results are presented in Table 3.4.7. (b) above.

The empirical results in the model show that inflation is a negative function of both increases and decreases in government size. This means that changes in government expenditure, both decreases and increases, exert a significant effect on inflation at 5% level of significance in the long run. The results further show that a 1% increase in government spending reduces inflation by 0.17% in SSA in the long run. This finding resonates with the panel linear ARDL results obtained from Table 3.4.7. (a) , whereby an increase in government spending also reduces inflation in the long run.

However, if government expenditure decreases by 1%, inflation increases by 0.19% in the long run. Therefore, a negative change in government expenditure exerts a significant effect on inflation at the 5% level of significance in the long run. Notably, inflation responds differently to both government expenditure increases and decreases. The magnitude of inflation's response to government expenditure decreases, is greater than when there are government expenditure increases. Thus, there is an asymmetric effect of government expenditure on inflation in the long run in SSA. This finding of asymmetry in the coefficients of inflation in response to the increases and decreases in government size agrees with the results of the statistical test of the significance of the asymmetry in Table 3.4.8. (a) below.

The reported results of an increase in inflation when there is a decrease in government expenditure seem to be at odds with a *priori.* An expansionary government spending is expected to increase inflation, and the converse is also true. These results also

contradict the predictions of the existing theoretical literature. For instance, contractionary government spending should lower inflation, and hence a difficult trade-off between increasing output and containing inflation. Similarly, an increase in government spending should lead to high inflation according to the demand-pull inflation of the Keynesian paradigm. Further, Bianchi et al. (2022) argue that unfunded expansionary government causes fiscal trend inflation. The FTPL also advocates that inflation can be determined by the fiscal authority by setting up the surplus primary budget without regard to the level of nominal government debt. The price level will therefore respond to this imbalance (Christiano & Fitzgerald, 2000; Cochrane, 2021; Leeper & Yun, 2006; Sargent & Wallace, 1981).

Empirically, the reported results of increasing inflation when government size decreases do support the country-level study of Olayungbo (2013) who found that contractionary government spending increases inflation in Nigeria. Apart from the country-level study of Olayungbo (2013), the existing empirical literature provides evidence that an increase in government spending leads to high inflation, as shown in Nademi and Winker (2022) ; Tariq et al. (2022) and Olaoye et al. (2023).

The possible interpretation of these surprising results is that an increase in government spending creates employment and increases output. An increase in output may imply a greater supply of goods than the demand, and their prices will subsequently drop. Again, contractionary government expenditure increases inflation in SSA countries. This could be due to the reduction of output, and this leads to a rise in prices of the few available goods because of excessive demand relative to supply. Another possible interpretation of the finding is that if the government spending increase is funded by tax increases, the likelihood is the crowding out of private sector

investments and private consumption levels, and these will suppress the aggregate demand, and hence, the price of goods and services will decrease.

Among the control variables, the results show that the exchange rate has a negative effect on inflation in the long run in SSA at the 10% level of significance. The magnitude and sign show that a unit increase in exchange rate reduces inflation by 0.001 units. This finding is in alignment with the result in the traditional panel ARDL model in Table 3.4.7. (a). This demonstrates the importance of the exchange rate variable in influencing inflation in SSA in the long run. This means that appreciation of the local currency reduces inflation in SSA. The result is consistent with the existing theoretical literature that the appreciation of local currency against foreign currency will render the prices of imported goods and services reasonably cheap (Ghosh, 2009; Ha et al., 2020). Food item makes up about 50% of the CPI in SSA, and food import comprises a large percentage of the total imports in SSA countries, and it is vulnerable to exchange rate movements. This is because movements in the exchange rate for the price of imported products can be directly reflected in domestic prices (Deaton, 1999).

The results further show that food production exerts a significant negative influence on inflation in the long run in SSA at the 5% level of significance. The magnitude of the coefficient indicates that a unit increase in the food production index induces inflation to reduce by 0.02 units in SSA. An increase in food production implies expansion of the productive capacity of the economy, thereby increasing aggregate supply and depressing the general price level and consequently reducing inflation in the region. The result resonates with the findings of Piper, Ferrari-Filho, and Lélis (2020) who also found a negative effect of productivity on inflation in Brazil.

The results further show that short-term interest rate exerts a significant negative influence on inflation in SSA at the 1% level of significance. This finding is also

consistent with the results found in the conventional panel linear ARDL. The magnitude of the coefficient indicates that a 1% increase in interest rate induces inflation to reduce by 0.35% in SSA. These findings are consistent with the theoretical predictions of Ayub et al. (2014) and Kose et al. (2012). The increase in short-term interest rate increases the cost of borrowing, which deters firms and households from borrowing and consequently reduces the amount of money in circulation as well as inflation. It is no surprise that most of the central banks use interest rates as a policy instrument to control inflation in their inflation-targeting policy framework. Generally, when the inflation rate rises above a certain inflation target level, the central bank increases the short-term repurchase offer rate (repo) to lower the aggregate demand for credit by individuals and businesses (Mishkin & Eakins, 2021).

Central bank independence and system transparency play a vital role in stemming the negative effects of political instability on inflation. This hypothesis is consistent with the increase in operational and political autonomy of central banks observed in developing countries (Boulware, Reed, & Ume, 2013; Rogoff, 1985). Greater central bank independence protects monetary policy from the influence of fiscal authorities, which may be susceptible to lobbying and political pressures prevalent in politically unstable and socially polarized countries. Similarly, greater transparency reduces the scope for government intervention in the economy, discouraging rent-seeking behavior and lobbying, while promoting fiscal discipline. The results further show that money supply, GDP, and institutional quality do not have a significant impact on inflation in SSA countries in the long run, even at a 10% significance level.

Regarding the short-run results, the empirical results revealed that positive change and negative change in government expenditure have insignificant effects on inflation even at the 10% level of significance in the short run. Moreover, in the panel non-linear ARDL model, the asymmetry of the coefficients has also been found not to be statistically significant in the short run. Similarly, the effect of government size has also been shown to be insignificant in the short run, even at a 10% level of significance in

the panel linear ARDL model results. This finding of the insignificant effects of government size on inflation in the short run could be attributed to the behavior of macroeconomic variables in general. The influence of one macroeconomic variable on another takes some time for the effects to be felt in the economy. For instance, there could be a lead time between when national budget changes are implemented and the response of inflation to budgetary changes (Mishkin & Eakins, 2021). Nevertheless, there is the existence of an error correction term, and it is negative and significant. This implies that there is convergence in the long-run relationship, and the speed of adjustment is about 67% per annum, the same as found in the panel linear ARDL counterpart.

Among the control variables, the results show that only the money supply exerts a significant impact on inflation in the short run. Money supply has a significant negative influence on inflation in the short run in SSA at a 1% level of significance. The sign and magnitude of the coefficient show that a 1% increase in money supply reduces inflation in SSA countries by 0.26%. The result is surprising, as one expects that the growth of the money supply will increase the rate of inflation. The result is, however, consistent with the findings of Bala and Chin (2018), who also found a negative effect of money supply on inflation in African OPEC member countries. Again, this could also follow the interpretation that inflation in SSA countries is not mainly demand-driven but supply-driven. This implies that an increase in money supply does not necessarily increase the consumption levels of households since most of the inhabitants live near subsistence levels. GDP has an insignificant effect on inflation in the short run in SSA, even at the 10% level of significance. This applies to the exchange rate, food production, Institutional quality, and interest rate, which seem to play a negligible role

in influencing inflation even at a 10% level of significance in the short run in SSA countries.

3.4.8. Testing Asymmetry of Coefficients: Wald Test Results

Table 3.4.8. Testing for asymmetry of coefficients.

Long-Run Asymmetry	$X^2 =$ 23.18 p-value = 0.000***
Short-Run Asymmetry	$X^2 =$ 0.36 p-value = 0.5486

Notes: * significance at 1%**

Source: Author's computation using Stata 18, 2024

This study determined whether the difference between the coefficients of the decreases and increases in government spending is statistically significant or not. Thus, whether there is an existence of asymmetry between the coefficients. The results of the Wald test are reported in Table 3.4.8 above. (a) There is an existence of asymmetry between the decreases and increases of government size in the long run, and this is statistically significant at 1%. This means that the magnitude of decreases and increases of government size on inflation over the observation period is not identical. This result agrees with the set hypothesis. This difference in the magnitude of the response to inflation would allow the monetary authority to focus more on the increase in inflation when the fiscal authority follows contractionary spending. On the other hand, there is a lack of asymmetric for the short-run coefficients of government size even at 10% significance. This finding implies that the null hypothesis of no short-term asymmetry cannot be rejected. These short-run asymmetry results resonate with the results found in the panel symmetric ARDL.

3.4.8. Short Run Asymmetry for SSA Individual Countries

Table 3.4.8: Short-term adjustments and Asymmetry for Individual countries

Country	EC	p-value	p-value (asymmetry)[8]
Angola	-0.043	0.691	0.314
Benin	-1.071	0.000***	0.019**
Botswana	-0.274	0.049**	0.501
Burkina Faso	-1.378	0.000***	0.262
Burundi	-0.743	0.000***	0.399
Cameroon	-1.136	0.000***	0.538
Congo Republic	-1.136	0.000***	0.762
Eswatini	-0.691	0.001***	0.781
Gabon	-0.796	0.000***	0.536
Gambia	-0.918	0.000***	0.498
Ghana	-0.178	0.169	0.383
Guinea	-0.611	0.000***	0.211
Madagascar	-0.319	0.013**	0.454
Mali	-1.186	0.000***	0.809
Mauritania	-0.271	0.056*	0.859
Mauritius	-0.143	0.116	0.209
Mozambique	-0.511	0.001***	0.694
Niger	-0.683	0.010***	0.123
Nigeria	-0.683	0.010***	0.385
Rwanda	-1.171	0.000***	0.005***

[8] Short-run asymmetry -% significance level

Senegal	-0.056	0.682	0.248
Seychelles	-0.350	0.017**	0.756
South Africa	-0.603	0.000***	0.065*
Tanzania	-0.851	0.000***	0.068*
Togo	-0.878	0.000***	0.158
Uganda	-0.571	0.005***	0.023**
Zimbabwe	-0.435	0.057*	0.300

Note: ***/**/* denote 1%, 5% and 10% significance level

Source: Auth*or's* computation using Stata 18, 2024

Table 3.4.8. presents the results of the coefficients of the error correction terms, together with their p-values and the short-run asymmetry results for the individual cross-sections. From the table, all the coefficients of the error term have a negative sign as expected. The coefficients of the error correction term are also statistically significant, mostly at the 1% level. This confirms that the short-term deviations from the equilibrium do converge in the long run. However, the p-values of Angola, Ghana, Mauritius, and Senegal are not statistically significant, even at the 10% level. This suggests that the convergence to the equilibrium is lacking for these countries.

Regarding the statistical significance of the asymmetry of short-term coefficients on inflation, it can be confirmed that in most countries, the asymmetric relationship does not exist between government size changes (government expenditure decreases and government expenditure increases) and inflation in the short run for SSA. These results support the overall group's statistical significance test results of no short-run asymmetry, but they are aligned with the results of the panel ARDL model. In contrast, 5 countries, namely, Benin, Rwanda, South Africa, Tanzania, and Uganda, have

statistically significant coefficients of short-run asymmetry, and this implies that there is an asymmetry in the short run between government size changes and inflation. It can be generally concluded that there is no short-run asymmetry for SSA because, out of the total 27 countries, 22 of them record a symmetric relationship in the short run, and only 5 have the opposite results.

3.4.9. Toda and Yamamoto panel test results

Panel unit root tests were conducted to determine the order of integration to be included for the augmented VAR (k+dmax) model to be estimated. LLC and IPS panel unit root test results for Table 3.4.3 were used. The maximum order of integration was found to be 1 lag, and this lag was added to the total number of lags for the estimation of the augmented VAR (k+dmax) model as the required procedure for Toda and Yamamoto's (1995) Granger Causality. Cointegration between government size and inflation was also confirmed by Kao (1999) and Westerlund (2007) panel cointegration tests. The cointegration of the variables allows Toda and Yamamoto's (1995) Granger causality test to be conducted on the variables.

Table 3.4.9. Toda-Yamamoto Causality Test Results

Variables	X^2	p-value	Lag(k)	Lag (k+ d_{max})	Direction of causality
Inflation (dependent variable)	21.013	0.0001***	3	3+1	GOV ⟹ INF
Government size (dependent variable)	6.911	0.0748*	3	3+1	INF ⟹ GOV
Overall Result					GOV ⟺ INF

Notes: *, **, *** 10%, 5% and 1% significance level, *Source:* Author's computation using EViews 13, 2024

Table 3.4.9. shows the results of the augmented VAR (k+dmax) model estimation. The second column from the left side of the table gives the Chi-square test statistic. The next column is the generated p-values. The Final Prediction Error (FPE), Akaike, and Hannan-Quinn (HQ) information criteria have been relied upon to choose the optimal lag length. The optimal lag length is 3, and the total lag length used in the augmented VAR estimation is 3+1.

From Table 3.4.9, it appears that there is a causal long-run relationship between government size and inflation in SSA countries. The null hypothesis of no Granger causality between government size and inflation is rejected. The results further reveal that government size Granger causes inflation at 1% level of significance, and inflation also Granger causes government size at a 10% level of significance. Further, the magnitude of the Chi-square statistic and the p-values show that the direction of causality is stronger from the direction of government size to inflation than from inflation to government size. In a nutshell, by applying cointegration tests and the Toda

and Yamamoto (1995) test to the panel of SSA countries over the years 1998-2021, it turns out that government size and inflation consistently Granger cause each other. This bi-directional causal relationship between government size and inflation is shown by the two-directional arrows in Table 3.4.9. above.

The finding is a surprising one since it is at odds with the existing theoretical literature. The conventional view is that an increase in government expenditure, especially unfunded, will lead to a rise in the price level, fuelled by the increasing demand for goods and services in terms of the Keynesian framework. Again, a contractionary government is supposed to lower inflation. Nevertheless, this finding supports Ezirim et al (2008) also found a bi-casual long-run relationship between government size and inflation in a time series study for the USA. However, this finding should be interpreted with caution because the average size of a government in SSA countries is far smaller than the USA size of government for the parallels to be drawn between the findings in SSA countries and Ezirim et al (2008) USA study. Furthermore, most of the empirical literature provides evidence of a unidirectional causal relationship between the two variables that move from government size to inflation, as discussed in the literature review section of this study. Therefore, evidence of the existence of a causal bi-directional relationship between government size and inflation is rather scarce in the existing literature.

However, a weak causality that runs from the direction of inflation to government size can arise under certain circumstances. For instance, an unexpected increase in the price level may induce the government to increase spending by subsidizing some of the basic services, such as public transport, public healthcare, and certain kinds of food and energy, to provide relief to the general population. Social security transfers may be increased considering persistent inflation. These desperate attempts by the government to provide relief may also be a recognition that persistently high inflation is associated with negative welfare effects that may trigger social unrest over time.

3.5. CONCLUSIONS AND POLICY RECOMMENDATIONS

3.5.1. Summary of the Findings and Conclusion

This section covers conclusions and key policy recommendations based on the results of the several econometric methods applied in the study. The purpose of the study was to examine the effects of government size on inflation for a panel of SSA countries, and the period covered is from 1998 to 2021. The study was specifically aimed at examining the short-run and long-run relationships between government size and inflation, along with the presence of an asymmetric relationship between the two variables of interest. The presence of short-run and long-run relationships between the two variables allowed for the testing of causality between them.

The findings of the study point to the presence of both short-run and long-run relationships between government size and inflation in SSA countries. The results of both the traditional panel linear ARDL and its extension, panel non-linear ARDL, reveal that government size exerts a significant effect on inflation in the long run in SSA countries at a 5% level of significance. Specifically, the findings show that a 1% increase in government size reduces inflation by 0.19% and 0.17% in symmetric panel ARDL and asymmetric ARDL models, respectively. However, in the short run, government size does not influence inflation even at a 10% level of significance based on the results of both models. In both models' results, the existence of the error correction term with the negative sign and 1% significance level further confirms the existence of a long-run relationship between the variables. The results of the two panel cointegration tests also strengthen the findings of the existence of a long-run relationship between the variables under study. The speed of adjustment back to the equilibrium is about 68% per annum in both models.

The findings are also robust to the presence of an asymmetric long-run relationship between government size and inflation in SSA countries. It appears that inflation responds negatively to both increases and decreases in government size over time, but the magnitude of response is not identical. Inflation responds to government expenditure decreases with a greater magnitude than its response to government expenditure increases. It has also been noted that the difference in the short-run coefficients is not statistically significant even at the 10% level of significance.

When it comes to control variables, the results of both models show that short-term interest rate exerts a significant impact on inflation in SSA in the long run at 1% level of significance. The findings of the study further reveal that a 1 % increase in short-term interest rate reduces inflation in the long run by 0.322% and 0.353 % respectively. This is expected in countries that have independent monetary authorities whose responsibility is to control inflation through the manipulation of the short-term interest rate.

The exchange rate seems to be an important factor in influencing inflation in SSA. The results of both models indicate that the exchange rate influences inflation at a 10% level of significance in the long run. This strengthens the argument that supply factors and imports mainly drive inflation in SSA rather than domestic demand factors. The above factor is related to the effect of food production in SSA countries. The NARDL results show that food production has a significant impact on inflation at 5% level of significance. An increase in food production leads to the stability of the price level in the long run.

From the above sections and regarding the results of both ARDL models, it appears that the short-term interest rate plays a relatively more important role than the government size in influencing inflation movements in SSA countries in the long run. This reasoning is based on its sign, magnitude, and the level of significance of inflation compared to government size. Inflation responds negatively to both the short-term interest rate and government size, but the magnitude of the response of inflation to the short-term interest rate is between 0.322% and 0.353% for every 1% increase in short-term interest rate for both models' results. Whereas for the government expenditure, the response of inflation ranges between 0.17% and 0.19% for both models for any 1 % change in government expenditure. Further, the impact of government size on inflation is statistically significant at 5% level compared to 1 % level of significance of short-term interest rate on inflation in the long run.

Regarding the short-term control variables, money supply has become important in influencing inflation in SSA countries in the short run. The results of both models show that a 1 % increase in money supply decreases inflation by 0.252% in the short run. The results further show that the money supply influence on inflation is significant at the level of 5The study further shows that the gross domestic product, institutional

quality index, exchange rate, food production index, and interest rate variables play a negligible role in inflation in the short term. Thus, they are insignificant even at the 10% level.

3.5.2. Policy Recommendations

Policymakers should concentrate on manipulating short-term interest rates to control inflation to acceptable levels. However, for the monetary authority to be effective in controlling inflation, there should be transparency in the formulation of the monetary policy. This can be achieved by changing the institutional structure to grant central banks independence from the fiscal authority so that they can be given the sole responsibility of managing inflation.

If both the fiscal authority and the monetary authority are not different from each other, as exists in some African countries, cooperation between the two institutions to jointly fight inflation is vital. The fiscal authority should act responsibly by guarding against public expenditure that is not funded by tax revenue but instead by debt. Thus, the fiscal authority's responsibility should be to reduce debt, and the monetary authority should reduce inflation that is induced by the business cycle.

The results of the causality test between government size and inflation are also relevant for policymakers. For instance, the policy implications of these findings suggest that the SSA countries can comfortably regulate the levels of inflation in the economy by controlling the levels of government expenditure. The use of fiscal policy to combat inflation is therefore supporting the Keynesian model of demand management. To curb inflation, the government should decrease expenditure. Similarly, to achieve a high level of inflation to boost economic activities, government expenditure should increase.

The area for the future direction of research is as follows: The application of the NARDL technique to investigate the non-linear effects of government size on inflation for the SSA individual countries. This is to ensure that the country-specific policies are formulated to control inflation.

CHAPTER FOUR

THRESHOLD EFFECTS OF INSTITUTIONAL QUALITY ON INFLATION IN SSA

4.1. INTRODUCTION

Although inflation levels differ from region to region or from one country to country, inflation remains a key macroeconomic problem in developing countries. For instance, in Sub-Saharan Africa (SSA) countries, it is relatively high and volatile compared to other developing countries (Ghanayem et al., 2023). Figure 4.1 below compares the average inflation rates for SSA with the Middle East and North African (MENA), a sub-region that shares developing characteristics with SSA, and contrasts the inflation rates with those of the G-7 countries over the period from 1998 to 2021. The SSA countries show higher average inflation rates than MENA and G-7 countries. They are also relatively more vulnerable to economic shocks than the other two regions, as shown by inflation spikes during the 2007-2009 global financial crisis and the recent COVID-19 pandemic. On the other hand, inflation remained low and less volatile for the G-7 countries over the study period, even during the global financial crisis.

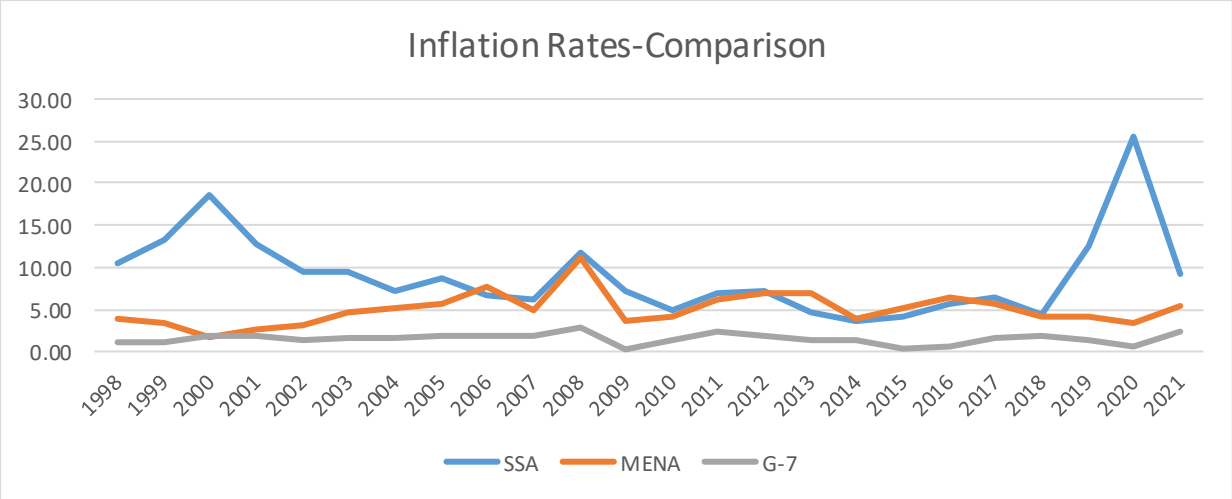


Figure 4.1. Inflation for SSA, MENA & G-7

Source: Data was downloaded from the database of the World Bank, 2024

According to Olaoye et al. (2024) high inflation has a serious negative impact on the economic performance of countries because it can cause uncertainty about future prices and make it difficult to plan for investments. Inflation hits the poor mostly, thereby exacerbating high poverty, inequality, and unemployment in SSA, and can even cause civil unrest. Therefore, reducing inflation is still one of the key priorities of

governments and policymakers in developing countries, including SSA countries. The conventional approach in the analysis of inflation dynamics has been focusing on the macroeconomic factors as the direct causes of inflation, ignoring the importance of institutions and ideology on inflation performance in developing countries (Acemoglu et al., 2004; Acemoglu et al., 2003; Aisen & Veiga, 2006, 2008). However, there is conflicting evidence on whether institutional quality increases or decreases inflation in developing countries. The empirical evidence suggests that countries that have economic institutions, such as an independent central bank, have lower inflation (Aisen & Veiga, 2006, 2008; De Haan & Kooi, 2000; Faust & Svensson, 2001; Garriga & Rodriguez, 2020; Kasseeah, 2011; Loungani & Sheets, 1997; Walsh, 1995). In contrast, Agoba et al. (2017); Hielscher and Markwardt (2012); Klomp and De Haan (2010) and Campillo and Miron (1997) provided evidence that central bank independence does not bring about price stability in Africa, as seen in developed countries; instead, the impact of central bank independence on inflation is insignificant due to political interference. Despite the above-mentioned contradictions, it can be deduced that institutions play an important role in macroeconomic performance in developing countries because they also minimise the effects of economic shocks and price instability. (Acemoglu et al., 2003; Acemoglu et al., 2001; Acemoglu & Robinson, 2019; Bell, 2002; Cicen, 2023).

The conventional view is that countries with strong quality institutions have low inflation rates while countries with poor institutional quality do not, as argued by Aisen and Veiga (2006); Acemoglu et al. (2004); Barugahara (2015); Cicen (2023), and Mignamissi et al. (2023). In the African context, only three studies by Barugahara (2015), Ghanayem et al. (2023), and Franses and Janssens (2018) have examined the connection between institutional quality (proxied by political instability) and inflation. The authors found that political instability is associated with high inflation in Africa. Research on this topic appears to be scarce, despite the persistently high inflation experienced in SSA, which is coupled with relatively weak institutions compared to those found in developed countries. The lack of consensus among scholars on the institutional quality-inflation nexus could be due to the assumption that the relationship is linear. The assumption of a linear relationship between institutional quality and inflation can be misleading if it is non-linear. The risk is that some researchers can use standard linear estimation techniques in the asymmetric data

structure. The use of standard linear estimation techniques in data that has potential asymmetric structure can result in misspecification of the model and invalid inferences. Moreover, recent evidence by Telatar, Telatar, Cavusoglu, and Tosun (2010) and Khan and Hanif (2020) shows that institutional quality has threshold effects on inflation in developing countries. In the context of SSA, an investigation into the threshold effects of institutional quality on inflation becomes even more crucial, given that the political instability, as manifested in many coups. The coups can lead to different political regimes with varying degrees of governance, and their effects on inflation rates.

This study, therefore, distinguishes itself from the existing studies on the institutional quality-inflation nexus because it explores the threshold effects of institutional quality on inflation in SSA and offers policy implications. Knowing that there is an institutional quality-inflation nexus in SSA is important for policymakers to deal with the high and volatile inflation, but that does not provide them with adequate information to forecast and mitigate inflation effectively. However, if policymakers know the exact institutional quality threshold level below which inflation increases, this additional information can enable policymakers to forecast inflation with better accuracy for their mitigation efforts. Our contribution to knowledge is as follows:

In this study, we estimate the effect of institutional quality on inflation using panel data from 27 SSA countries spanning the period from 1998 to 2021. A two-step first-difference generalised method of moments (FD-GMM) is employed after controlling for other determinants of inflation in SSA. The advantage of this technique is that it accounts for endogeneity, serial autocorrelation, and omitted variable bias. Hence, it generates consistent and unbiased results in line with Roodman (2009b). The SSA sub-region was chosen because of its relatively high inflation rates compared to other developing countries. Additionally, the poor economic performance of most of these SSA countries has driven their populations to high levels of poverty, inequality, and unemployment. Again, most SSA countries have weak institutional quality as manifested in pockets of military coups,[9] widespread corruption, and weak law and order maintenance. Next, we employ the dynamic panel threshold model of Seo and Shin (2016) and Seo et al. (2019), which is based on the FD-GMM, to estimate the

[9] Sudan, Niger and Mali recently

institutional quality threshold effects of each dimension on inflation. Notably, (Barugahara, 2015; Franses & Janssen, 2018; Ghanayem et al., 2023; Telatar et al., 2010), the authors use many dimensions[10] to compile an index of institutional quality, which is a combination of legal institutions, political institutions, and economic institutions. These dimensions are not mutually exclusive in terms of classification; for instance, the rule of law and regulatory quality can be regarded as both economic and legal institutions. Hence, this index is comprehensive and covers a wider spectrum of institutional quality instead of focusing only on the political instability index (Kaufmann & Kraay, 2024). It is important to know the exact threshold level of each dimension of institutional quality on inflation because they may differ, and this can require different responses from the policymaker.

Thereafter, the overall institutional quality threshold on inflation is estimated. Hansen's (1999) panel threshold method is used to estimate the threshold effects of institutional quality on inflation, and this method also accounts for the unobserved fixed country effects in the dataset. However, the key limitation of Hansen's (1999) model is that it requires all the regressors and the transition variable to be exogenous. Again, Hansen's (1999) model is used for static panel data, whereas inflation is a dynamic process. The other option could be the use of Kremer et al.'s (2013) dynamic panel threshold model, but the model assumes that the explanatory variables and or the transition variables are exogenous. This implies that if the institutional quality is endogenous to inflation, the use of the Kremer et al (2013) model can potentially lead to biased estimates. Further, the Kremer et al (2013) dynamic panel threshold model estimator does not account for potential reverse causality as found in the Minea et al. (2021) study. Therefore, Seo and Shin (2016) threshold model has advantages over other threshold models because it allows both the explanatory variables and the transition variable to be endogenous, and this attribute makes it relatively more efficient than other dynamic panel data threshold models in generating unbiased estimates of the threshold values.

The FD-GMM empirical results support the works of Barugahara (2015), Ghanayem et al. (2023), and Franses and Janssen (2018), who found that strong institutional quality (political stability) mitigates the effects of inflation. The sign and size of the

[10] Control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law and voice and accountability estimates

coefficient of the institutional quality are in line with our priors. Additionally, it is revealed that institutional quality exerts a significant effect on inflation both below and above the estimated threshold.

The rest of the chapter is organised as follows: The next section discusses the review of the literature. This is followed by the introduction of the data used and the empirical strategy applied in Section 4.3. In Section 4.4, the empirical model results are presented and discussed. Conclusions and key policy recommendations are found in Section 4.5.

4.2. LITERATURE REVIEW

4.2.1. Introduction

This section of the chapter discusses the theoretical literature that pertains to the connection between institutions and inflation. The study is underpinned by the New Institutional Economics (NIE) theory. This theory argues that institutions shape the macroeconomic outcomes of countries. The discussion of the theoretical literature will be followed by a survey of the empirical literature on the threshold effects of institutional quality on inflation in SSA countries. However, the empirical research on the threshold effects of institutional quality on inflation is non-existent in SSA and even in other parts of the world. Therefore, the empirical literature surveyed discusses the relationship between institutions and inflation.

4.2.2. Review of the Theoretical Literature

The conventional literature on the analysis of inflation dynamics focused only on the economic causes of inflation, such as money creation, and ignored the political and institutional causes of inflationary pressures. However, the recent analyses of inflationary pressures have shifted away from the direct economic causes of inflation towards the political and institutional determinants of inflation in developing countries (Edwards, 1994). This approach departs from the view that policymakers develop policies based on their strategic objectives and devoid of the influence of economics, politics, and institutions (Alesina &Tabellini, 1988). Instead, policies are endogenous to the interaction of the economic, political, and institutional milieus that are found in the countries.

The theory of New Institutionalism is viewed as an interdisciplinary approach that includes economics, law, anthropology, sociology, political science, and organisational theory. There is no precise definition of institutions; most researchers agree that the premise of the NIE theory is that an individual creates institutions through interaction with other human beings. These institutions impose constraints on human behaviour, and these can be formal or informal. Formal institutions have rules such as law, protection of property rights and culture, and moral codes form the informal rules (North, 1990; Peters, 2019).

These forms of institutions also have enforcement characteristics. Another feature of this theory is that institutions have an existence of stability over time. For instance, governments (political institutions) are stable and have the power to enforce property rights. Governments can also establish monetary policy institutions whose main objective is to control inflation. This monetary mandate can be achieved if there is support from the government, such that the monetary institutions (central banks) can achieve price stability in the countries. North (1990) posits that institutions are the rules of the game and hence institutions determine organisations, and organisations, in turn, affect the evolution of institutions. Thus, a credible and committed state, where institutions such as the rule of law and an effective judicial system are working, will attract investments and lower the transaction costs.

Institutions are said to be weak if there is a disregard for the rule of law, a lack of protection of property rights, an inability of the government to effectively deliver public services to its people, no restraint on the executives, widespread corruption, lack of independent central banks in carrying out their mandate of controlling inflation effectively. Strong quality institutions are the opposite of weak institutions (Acemoglu et al., 2004; Agoba et al., 2017). Further, Acemoglu et al. (2003) provide evidence that institutions are more important for economic growth than economic policy. According to the authors, once the institutional variable is added to the regression model, the coefficient of the macroeconomic policy turns insignificant.

The theory departs from the canonical neo-classical theory by putting institutions at the centre stage of macroeconomic analysis, whereas the neo-classists had taken institutions as given and their economic space was characterised by efficient markets, which it is argued that efficient markets can only exist when there are no transaction

costs. The NIE school of thought argues that transaction costs play an important role in economics, and hence, the transaction cost theory is at the core of the NIE paradigm (Parada, 2006). This is because transaction costs arise when obtaining information due to information asymmetry held by parties to an exchange, or when measuring the performance of agency costs, negotiating costs, and the costs of enforcing agreements. Therefore, institutions matter, and they shape the performance of economies over time. Institutions reduce uncertainty in human exchange and reduce the cost of transacting (Marinescu, 2012; North, 1990). Thus, the reduction of transaction costs stimulates economic activity by bringing efficiencies in the production system, coupled with a decline in inflation.

The authors argue that quality institutions should lead to better economic performance and low and stable inflation in countries because there is a rule of law, there is protection of private property rights, government effectiveness, and the absence of corruption. Both political and economic institutions are part of the institutional matrix. With increasing international specialisation and division of labour due to the globalised economy, institutions have become even more crucial to lower transaction costs and assist in the enforcement of agreements across international boundaries. For instance, the evolution of capital markets is dependent on the security of property rights, where rulers cannot arbitrarily seize the assets and negatively affect investments in turn leads to poor economic performance. In contrast, where there is the commitment of the state rulers to the protection of private property rights, restraint of the executive powers and an independent judicial system, the transaction costs will be reduced, and better economic performance will be achieved. In this manner, high-quality political institutions create better economic institutions and hence, macroeconomic outcomes such as inflation become low and stable.

The role played by institutions in economic performance has also been supported by Acemoglu et al.'s (2001; 2003) hypothesis of 'extractive' institutions. The authors argue that the present unequal economic development in the various ex-colonies of European countries is due to the different institutions that were set up by the colonists. These institutions continued to exist even in the post-independence era of the colonies. In 'extractive' institutions, the colonisers' strategy was to extract the resources of the colonies without any intention to stay and not establish better institutions that replicated their countries of origin, such as the rule of law, restraints

on government spending, and protection of property rights. These 'extractive' institutions manifest themselves through political instability, absence of the rule of law, lack of restraints on the executives and widespread corruption. These historically established weak institutions lead to suboptimal macroeconomic policies that are characterised by poor economic performance, high and volatile inflation and other economic crises.

In places where the colonisers stayed and established institutions like their countries of origin to ensure good governance, economic performance continued to be better even when the colonisers had left the colonies. The authorities of the independent states continue to maintain the structure of the established institutions. Therefore, in these high-quality institutions that are characterised by better macroeconomic policies, inflation is expected to be low and stable.

Within the institutional framework, the connection between institutions and inflation can also be explained by the theory of 'myopic' government (Alesina & Tabellini, 1990). According to the authors, alternating governments have uncertainty about each other's preferences or whether the current government will be reappointed in office in the future. Therefore, the current government does not have the willingness to change its fiscal policies to reduce debt and deficit. This is because, with political instability, no one is concerned about the long-run goal of price stability. Budget deficits and public debt are used strategically by the incumbent government to influence the policy choices of the future democratically elected government. This polarisation between the alternating governments leads to high public deficits and increasing public debt. In this political environment, the future government will have limited fiscal policy choices since it will inherit high deficits. The accumulation of debt and high deficit will eventually be costly to everyone. High and persistent debts due to different and unstable political institutions lead to high inflation.

Similarly, the effect of political institutions on macroeconomic instability can also be explained by Alesina and Drazen's (1989) hypothesis of 'war of attrition. ' They argue that in situations where there are disagreements between political groups over the distributional objectives of the stabilisation policies, stabilisation policies take time to be implemented. For instance, there could be a need for fiscal policy changes when deficits and government debt are growing, but the different socio-economic groups or

political parties may disagree on how to share the burden of fiscal adjustments to stop inflation. With delays over stabilisation policies due to conflict between political parties, the increasing deficits and government debts lead to serious inflationary pressures. By the time one political group concedes, maybe through elections, it will be costly to effect big fiscal policy changes to stabilise the deficits and government debt, and in turn lower inflation. Thus, the higher the number of political groups, the higher the likelihood of conflict, the harder to reach agreements, and the higher are deficits and the associated macroeconomic problems, such as higher inflation. Therefore, political institutions are very important in determining inflationary pressures.

In the same vein, Cukierman, Edwards, and Tabellini (1989) argue that politically unstable and polarised regimes tend to have high inflation in developing countries. According to their political and economy model of tax reform, unstable countries often face high costs of preventing tax evasion and high administration costs of tax collection because of weak institutions that have been created to collect taxes. These countries tend to depend on the seigniorage to raise revenue to fund their public expenditures. This reliance on seigniorage to raise revenue is accompanied by high inflation.

4.2.3. Review of the Empirical Literature

Ghanayem et al. (2023) investigated the impact of political instability on inflation volatility in the Middle East and North Africa (MENA). The authors analysed the five dimensions of political instability by adopting the factor analysis technique. The first dimension is the instability of political regimes (successful coups, riots, the number of major constitutional changes); the second is war (guerrilla warfare and ethnic warfare and the number of legislative elections), third is government instability (the number of major cabinet changes, changes in effective executive), fourth is aggression 1(assassinations, government crises and revolutions) and lastly, aggression 2(anti-government demonstrations and alleged coups). The inflation volatility was measured by generating the conditional variance using the GARCH technique. The study covered 14 countries over the 2006-2018 period, and the system-GMM estimation technique was employed. The findings show that the instability of the political regime dimension increases inflation volatility, while the government instability dimension

reduces inflation volatility in MENA. The results also indicate that other dimensions of political instability are insignificant to inflation volatility.

Similarly, Barugahara (2015) investigated the impact of political instability on inflation volatility in 49 African countries from 1985 to 2009. In this study, political instability was measured by the incidence of coups, the state fragility index, and state failure. Further, the study used the GARCH (1,1) model to construct the conditional variance of inflation level as a measure of inflation volatility. The system-GMM was also used, and the empirical evidence showed that political instability and inflation are positively related.

Franses and Janssens (2018) undertook a panel data study of 47 African countries over the 1960-2015 period. The authors employed the Granger causality test to estimate the causal relationship between inflation and dimensions of institutional quality such as democracy, religious fractionalisation, and corruption. They found that high inflation levels are associated with less democracy, high religious fractionalisation, and more corruption.

Agoba et al. (2017) examined the effects of the financial systems and the quality of the political institutions on the effectiveness of central bank independence in achieving low inflation in Africa. The sample covered 48 African countries over the 1970-2012 period. The authors employed the Two-Stage Least Squares method to estimate the panel regression. The results found that, unlike in developed countries, the independence of the central bank is not effective in reducing inflation in Africa and developing countries. However, high central bank independence can achieve stable inflation in Africa and developing countries when there is high development of the banking sector and when institutional quality is strong.

Aisen and Veiga (2006) investigated the relationship between political instability and inflation in 100 countries from the 1975-1999 period. The authors employed the fixed effects method on the panel data. Political instability and institutions were represented by executive changes and the index of economic freedom. The authors reported that greater instability in politics, less economic freedom, and high political fragmentation and ideological polarisation can cause higher inflation volatility.

Aisen and Veiga (2008) expanded their sample of countries to 160 in analysing the effects of political instability, social polarisation, and the quality of institutions on

inflation volatility from the 1960-1999 period. Political instability was represented by cabinet changes, the ethnic homogeneity index, and the polity scale. The System-GMM estimate was used. The findings are that higher degrees of political instability and social polarisation, less democracy, and lower *de facto* central bank independence lead to higher inflation volatility. It was also reported that political instability has greater effects on inflation volatility in developing countries with less central bank independence and economic freedom.

Shevchuk, Blikhar, Zabzaliuk, and Tataryn (2020) examined the relationship between the rule of law and inflation in the 40 middle-income countries of Central and Eastern Europe, the Former Soviet Union, and East Asia. The study covered the 2013-2019 period, and the Random Effects panel method was employed on the data. The index for the rule of law variable was constructed of the following sub-indices: limited government powers, absence of corruption, order and security, fundamental rights, open government, effective regulatory enforcement, access to civil justice, and effective criminal justice. The authors found that the rule of law is positively related to inflation for the overall group of 40 countries and the regional subgroups. However, this positive relationship between the rule of law and inflation is more pronounced in Central and Eastern Europe and the Former Soviet Union regions than in the East Asia region.

Edwards and Tabellini (1991) found mixed evidence of the effect of political instability on inflation in a cross-country study of 76 countries. The study employed the OLS technique and covered the 1971-1982 period. The authors used the change of leadership to capture political instability.

Telatar et al. (2010) investigated the relationship between political instability, political freedom, and inflation in 39 countries. The period of investigation spanned from 1983 to 2002, and the two-step GMM was employed. The authors found that there is a positive effect of political instability on inflation only for developed countries and countries with low inflation. However, when political freedom is added to the regression, political instability is also found to be positively related to inflation in developing countries, but it is significant only for high-inflation countries.

In another study, Khan and Saqib (2011) examined the relationship between political instability and inflation in Pakistan. Political instability was represented by a polity

variable to define whether the country is in an autocratic regime or a democratic regime, using the weighted scale. The other two variables that represent political instability are government crises and Cabinet changes. The study used annual time series data spanning the 1951-2007 period, and GMM estimation was used on the time series data. The authors reported the existence of a relationship between political instability and inflation in Pakistan. It was found that there is a positive association between the measures of political instability and inflation in Pakistan. Asadi and Sheidaei (2017) also reported similar results in Iran. Employing the GMM technique on time series data from 1994 to 2014, the authors found that an increase in institutional quality reduces inflation in Iran.

Minea et al. (2021) investigated the relationship between inflation targeting and institutional quality in developing countries. The authors argued that institutional quality is endogenous to inflation, an approach that deviates from many studies in which institutional quality is taken as exogenous. Their study covered the 1994-2007 period and employed econometric techniques such as Propensity Scores Matching and GMM on the data. The authors reported that inflation targeting improves the quality of the institutions of the countries selected for the sample in the long run. According to the authors, developing countries that have adopted inflation-targeting regimes have shown improvement in the quality of institutions compared to the quality of institutions of developing countries that had no inflation-targeting regime.

Cicen (2023) examined the causal relationship between institutional quality and inflation for 24 developing countries. The author employed the Yilanci and Gorus (2020) test, which is an enhanced version of Toda and Yamamoto's (1995) causality test on panel data covering the 2000-2019 period. The legal system and property rights represented the Institutional quality index in the regression model. It was found that institutional quality and inflation had a bi-directional causal relationship with each other.

Khan and Hanif (2020) investigated the role of institutions in the inflation-economic growth nexus of 113 economies, both developed and developing. The period covered 1981 to 2015, and institutional quality entered the regression model as an interactive term to reflect the threshold effects. The institutional quality variable was represented by government stability, bureaucratic quality, and law and order. The GMM technique

was used in the estimation. The results show that there is a minimum level of institutional quality above which the relationship between inflation and economic growth is negative. However, below this threshold, the relationship between the two variables is non-existent.

Narayan et al (2011) examined the relationship between inflation and institutional quality in 54 developing countries. Government stability, military in politics, law and order, and democratic accountability represent the institutional quality. The period of study covered 1995 to 2004. They found that improvements in democracy and the reduction in the level of participation of the military in politics lower inflation in the long run.

From the above, it is apparent that there is a relationship between institutional quality and inflation in SSA countries and across the world. Although a few studies have found mixed evidence and a bi-directional causal relationship between institutional quality and inflation, the vast empirical literature surveyed agrees that institutional quality impacts inflation. Thus, weak institutional quality increases inflation, and strong institutional quality mitigates the effects of inflation. However, so far, no study has investigated the threshold effects of institutional quality on inflation in SSA.

4.3. DATA AND EMPIRICAL STRATEGY

4.3.1. Data

To estimate the threshold effects of institutional quality on inflation in SSA, this study uses annual panel data comprising 27 SSA countries and covering the period from 1998 to 2021. The choice of the period is based on the availability of data. In addition, the data used in the study should be balanced (data matches each variable in every period, no missing data in every period) as a requirement for using Seo and Shin (2016) dynamic panel threshold model for estimation; hence, the data used in this paper is strongly balanced. The choice of countries has been influenced by the fact that SSA countries share a common colonial history, have similar economic structures, and are also characterised by relatively high levels of macroeconomic volatility compared to other developing countries. Therefore, there are more elements of homogeneity than heterogeneity in them (Woldu,2022). This degree of homogeneity of SSA countries improves data quality.

The countries in the sample are, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Congo Rep, Eswatini, Gabon, Gambia, Ghana, Guinea, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tanzania, Togo, Uganda, and Zimbabwe.

This study uses variables that are known to be the standard determinants of inflation. They are the following: - government size (GOV), broad money supply (BMS), food production index (FPI), nominal interest rate (INT), Nominal exchange rate (EXR), Annual economic growth rate (GDP), and Institutional quality index (IQI). The list of countries and the variables used in the study have been downloaded from the World Development Indicators (WDI) database published by the World Bank. However, the source of the institutional quality index components is the World Governance Indicators database of the World Bank. The measurement of the variables and their description are discussed below:

Dependent Variable

***Inflation rate (INF*)**: This is the general rise in the prices of goods and services, and inflation is measured by the consumer price index (CPI) in %. It is measured annually; that is, monthly averages of CPI are annualised. An increase in CPI implies increases in the general price level of goods and services.

Explanatory variables

Institutional quality index (IQI): Institutional quality is the main independent variable in this study. Institutional quality refers to the rules that govern society, such as institutions by which authority is exercised in a country. Many papers on the institutional quality index-inflation nexus, such as those of Aisen and Veiga (2008) ; S. U. Khan and Saqib (2011); Telatar et al. (2010); and Khan and Hanif (2020) have used only political instability as a measure of institutional quality or political instability with an additional 1-2 dimensions of institutional quality to compute the institutional quality index. The use of political instability is generally a good dimension of institutional quality, but it does not cover many crucial aspects of institutional quality or governance indicators. Other proxies for institutional quality, such as cabinet changes, are also not appropriate to many of the SSA countries since cabinet changes remain unchanged over a long period; thus, executives cling to power.

In this study, institutional quality is represented by six composite indicators that reflect the broad dimensions of governance, such as the rule of law, governance effectiveness, political stability, and absence of violence/terrorism, control of corruption, the degree of regulatory quality, and voice and accountability. These cover a wide spectrum of governance indicators and are used globally to indicate how institutions function in a country (Kaufmann et al., 2011). The institutional quality index was computed using Stata 18 software for data analysis. The overall institutional quality score ranges from -2.5 and 2.5. An overall score of -2.5 represents poor and weak institutions. A country that has a score of 2.5 on institutional quality implies that there is good governance, since a positive overall score means strong quality institutions (Kaufmann, Kraay, & Mastruzzi, 2010).

The connection between institutions and macroeconomic performance has long been studied by Acemoglu et al. (2003) and North (1990). For instance, Acemoglu et al. (2003) argue that different institutions that were set up by the European colonisers,

particularly in Africa, are responsible for the current uneven development across African countries. Further, macroeconomic volatility, such as high inflation, output volatilities, and crises, is rooted in weak institutions. Lack of restraints on the executives will lead to poor macroeconomic policies, which will lead to inflation rate volatility. Aisen and Veiga (2006), concurring with Acemoglu et al. (2003), conjecture that economies with weak institutions and a high degree of political instability struggle to have efficient tax systems and may rely on seigniorage as a source of revenue. However, this usually leads to a higher level of inflation. It is hypothesized that weak institutions are positively correlated with high inflation rates in SSA countries. Moreover, it is expected that institutional quality will cause inflation in the long run in SSA countries. However, the effects of institutional quality on inflation are likely to be nonlinear and vary between the dimensions of institutional quality. Each dimension is discussed below:

Rule of law estimate (RLE)

The legal system is very important in every country. Investors will be attracted to countries where there is maintenance of law and order and where there is protection of private property rights. The increase in the confidence of the legal system that is perceived as fair and transparent invigorates the establishment of firms, production, and employment. This leads to overall stability in macroeconomic indicators such as inflation (Shevchuk et al., 2020).

Regulatory quality estimate (RQE)

Effective economic governance is key to economic growth and development. A good regulatory system increases economic governance, and market failures are corrected. When the regulatory system is perceived as market-friendly, economic agents will have confidence in the regulatory system, and this will increase private sector activity. A good regulatory system decreases uncertainty and brings about economic efficiency and economic growth, including price stability(Kirkpatrick, 2014; North, 1990).

Political stability and absence of violence/terrorism estimate (PSE)

Political stability is very crucial for the private sector to invest capital and grow the economy. In a climate of an unstable cabinet, frequent wars, and polarization of ethnic groups, economic volatility and crises become common. Therefore, political

instability causes inflation in developing countries (Aisen & Veiga, 2008; Barugahara, 2015; Franses & Janssens, 2018).

Government Effectiveness Estimate (GEE)

Good governance increases the confidence of the investment community in participating in the economy of the countries. The government should establish social and economic policies that favour a free-market system and commit to their implementation. This also means that the quality of public services is improved, including creating a better physical infrastructure for the private sector to operate and to enhance economic growth. Investment spending that is viewed as productive by the private sector will enhance economic growth, including price stability (Alam, Kiterage, & Bizuayehu, 2017).

Control of Corruption Estimate (CCE)

The link between corruption and inflation can be explained by the theory of optimal taxation. The government may have an intention to increase inflation so that seigniorage can be generated. Where there are poor taxation systems, tax evasion, and the costs of tax collection are very high, and this environment is associated with corrupt governments (Ben Ali & Sassi, 2016). In this environment, the government will rely on seigniorage to raise inflationary revenue. The private sector will also go underground when they see that corruption is uncontrollable and they do not pay taxes. The corrupt environment also leads to capital flight as taxable assets and income shrink, leading to more reliance on inflationary tax. With more government spending and less revenue, corruption causes budget deficits in less developed financial markets, resulting in inflation. Ayodeji (2020) also confirmed the connection between corruption and inflation in 15 countries of the Economic Community of West African States (ECOWAS) in the panel logit study.

Voice and accountability estimate (VAE)

This has to do with civic rights and the freedom to participate in the governance of the country. In countries where people participate in the running of the country, economic participation, economic growth, and development are realized. The costs of inflation

are reduced in a democratic state since everyone has a say in governance (Wandeda, Masai, & Nyandemo, 2021)

***Government size (GOV*).** Final government consumption expenditure as a % of GDP is a proxy for government size. In economic theory, the size of the government is important for macroeconomic stability. Larger government tends to reduce output volatility and inflation through the operation of automatic stabilizers (Gali, 1994; Mohanty & Zampolli, 2009; Oz-Yalaman et al.,2019)

According to the Keynesian (1936) demand-pull paradigm, with full employment of resources, an increase in government spending is accompanied by an increase in aggregate demand and a subsequent rise in output, an increase in employment, and a rise in private consumption levels. Therefore, when the demand for goods and services increases, the general price level will rise. A contractionary government spending should lower inflation.

A *priori*, the effect of government size on inflation is ambiguous in SSA.

Broad money supply (BMS): Money supply is the standard determinant of inflation. It is measured as a % of GDP, and it captures the effectiveness of monetary policy. If the monetary policy is effective in controlling inflation, institutional quality will be non-significant in the analysis of inflation in SSA. According to the quantity theory of money, the growth of the money supply is generally associated with the general increase in prices of goods and services in response to increasing demand (Friedman, 1989) . Friedman (1989) argues that the money supply is an external variable and not affected by internal factors such as price and output; instead, it affects them. The Fisher equation is generally known to vividly express the relationship between the quantity of money and the general levels of prices. It is expressed as follows:

MV = PT, M represents the quantity of money, V-velocity of money in circulation, P-price level, and T is the size of transactions. The direct relationship between the supply of money and price level assumes that the velocity of money in circulation and the size of transactions are constant in the short term. Further, the theory assumes that all the growth in the money supply goes to spending. Therefore, changes in the supply of money induce changes in the level of prices. The evidence of money supply causing inflation was also confirmed by Mbongo et al. (2014) in a similar study in Tanzania.

It is hypothesized that growth in the money supply is positively correlated with inflation in SSA countries.

Food production index (FPI): This is the index of food production at 2014-2016 = 100 constant prices. Inflation is relatively volatile in SSA countries due to the highest contribution of food items in the CPI. It is estimated to contribute about 50 % of the CPI. The volatility of food prices and unstable agricultural production fuel the volatility of inflation in SSA countries. SSA countries are also the greatest food and energy importers, and this makes up about 56 % of the consumer basket. Therefore, global shocks in food prices add to high inflation (Deaton, 1999).

There is also increasing demand for food production since most of these SSA countries have very high population growth rates that are higher than their economic growth rates. With increasing urbanisation, the continuous increase in demand for food puts more pressure on food production, and hence upward pressure on food prices (Ofori et al., 2017). Stable agricultural production and food prices are crucial to fighting inflation in SSA countries. It is hypothesized that unstable food production will increase inflation in SSA.

Currency exchange rate (EXR): The nominal exchange rate is the price of the domestic currency in terms of the foreign currency. The real exchange rate, on the other hand, is the price of domestic goods in terms of foreign goods(Garcia & Restrepo, 2001) The theoretical literature advances many factors that affect the price levels of countries, such as the fiscal and monetary policies, the global prices, and also the mark-up prices over costs, including price discrimination of prices (Ha et al., 2020). Further, the depreciation and appreciation of the local currencies against the foreign currencies do affect the price levels.

Several theories have been proposed to establish the connection between exchange rates and inflation. One such theory is the law of one price, which assumes perfectly integrated markets whereby buyers from different markets should theoretically pay the same price (law of one price) net of transportation costs for identical goods (Goldberg & Knetter, 1996). The law of one price hypothesis is when identical products sell at the same price in different countries. For the law of price to hold, the assumption is that there are no transaction costs, distribution costs, and resale costs. The law of one price implies that exchange rates' movements do not affect the price level of goods

traded. However, the law of one price hypothesis has received much criticism as its assumptions are taken to be too unrealistic and not supported by data (Goldberg & Knetter, 1996).

The other strand of literature has analysed the effect of exchange rate pass-through (ERPT) on the domestic price level. ERPT refers to a percentage change in the import prices caused by a change of percentage in the exchange rate between two exporting and importing countries (Ghosh, 2009; Ha et al., 2020). This paradigm assumes that mark-ups of prices on costs should be constant and have constant marginal costs. ERPT could be complete if there is a one-to-one relationship between exchange rate movement and the price of imported goods, or it can be partial due to price discrimination whereby market-dominant companies sell the same products but charge different prices to different markets. Sometimes, the pass-through effects of local currency depreciations are diluted by mark-ups and increases in taxes (Ghosh, 2009). Generally, exchange rate movements affect the prices of tradable goods. If, for instance, the domestic currency depreciates against the foreign currency, the imported goods that form part of the basket of CPI will be expensive, and this will lead to domestic inflation. Therefore, the bigger the share of imported goods within the basket of CPI, the more the effect of exchange rate is on domestic prices, *ceteris paribus* (Garcia & Restrepo, 2001).

The other channel through which depreciation can have a direct effect on domestic inflation is when there are imported input costs to domestic production. These input costs will be passed through to the consumers by way of the increased price of the final good in the final stage of the production process. It is hypothesized that the depreciation of the local currencies of the SSA countries against their foreign currencies will lead to an increase in domestic prices.

Short-Term Interest Rate (INT)*:* The interest rate is the cost of borrowing, and it also serves as income to the savers or investors. It is expressed in %. Economists have long been interested in the connection between short-term interest rates and inflation rates. This interest culminated in the development of a theory by Irvin Fisher (1930), and hence, afterward, the theory is referred to as the Fisher hypothesis in explaining the relationship between the two variables. Suppose i represent the nominal interest

rate, r is the real interest rate, and π^e expected inflation rate, the Fisher equation can be defined as: -

$i = r + \pi^e$ or $r = i - \pi$e. This implies that the nominal interest rate is the sum of real interest and the expected inflation rate, or the real interest rate is equal to the nominal interest rate less the expected inflation rate. The intuition behind the Fisher equation or hypothesis is that there is a one-to-one relationship between the nominal interest rate and inflation (Ayub et al., 2014). The Fisher framework has been largely used to explain the connection between the nominal interest rate and expected inflation. It is for this reason that most of the central banks use interest rates as a policy instrument to control inflation in their inflation-targeting policy framework. Generally, when the inflation rate rises above a certain inflation target level, the monetary authority increases the short-term repurchase offer rate (repo)[11] to lower the aggregate demand for credit by individuals and businesses (Mishkin & Eakins, 2021).

However, the aggregate demand depends on the long-term interest rates according to the expectation theory of the term structure of interest rates. This theory defines long-term interest rates as the weighted average of future short-term interest rates plus a term premium. Therefore, a decrease in the short-term rates should also apply to long-term rates. This justifies the use of short-term interest rates by the monetary policy to manage the aggregate demand and therefore control inflation (Kose et al., 2012). The expectation is that an increase in the nominal interest rate will lower inflation in SSA countries.

Economic Growth (GDP)

An increase or a decrease in GDP from one period to another is a measure of economic growth or decline. According to Campillo and Miron (1997) as countries develop economically, they become more technologically advanced and might be able to fight inflation better using sophisticated technologies. It is also argued that economic agents in advanced countries have a higher aversion to high inflation rates due to their experience of the negative welfare effects of inflation (Vuletin & Zhu, 2011).

[11] The short-term interest rate used by the Central Banks, for example in South Africa to lend commercial banks.

Another strand of the demand-pull theory (Keynes, 1936) is that as economic activity is stimulated, there will be an increase in employment coupled with a rise in income, and the propensity to consume increases. This rise in consumption levels triggers an increase in the general prices of goods and services. A *priori*, there is a positive relationship between GDP and inflation in SSA countries.

Panel Unit Root Testing

Before estimation procedures can commence, there is a need to test the series for stationarity. Failure to do panel unit root testing can lead to estimation results that show a spurious relationship with an insignificant R-squared. The study used two tests, namely, Levin, Lin, and Chu (LLC) and Augmented Dicky-Fuller (ADF), to ensure the reliability of verdicts on stationarity.

These are widely used tests and are known for their power. All the tests formulate the Null Hypothesis of no stationarity. The Alternative Hypothesis states that the series is stationary. The rejection of the Null hypothesis confirms that the series is stationary and can be used in estimation models.

4.3.2. Empirical Strategy

In this study, the linear dynamic effects of institutional quality on inflation are first estimated using two-step FD-GMM. Thereafter, the threshold effects of institutional quality on inflation are estimated for SSA. It is important to estimate the threshold effects of institutional quality on inflation to determine the minimum threshold level below which inflation can rise. As explained in the earlier section of the thesis, recent evidence has shown that there is a potential non-linear relationship between the two variables. Knowing the exact threshold level of institutional quality to inflation can provide valuable information to policymakers to forecast inflation better.

We use the dynamic panel data threshold model of Seo and Shin (2016), which is based on the two-step FD-GMM technique. Inflation is a dynamic process, so past inflation can influence current inflation and may also affect the expected inflation rates. Therefore, the panel data methods of Ordinary Least Squares (OLS), Fixed Effects (FE), and Random Effects (RE) are not suitable as they are static for estimating the

dynamic relationships between institutional quality and inflation. These traditional panel data methods can lead to biased estimates when dealing with dynamic panel data with country-specific effects (μ_i) and the lagged dependent variable ($\beta_1 INF_{it-1}$) (See Eq.15.below) (Arellano & Bond, 1991). The biased estimates can emanate from the correlation of the unobserved country-fixed element with the lagged dependent variable. To address this limitation, Arellano and Bover (1995) and Arellano and Bond (1991) propose the first-difference transformation to eliminate the country-specific effects. Hence, equation 15 is transformed to equation 16 below to eliminate the country-specific effects. However, the first-difference transformation to eliminate the country-fixed effects can also create the problem of endogeneity, whereby the transformed error terms are correlated with the lagged explanatory variables. For instance, Minea et al. (2021) found that institutional quality is endogenous to inflation (reverse causality). Therefore, the use of traditional panel models such as OLS, FE, and RE can lead to simultaneity bias. The other source of endogeneity is omitted variables in the model specification. For example, in this study, the import price and oil price variables have been omitted in the model specification, although they are important determinants of inflation in SSA[12].

Therefore, the FD-GMM is preferred since it also addresses the problem of endogeneity by leveraging appropriate instrument variables in the estimation model (Ojeka et al., 2024). The technique also addresses the concerns of serial autocorrelation of the errors. FD-GMM also requires the cross-sectional units to be greater than the time-series observations, which is the case in this study, N >T. The lags of the explanatory variables are included in the model as instruments to address endogeneity, and thereafter, the model (Eq.16) is estimated. The econometric model is specified as follows: -

$$INF\text{it} = \beta_0 + \beta_1 INF_{it-1} + \beta_2 IQI_{it} + \beta_3 GDP_{it} + \beta_4 logGOV_{it} + \beta_5 logFPI_{it} + \beta_6 logBMS_{it} + \beta_7 logEXR_{it} + \beta_8 INT_{it} + \mu_i + \varepsilon_{it} \quad (15)$$

$\beta_1 INF_{it-1}$ term represents the linear dynamic effects of the lagged inflation on the current and future inflation. IQI represents the main explanatory variable while GDP, $logGOV$, $logFPI$, $logBMS$, $logEXR$ and INT are the control variables. β_0 to β_8 are

[12] [12] Alehegn (2021) 'systematic review study on the determinants of inflation in SSA from 1970-2017

the parameters to be estimated. The i and t are country and time indices respectively. The μ_i is the individual country-specific and time-invariant fixed effect and ϵ_{it} is an error term assumed to be, ε ~NID (0, σ^2). Eq.1 is first differenced to get Eq. 16 as follows:

$$\Delta INFit = \Delta\beta_1 INF_{it-1} + \Delta\beta_2 IQI_{it} + \Delta\beta_3 logGDP_{it} + \Delta\beta_4 logGOV_{it} + \Delta\beta_5 logFPI_{it} + \Delta\beta_6 logBMS_{it} + \Delta\beta_7 logEXR_{it} + \Delta\beta_8 INT_{it} + \Delta\varepsilon_{it} \quad (16)$$

The dynamic panel threshold method

The threshold effects of institutional quality on inflation can be estimated using the dynamic panel threshold model of Kremer et al.,' (2013). However, this regression model requires that the regressors, and or the transition variable be exogenous. This ignores the fact that institutional quality can be endogenous to inflation. Therefore, employing the Kremer et al' (2013) dynamic panel threshold regression model estimator in this study can lead to inconsistent and biased results. The other option is to use Hansen's (1999) panel threshold model for this study. Although the unobservable fixed specific-country element is accounted for in Hansen's (1999) panel data threshold model, its key limitation is that it does not account for the possible endogeneity of the institutional quality to inflation in SSA. Again, the static threshold models assume that the estimated threshold is fixed over time, failing to pay closer attention to the existing dynamic relationships between institutional quality and inflation (Ojeka et al., 2024). The estimates obtained from the above-mentioned models can be biased. As an alternative, this study adopts Seo and Shin's (2016) dynamic panel threshold model with endogenous variables to estimate the threshold effects of institutional quality on inflation for the SSA countries. This model has an advantage over other non-linear models because it does not suffer from multicollinearity and overestimation of coefficients of threshold variables that may arise due to exogenous threshold variable misspecification (Hatemi-J et al., 2017). The technique also allows for estimating threshold effects with panel data, even if some regressors are endogenous. The model uses appropriate instrument variables, thereby addressing potential endogeneity (Seo et al., 2019). This makes Seo and Shin's (2016) model relatively superior compared to other panel threshold models; moreover, it is known to yield consistent and unbiased estimates. The dynamic panel threshold regression equation of Seo and Shin (2016) takes the following form:

$$y_{it} = (1, X'_{it})\,\phi_1 I\{q_{it} \leq \gamma\} + (1, X'_{it})\,\phi_2 I\{q_{it} > \gamma\} + \varphi + \epsilon_{it} \quad (17)$$

Where y_{it} is the dependent variable, X'_{it} represents regressors, including the lagged independent variable. $The\ q_{it}$ is the transition variable, ϕ_1 and ϕ_2 are the slope parameters, and they divide the sample into high and low regimes. γ is the threshold parameter, φ is the unobserved individual fixed element, and ϵ_{it} is an error term assumed to be ε ~NID (0, σ^2). The above Eq. 17 can be applied to this study in this regression equation format:

$$INF_{it} = \beta 1_i\, IQI_{it} I\,(IQI_{it} \leq \gamma) + \beta 2_i\, IQI_{it} I(IQI_{it} > \gamma) + \theta X_{it} + \varphi + \epsilon_{it} \quad (18)$$

INF_{it} represents inflation as a dependent variable. t and i are the time and country indices. IQI_{it} is the institutional quality index, and is also the threshold variable that can split the sample into regimes or groups depending on whether IQI_{it} is above or below the unknown parameter, γ . $\beta 1_i$ and $\beta 2_i$ are the slope parameters. The impact of institutional quality on inflation will be $\beta 1$ for countries in a low level of institutional quality regime and $\beta 2$ for countries in a high level of institutional quality regime. X_{it} represents a set of control variables, including the lagged dependent variable. The slope coefficients of the control variables are assumed to be regime-independent. To test for the threshold effect in a dynamic panel threshold model as per Eq.18. above, the setting is:$H_0 : \beta_1 = \beta_2$ and the $H_1 : \beta_1 \neq \beta_2$. Further, it should be noted that in this study, the dynamic panel threshold regression model estimator in Eq. 18 above, is based on the two-step FD GMM proposed by Arellano and Bond (1991).

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4.4. RESULTS AND DISCUSSION

4.4.1. Summary of descriptive statistics of the variables

The table below summarizes the descriptive statistics of the variables that have been used in the model.

Table 4.1. 1.(a) Summary Descriptive Statistics

Measure	INF	BMS	EXR	FPI	GDP	GOV	INT	IQI
Mean	9.006	31.211	844.878	89.652	3.999	15.255	6.874	0.000
Median	4.725	23.864	493.829	93.640	4.365	14.648	5.399	-0.031
Maximum	557.202	159.329	9686.772	181.330	21.452	39.451	52.437	2.907
Minimum	-3.233	5.143	0.024	28.770	-17.669	0.952	-18.132	-2.949
Std. Dev.	30.575	22.087	1557.161	22.955	4.186	6.115	11.522	1.000
Observations	648	648	648	648	648	648	648	648

Source: Author's computation using EViews 13, 2024

From Table 4.41(a), the magnitude of the standard deviations shows that the observations are dispersed from the means, particularly for inflation[13], government consumption expenditure, exchange rate, short-term interest rate, and food production index. This implies that the means of the variables may not be reliable to inform policy because they are fluctuating, and some of them can be outliers. In contrast, the observations for GDP, institutional quality index, and money supply are less scattered around their means and hence can be relied upon for the policy-making process. Table 4.4.1(a) further shows that the average inflation rate in the SSA countries is very high compared to inflation in the developed countries, despite the overall decline in inflation

[13] If Zimbabwe data for inflation is excluded, the average inflation for SSA over 1998-2021 period is 5.81%.

rates across the world since the start of the *Great Moderation* era. Institutional quality has a mean of 0.000 and a standard deviation of 1.00, with the values ranging from -2.95 to 2.91 for minimum and maximum, respectively. There has been some improvement in the institutional quality in SSA over the years, as observed with regard to governance and sound economic management policies. (Crowe & Meade, 2008). For instance, Angola was required to improve democratic governance and transparency with respect to oil revenue expenditure (Hackenesch & Hackenesch, 2018). Again, the improved institutional quality in SSA countries is likely to suggest the fact that some countries have experienced significant improvements in governance and sound economic management policies due to the institutional reforms being encouraged by the establishment of regional organizations such as the South African Development Community (SADC), Economic Community of West African States (ECOWAS) and African Monetary Union (AMU) (Crowe & Meade, 2008).

These regional bodies require their members to achieve certain targets on macroeconomic indicators and to improve governance. Other factors, such as the conditions set by the international donors for countries to access aid, also contribute to improved quality of the institutions. For example, the reconstruction programme of post-war Angola was a partnership with the EU for international aid. One of the requirements of the international aid donors to Angola was that the latter should improve on democratic governance and transparency in the oil revenue expenditure allocation (Hackenesch & Hackenesch, 2018). Consequently, Angola moved from -1.65 in 1998 (during the civil war) to -0.30 in 2021 on the institutional quality index. Rwanda also experienced ethnic war during the 1990s, and the institutional quality was -1.49 in 1998 and 0.97 in 2021. Similarly, Burundi moved from -1.87 in 1998 to -0.85 in 2021.

Government consumption expenditure to GDP ratio recorded a mean value of 15.25% and a standard deviation of 6.11%. The minimum and maximum values stood at 0.95% and 39.45% respectively. In comparison with the OECD countries, government consumption expenditure as a share of GDP in SSA countries is very small but relatively more volatile. According to Haelg et al. (2022), the OECD government spends an average of 20.22 % which is above the average spend by SSA countries by 5%. The OECD average standard deviation of 4.81% is also less than the SSA's average standard deviation of 6.11% and this confirms the relative stability of government consumption expenditure of the OECD countries over time. The large size of governments in the OECD is attributed to huge social transfers, unlike in most of the SSA countries, in which there is little or no government spending on social benefits. Tariq et al. (2023) further point to the fact that large government sizes in developed countries have efficient tax systems that fund large public expenditures and hence can only cause moderate inflationary pressures. In contrast, increasing government expenditure in developing countries will likely be funded by increasing debts because of poor tax systems. The mounting debt can, over time, increase inflation in developing countries. The evidence from Table 4.4.1. (a) also indicates that the exchange rate has a mean of 844.88 and a standard deviation of 1557.16, with the values ranging from 0.02 to 9686.77 in SSA. The exchange rate fluctuations are mainly attributed to the fluctuation of commodity prices since SSA countries depend on the exports of raw materials and importers of energy, food, and other materials for domestic use. The fluctuation of the SSA's exchange rates also adds to the high volatility of the inflation rates in this sub-region. The political climate also renders SSA's currency purchasing power against major currencies to weaken as investors take away their capital assets to stable political environments (Nguyen, Dridi, Unsal, & Williams, 2017). The

fluctuating exchange rates in SSA countries also pose a threat to the future economic growth of these countries since there is a link between economic growth and exchange rates (Oseni, 2016).

Real interest rate recorded a mean value of 6.80% and a standard deviation of 11.54% in SSA countries. The minimum and maximum values stood at -18.13% and 52.44% respectively. Recently, interest rates have shown a downward spiral across the globe but are still in double-digit figures in SSA. The theoretical predictions are that low interest rates imply low economic activity, and the opposite is also true. Further, high indebtedness should cause real interest rates to rise. However, there is weak empirical evidence that high debts, as seen in SSA countries, have caused real interest rates to rise. Rather, the risk of default on debt payments, together with other factors, could be the reason for the relatively high real interest rates in SSA (Bismut & Ramajo, 2021). Except for South Africa, most SSA countries have double-digit real interest rates, perhaps explaining the low economic activity due to the high cost of borrowing as most of the inhabitants resort to informal semi-subsistence living.

The results further show that the average value of the food production index is 89.65 with a standard deviation of 22.95. The minimum and maximum values stood at 28.77 and 181.33, respectively. The shown figures confirm the relatively high food prices and high food price volatility in Africa compared to other regions in the world. For instance, Minot (2014) reports that the monthly average standard deviation of food prices in SSA countries is about 0.116 compared to the monthly standard deviation of international food prices of 0.06. This difference in the food price and its volatility explains much of the high inflation rates, including the highly volatile general price level in SSA. Again, the results show that the average value of GDP growth is 4.00 with a standard deviation of 4.19. The minimum and maximum values stood at -17.67%

and 21.45% respectively. Finally, the average value of the broad money to GDP ratio is 31.21% with a standard deviation of 22.09%.

4.4.1. (b) Descriptive statistics of the dimensions of IQI

Table 4.4.1. (b): Descriptive Statistics for the Dimensions of Institutional Quality

Measure	PSE	RLE	RQE	VAE	GEE	CCE
Mean	-0.393	-0.556	-0.490	-0.485	-0.587	-0.529
Median	-0.316	-0.588	-0.508	-0.583	-0.697	-0.659
Maximum	1.283	1.024	1.207	1.007	1.161	1.633
Minimum	-2.523	-1.870	-2.202	-1.724	-1.601	-1.581
Std. Dev.	0.815	0.609	0.580	0.677	0.586	0.620

Source: Author's computation using EViews 2013, 2024

Note: Political stability and absence of violence estimate (PSE); Control of corruption estimate (CCE); Government effectiveness estimate (GEE); Rule of law estimate (RLE); Regulatory quality estimate (RQE), and Voice and Accountability estimate (VAE)

Table 4.4.1. (b), above shows the descriptive statistics of the dimensions of the institutional quality index. The RLE has a maximum of 1.024 and a minimum of -1.870; the mean is -0.556. GEE has a maximum of 1.161 and a minimum of -1.601. The mean and the standard deviation are -0.587 and 0.586, respectively. The CCE records the maximum and minimum of 1.633 and -1.581, respectively. The mean is -0.529, and the standard deviation is 0.619. What is also noticeable from the table above is that the averages of all the dimensions are negative. Further, RLE, GEE, and CCE have relatively low averages compared to the averages of RQE, VAE, and PSE. This may suggest that these dimensions have relatively weak institutional quality compared to RQE, VAE, and PSE dimensions. The latter have their averages above -0.550. Therefore, theoretically, countries that have weak institutional quality as reflected in

the sizes of the means of RLE, GEE, and CCE should experience relatively higher inflation rates in SSA, *ceteris paribus.*

Table 4.4. 2. Pairwise Correlation Matrix

Variable	INF	IQI	INT	GOV	GDP	FPI	EXR	BMS
INF	1.							
IQI	-0.156	1.						
INT	-0.287	0.074	1.					
GOV	0.251	0.101	0.467	1.				
GDP	0.133	0.036	0.408	0.615	1.			
FPI	0.250	0.032	0.528	0.721	0.657	1.		
EXR	0.148	-0.311	0.313	0.406	0.357	0.489	1.	
BMS	0.189	0.303	0.428	0.746	0.481	0.641	0.282	1

Source: Author's computation using EViews, 13, 2024

From Table 4.4.2. above it can be seen that institutional quality (IQI) and interest rates (INT) have negative relationships with inflation. This implies that institutional quality and interest rates have an impact on inflation in SSA countries. Government size and GDP are positively related to inflation as expected. On the other hand, the food production index and exchange rate have a positive relationship with inflation in SSA. It is also important to check for multicollinearity of the dataset because the interaction between independent variables may lead to wrong conclusions, as it will be difficult to identify the variable whose impact on the dependent variable is statistically significant. A decision rule provided by Imdadullah et al. (2016) indicates that the correlation between the independent variables should be lower than 0.8 if multicollinearity does not exist. It can be observed from Table 4.4.2 above that no variable has a 0.8 correlation with the other.

4.4.3. Panel Unit Root Testing

Panel unit root testing was performed using the Levin-Lin-Chu (LLC) and ADF-Fisher tests to avoid any potential spurious relationships between the variables. Table 4.4.3. below shows the results of panel unit root testing.

Table 4.4.3. Panel unit root testing

Variable	LLC		ADF-Fisher	
	Level	**1st Difference**	**Level**	**1st Difference**
IQI	-1.776 (0.0378) **	-19.7365 (0.0000) ***	65.887 (0.1287)	252.331 (0.0000) ***
GOV	0.3271 (0.6282)	-8.3154 (0.0000) ***	60.1929 (0.2617)	258.746 (0.0000) ***
BMS	1.9624 (0.9751)	-11.6891 (0.0000***	34.2642 (0.9844)	219.561 (0.0000) ***
INF	-9.7777 (0.0000) ***	-23.4874 (0.0000) ***	239.857 0.0000***	580.862 (0.0000) ***
GDP	-4.5832 (0.0000) ***	-12.2070 (0.0000) ***	151.017 (0.0000) ***	408.435 (0.0000) ***
FPI	2. 3070 (0.9895)	-8.3258 (0.0000) ***	23.6590 (0.9999)	245.000 (0.0000) ***
EXR	0.5852 (0.7208)	-13.6577 (0.0000) ***	32.0096 (0.9925)	225.208 (0.0000) ***
INT	-48.9912 (0.0000) ***	-25.2946 (0.0000) ***	426.479 (0.0000) ***	640.553 (0.0000) ***

Note: **/*** denote 5% and 1% significance level respectively.

Source: Author's computation using EViews 13, 2024.

The results from Table 4.4.3. indicate that the exchange rate, food production, government spending and broad money supply are non-stationary at the level for both LLC and ADF-Fisher tests. The results of the first difference panel unit root test indicate otherwise, i.e. the variables are stationary at the first differences. This indicates that exchange rate, food production, government spending, and broad money supply are integrated of order one *I*(1). In addition, institutional quality is stationary at the level in the LLC test but not at the level under the ADF-Fisher test. It is stationary at the first difference in the ADF-Fisher test. Inflation, interest rate, and GDP are stationary at the level in both panel unit root tests. This indicates that the variables have zero-order *I*(0) integration. Therefore, the variables can be used in the estimation model.

4.4.4. Panel Cointegration Test Results

The essence of testing for cointegration in the variables is to make sure that variables move together and that there is an existence of long-term relationship between variables**.** The Pedroni (1996) test was used to test the existence of cointegration between inflation and other variables. This test is residually based; thus, it tests whether there are unit roots in the residuals, and it is popularly used in heterogeneous and homogenous panels**.** The Pedroni panel cointegration test has the advantage over many panel cointegration tests in that it uses many tests for a better verdict of whether to reject or not to reject the null hypothesis of no correlation. It is also known for its power and consistency in the application.

Table 4.4.4. Pedroni Panel Cointegration Test Results

Test	Statistic	p-value
Modified Phillips–Perron test	4.4831	0.0000***
Phillips–Perron test	-12.1224	0.0000***
Augmented Dickey-Fuller test	-12.3895	0.0000***

Note: *** represents 1% significance level
Source: Author's computation using Stata 18, 2024

The above Table 4.4.4. shows the results of the Pedroni panel cointegration test. The advantage of the Pedroni panel cointegration test is that the output gives three tests for a better verdict. The results are made up of three tests, namely Modified Phillips-Perron, Phillips-Perron, and Augmented Dicky-Fuller tests. All three tests have test statistics and p-values indicate that institutional quality and inflation in SSA have a long-run relationship. All three tests indicate that the variables are significant at 1% and 5% levels, and the Toda and Yamamoto (1995) causality test and the Kremer et al. (2013) dynamic panel threshold model can now be employed on the variables.

4.4.5. Cross-section dependence test results

In this study, the Cross-section Dependence (CD) test of Pesaran (2004) and the Lagrange multiplier (LM) test of Breusch and Pagan (1980) were employed to test the presence of errors dependence of the cross-sections in the panel data. The tests are relatively simple to apply and robust to breaks in slope coefficients. Testing for cross-section dependence is important because when the errors correlate with the regressors, this may generate inconsistent estimations from the regressions. The common factors may emanate from the responses of countries to similar economic, political, or spatial stimuli, or common unobserved factors (Gaibulloev et al., 2014). Tests for cross-sectional dependence are based on the estimated averages of pair-wise correlation coefficients of the residuals (ρ_{ij}) (Gaibulloev et al., 2014; Im et al., 2003; Pesaran, 2015).

The hypothesis is that there is no cross-sectional dependence of residuals, and a 5% level of significance is set. Probability values that are above a 5% level of significance imply that the null hypothesis of independent residuals in the cross-sections cannot be rejected. The rejection of the null hypothesis implies that the residuals are dependent in the cross-sections. The results of Table 4.4.5, below, show that two (Breusch-Pagan

LM and Pesaran CD tests) out of three tests have probability values that are more than the 5% level of significance. This means that there is no cross-section dependence in the residuals, and the null hypothesis cannot be rejected. Therefore, it is concluded that the errors are not correlated in the panel but are independent of others. The results of the estimates are expected to be valid.

Table 4.4.5. Cross-Section dependence test results

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	72.982	351	1.0000
Pesaran scaled LM	-10.493		0.0000
Pesaran CD	0.201		0.8406

Source: Author's computation using EViews 13, 2024

4.4 6. Discussion of the FD-GMM results

Table 4.4. 6.(i). Two-Step FD GMM Results

Variables	Coefficient	Std. Errors	t-Statistics	p-value
L. Inflation	-0.203	0.207	-0.98	0.337
IQI	-5.441	10.582	-0.51	0.051*
GDP	0.394	0.561	0.70	0.489
logBMS	72.312	17.686	4.09	0.000***
logGOV	-30.858	14.613	-2.11	0.044**
logEXR	9.891	5.906	1.67	0.106
logFPI	-167.449	40.543	-4.13	0.000***
INT	-2.651	0.727	-3.65	0.001***

Note: ***/**/* represent 1% 5% and 10% significance levels

Source: Author's compilation using Stata 18, 2024

Table 4.4.6. (ii). Diagnostic Tests-Two Step FD-GMM Results

No of instruments: 24 Observations: 27 groups

Test	p-value
F-Statistics-joint significance	0.000***
AR (2) in first difference	0.172
Sargan test of overidentified restrictions	0.315
Hansen test of overidentified restrictions	0.176

Note: *** represents 1% significance level

Source: Author's compilation using Stata 18, 2024

Table 4.4.6.(i) shows the results of the FD-GMM estimation. The past period inflation negatively influences the current inflation, but the impact is negligible and statistically insignificant even at a 10% level. Institutional quality exerts a negative effect on inflation in SSA countries at a 10% significance level. This implies that an increase in institutional quality lowers inflation in SSA countries. This finding is consistent with the *priori* that strong institutions reduce inflation and the opposite holds. Further, this finding supports the existing literature on the relationship between inflation and the quality of institutions (Acemoglu, Johnson, & Robinson, 2005; Aisen & Veiga, 2006, 2008; Barugahara, 2015; Ghanayem et al., 2023). Regarding the control variables, the finding shows that GDP has a positive but weak relationship with inflation in SSA countries, and it is also statistically insignificant even at the 10% level. Money supply, on the other hand, is statistically significant at 1%, and its magnitude of 2.7 reflects its importance in inflation control. This finding is consistent with the empirical literature, whereby growth in money supply induces the propensity to consume, which in turn raises the general price level (Mishkin, 2007; Mishkin & Eakins, 2021). Government spending exerts a negative impact on inflation in SSA, and it is significant at the 5%

level. This finding is at odds with the expected hypothesis that an increase in government expenditure should increase inflation in SSA countries. Theoretically and empirically, a rise in government spending is associated with high inflation (Bianchi et al., 2022; Cochrane, 2021; Galí, 2018). However, the finding supports the country-level study of Olayungbo (2013), who found that contractionary government spending increases inflation in Nigeria, and the opposite also holds. The possible interpretation of these surprising results is that an increase in government spending creates employment and increases output. An increase in output may imply a greater supply of goods relative to the demand, and their prices will subsequently drop. The exchange rate is positively related to inflation, but statistically insignificant even at a 10% level in SSA.

The results further show that short-term interest rate has a negative relationship with inflation in SSA countries. This agrees with the prior that a rise in interest rate increases the cost of borrowing, and this discourages investment and private consumption levels. The finding further supports the study by Kose et al. (2012) in Turkey, wherein the interest rate was used as a policy instrument in the inflation-targeting framework. The food production index has a negative relationship with inflation in SSA countries and is significant at a 1% level. This finding resonates with the empirical studies of Ofori et al. (2017), who found that stable agricultural production and food supply lead to lower prices of food.

Regarding the diagnostics of the model in Table 4.5. (ii), the AR (2) of 0.172 is not significant, and therefore, the null hypothesis of no serial autocorrelation cannot be rejected. Similarly, the Sargan and Hansen tests of over-identifying restrictions, with the p-values of 0.315 and 0.176, respectively, indicate that the applied instruments are valid, and they are not correlated with the error term. Notably, the Sargan test value

lies between 0.025% and 1% significance level. According to Roodman (2009a), the Sargan test value should be above 0.025 % but less than 1% for the test results to be valid. The F-test 1% significance level also indicates the reliability of the model, confirming that the estimates are robust and reliable.

4.4.6. Discussion of the Dynamic threshold model results

4.4.6. (iii) IQI dimensions threshold results

Variable	Threshold estimate	p-value
PSE	-1.049	0.000***
RLE	-0.075	0.812
RQE	-0.583	0.023**
AVE	-1.126	0.000***
CCE	-1.021	0.000***
GEE	-0.942	0.000*

Note: ***/**/* denotes 1%, 5%, and 10% levels of significance, respectively.

Source: Author's compilation using Stata 18, 2024

Table 4.6 (i) presents the results of the dynamic threshold model on the estimated thresholds and their probability values. Evidence from the Table is that the threshold estimates of all the institutional quality dimensions have negative signs and are statistically significant, except for the rule of law (RLE) threshold estimate, which is statistically insignificant. Based on the size of the threshold estimated values, the optimal (the level at which it does not negatively influence inflation) institutional quality on inflation for VAE, PSE, and CCE can be viewed as relatively lower than the optimal institutional quality of GEE, RQE, and RLE on inflation. Thus, they are relatively weaker than the other dimensions of institutional quality. The observed different optimal institutional quality levels suggest that the institutional quality dimensions have varying effects on inflation in SSA.

Table 4.4.6.(iv): Dynamic panel data threshold model results

Variable	Coefficient	Std. Errors	z	p-value
Lagged INF < r	0.551	0.012	44.27	0.000***
IQI < r	-13.319	2.527	-5.27	0.000***
Constant	28.497	4.549	6.26	0.000***
Lagged INF>r	-0.968	0.136	-7.14	0.000***
IQI >r	14.372	2.252	5.70	0.000***
r	-0.159	0.084	-1.89	0.059*

Note: < and > are low and high regimes, respectively; ***/* represents 1% and 10% significance levels, respectively. r denotes the estimated threshold.

Source: Author's compilation using Stata 18, 2024

The results of the dynamic panel data threshold model are in Table 4.6 (ii). The evidence from the table confirms that institutional quality has threshold effects on inflation in SSA. The estimated threshold is -0.159. Therefore, the null hypothesis of no threshold is rejected. The study further reveals that institutional quality exerts influence on inflation both below and above the estimated threshold and is statistically significant at 1%. The institutional quality's coefficient is -13.319 below the estimated threshold and 14.372 above the estimated threshold. Both below and above the estimated threshold, institutional quality coefficients are statistically significant at 1% level. However, the magnitude of the coefficient of the institutional quality above the estimated threshold is greater than that below the estimated threshold. This can mean that there is more impact of the institutional quality on inflation above the threshold than below the threshold. The increase in the institutional quality below the estimated threshold appears to mitigate inflation. This resonates with the expected result that an

increase in the quality of institutions will ameliorate the inflation effects in SSA. Empirically, the finding corroborates that of the existing literature as reported earlier. Surprisingly, the institutional quality above the estimated threshold increases inflation in SSA. The likely interpretation of this finding is that with improved quality of the institutions, investor confidence is boosted, leading to better economic conditions. The improved economic conditions, in turn, raise aggregate demand for goods and services, and this demand induces the price level to rise.

Table 4.4.6. (iii) Countries in High IQI Regime

Country	**IQI**	**INF**
Benin	0,081	2,325
Botswana	2,024	6,636
Burkina Faso	0,322	1,971
Eswatini	0,251	6,494
Gabon	0,135	1,832
Gambia	-0,077	6,089
Ghana	0,628	15,483
Madagascar	-0,154	8,540
Mali	-0,017	1,792
Mauritius	2,087	4,563
Mozambique	-0,073	10,738
Rwanda	0,044	5,832
Senegal	0,427	1,606
Seychelles	1,013	6,012
South Africa	1,553	5,243
Tanzania	-0,008	6,990
Uganda	0,460	5,787

Table 4.4.6. (iv). Countries in Low Regime

Country	IQI	INF
Angola	-1,040	56,972
Cameroon	-0,636	2,254
Burundi	-1,047	8,851
Congo Republic	-1,331	3,022
Guinea	-0,822	13,70
Mauritania	-0,180	4,896
Niger	-0,296	1,953
Nigeria	-0,708	12,006
Togo	-0,567	2,056
Zimbabwe	-2,071	39,775

Source: Author's computation of data downloaded from the World Bank website using Microsoft Excel, 2024

Notably, based on the estimated institutional quality threshold of -0.159, SSA countries can be classified into regimes of high (above the estimated threshold) institutional quality and low(below) institutional quality as reported in Tables 4.4.6 (iii) and (iv). Therefore, Mauritania, Nigeria, Niger, Togo, Angola, Burundi, Congo Republic, Guinea, Cameroon, and Zimbabwe fall under the regime of weak (low) institutional quality because their average individual institutional quality indexes are below the estimated institutional quality of -0.159 over the observed 1998-2021 period. The remainder of the countries in the sample belong to a regime of relatively strong institutional quality because their individual average institutional quality indexes are above the estimated institutional threshold of -0.159.

On closer examination of Table 4.4.6. (iii) and (iv), one can discern a correlation between institutional quality and inflation in most countries. Countries that have low-quality institutions seem to have high inflation, and those that have better institutional quality have corresponding lower inflation, although there are exceptions to the pattern in some countries where the correlation between the two variables is not clear, possibly because the variables bear no relationship with each other. For example, the Congo Republic has low average inflation, yet the institutional quality is below the

threshold estimate and, thus, in a low regime category. This low inflation is due to the introduction of an anti-inflationary programme in the 1990s to stabilize and reduce inflation. The government had to focus on deficit reduction, and this also helped to reduce inflation. Inflation in the Congo Republic also reacts more to imports (imported inflation) and output (supply), and not to demand factors. If output is faster than consumption, inflation becomes negative (Christian, 2023).

In addition, the CFA[14] zone countries (Benin, Burkina Faso, Cameroon, Congo Republic, Gabon, Mali, Niger, Senegal, and Togo)[15] have relatively low and stable inflation compared to their non-CFA counterparts, as shown in Table 4.6 (iii) and (iv) above. The average inflation rates of CFA range between 1,7% to 3% whilst the average inflation rates of the non-CFA countries range between 5% and 57% over the sample period. This is because, in the former, their currency, the CFA Franc for WAEMU, is pegged to the euro. Therefore, the French price level and the money created through their common central bank account are a significant share of the determinants of inflation in these countries (Strong, 2021). However, they are not much different from the rest of the sample in terms of institutional quality levels

4.4.7. Causality Analysis: Toda & Yamamoto's (1995) Test

For robustness, we also estimated the causal relationship between the institutional quality and inflation for the panel and individual SSA countries using Toda & Yamamoto's (1995) Causality Test.

Table 4.4.7. (a) Toda and Yamamoto Causality Results -Full Sample

Variables	**X^2**	**p-value**	**Lag(k)**	**Lag(k+max$_d$)**	**Direction of causality**
INF (dependent variable)	13.562	0.0349**	6	6+1	IQI ⟹ INF
IQI (dependent variable)	4.599	0.5961	6	6+1	Insignificant
Overall Result					**IQI ⟹ INF**

Note: ** represents a 5% level of significance

[14] African Financial Community
[15] WAEMU zone and the other CFA zone is Central African Economic and Monetary Community (CAEMC)

Source: Author's computation using EViews 13, 2024.

Table 4.4.7 (a) reports the Granger Causality results of Toda and Yamamoto for the overall group of SSA countries. The total lag length of the two variables of interest, as selected by the information criteria (FPE, AIC, HQ, and Schwartz), is 6, and the maximum order of integration is 1, making a total of 7 lags. The results indicate a causal relationship between institutional quality and inflation in SSA countries. The evidence from the table further shows that institutional quality Granger causes inflation in SSA. This is reflected by the magnitude of the X^2 statistic value and the significance level, which is 5%. The causal relationship runs from the direction of institutional quality to inflation, and this resonates with the a *priori.* Further, this finding confirms the empirical evidence found in Barugahara (2015); Franses and Janssens (2018) and Ghanayem et al. (2023) papers.

4.4.7(b). Discussion of the Granger Causality Results for individual countries.

Table 4.4.7. (b) Individual countries -Granger causality results

Country	X^2	Direction of causality	Country	X^2	Direction of causality
Angola	29.721***	IQI → INF	Mozambique	4.759	IQI — INF
Benin	5.479*	IQI ← INF	Niger	5.765	IQI — INF
Botswana	17.291***	IQI → INF	Nigeria	20.342***	IQI → INF
Burkina Faso	3.348*	IQI → INF	Rwanda	44.574***	IQI → INF
Burundi	12.182*	IQI ← INF	Senegal	4.067**	IQI → INF
Cameroon	18.425***	IQI ↔ INF	Seychelles	44.403***	IQI → INF
Congo Rep.	152.60***	IQI → INF	South Africa	15.753***	IQI → INF
Eswatini	169.408***	IQI → INF	**Tanzania**	192.80***	IQI ← INF
Gabon	168.850***	IQI ← INF	Togo	587.844***	IQI → INF
Gambia	2.687	IQI — INF	Uganda	0.9498	IQI — INF
Ghana	13.765***	IQI ↔ INF	Zimbabwe	15.623**	IQI → INF
Guinea	4.815**	IQI ← INF			
Madagascar	6.508**	IQI → INF			
Mali	18.039***	IQI → INF			
Mauritania	0.064	IQI — INF			
Mauritius	26.452***	IQI ← INF			

Notes: The X^2 statistic with the highest value is reported in a bi-directional causal relationship, and */**/*** represent 10%, 5%, and 1% significance levels, respectively. The blue arrows represent the direction of the relationship. The grey line without arrows represents the absence of a relationship between IQI and INF.

Source: Author's computation using EViews 13, 2024.

Table 4.4.7. (b) shows the Granger Causality results for the individual countries. Institutional quality Granger causes inflation significantly in many of the SSA countries. For example, out of the sample of 27 countries, 14 countries show that institutional quality causes inflation. This applies to the following countries: Angola, Botswana, Burkina Faso, Congo Republic, Eswatini, Madagascar, Mali, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Togo, and Zimbabwe. This result concurs with the findings of many studies on the relationship between institutional quality and inflation in developing countries (Asadi & Sheidaei; Barugahara, 2015; Franses & Janssens, 2018; Ghanayem et al., 2023).

In contrast, other countries such as Benin, Burundi, Gabon, Guinea, Mauritius, and Tanzania have the direction of causality running from inflation to institutional quality. This finding deviates from the expectation but partially supports the study by Minea et al. (2021) in which the authors found that countries with inflation targeting monetary policy improve the quality of institutions in developing countries. The finding also partially supports Telatar et al. (2010) study in which it was reported that when political freedom is added to the regression, political instability is positively significant in developing countries for only the high-inflation countries. The averages of the institutional quality and inflation of the above-mentioned countries over the sample period are shown in Table 4.4.6. (iii) above. The average institutional quality and inflation are very low, except for Guinea's inflation, which is relatively high. The low inflation in these countries may further support the Telatar et al. (2010) finding of the non-significance of political instability in low-inflation countries in developing countries. Moreover, Benin, Gabon, and Guinea are members of WAEMU of where euro price instability and money creation by their common bank play an important role in determining inflationary pressures in these countries.

However, other countries from the SSA sample have reported a lack of relationship between institutional quality and inflation. The countries affected are Gambia,

Mauritania, Mozambique, Niger, and Uganda. This surprising result could be interpreted that inflation is perhaps driven by factors other than institutional quality. Finally, Cameroon and Ghana have bi-directional causal relationships between the institutional quality index and inflation, with relatively stronger relationships from the direction of institutional quality to inflation. Although the finding is contrary to the expectation, it is, however, supporting Cicen (2023)'s study in which the author employed the improved Toda and Yamamoto Granger causality test on 24 developing countries. The study documented the existence of a causal relationship that is bi-directional between institutional quality and inflation.

Therefore, it is crucial to state that while causality varies, reflecting country-specific dynamics, such as unique structural and economic conditions across SSA, we could note that this does not detract from the robust threshold relationship found across SSA. Moreover, as pointed out by Hamilton (1990), economic variables respond differently to time dynamics and fluctuate during the business cycle's expansion and contraction phases. In this regard, the diversity in causal directions offers additional context rather than validating the threshold effect

The finding of a bi-directional relationship between institutional quality and inflation highlights the equal importance of these variables in economic growth. This further elevates the importance of maintaining a harmonious relationship between the fiscal and monetary authorities within the SSA context with the aim of improving both the institutional quality and inflation rates. Therefore, since most countries have a causal relationship running from institutional quality to inflation, the conclusion is that institutional quality is an important and key factor in inflation dynamics in SSA countries

4.5. SUMMARY, CONCLUSIONS, AND POLICY RECOMMENDATIONS

4.5.1. Introduction

This paper has examined the causal relationship between institutional quality and inflation and subsequently, the threshold effects of institutional quality on inflation in SSA countries**.** The section is divided into a summary of the findings, conclusions, and policy recommendations.

4.5.2. Summary of the findings

This paper has investigated the causal relationship between institutional quality and inflation, alongside the threshold effects of institutional quality on inflation in SSA countries. The study was motivated by high and volatile inflation in SSA countries. The results of the study report the existence of a causal relationship between institutional quality and inflation for most of the countries under study and for the full sample. Moreover, the results of the full sample also show that the causal relationship between institutional quality and inflation is significant at 5% level.

In contrast, for Mauritius, Guinea, Gabon, Burundi, Benin, and Tanzania, inflation has been found to Granger-cause institutional quality over the study period. This finding is at odds with the existing literature. Additionally, in a few countries (Mauritania, Gambia, Uganda, Mozambique, and Niger), the institutional quality bears no relationship with inflation. This may suggest that institutional quality is not important in the inflation dynamics of these countries; rather, other determinants of inflation are at work. Ghana and Cameroon have shown a bi-directional causal relationship between institutional quality and inflation. However, the strength of the relationship is more from the direction of institutional quality to inflation than the other way round. This suggests that both the fiscal authority and the monetary authority must work together to stabilize inflation in their countries. Overall, there seems to be sufficient evidence that institutional quality has a significant impact on inflation in the majority of SSA countries.

Regarding the threshold effects of institutional quality on inflation in SSA countries, the empirical results show that institutional quality has threshold effects on inflation. The threshold effects of the individual dimensions of the institutional quality index were first

estimated. The results reported the existence of threshold levels across all the institutional quality dimensions on inflation in SSA countries. This implies that each dimension of the institutional quality impacts inflation in SSA countries, though the magnitude of impact on inflation may differ across the dimensions. The estimated threshold values of all the dimensions are negative. Moreover, the estimated thresholds are statistically significant, except for the rule of law institutional quality dimension.

For the overall results of the institutional threshold estimation, the model has generated two more variables that are regime dependent, both above and below the estimated threshold value for the SSA countries. The estimated threshold is -0.159, and it is statistically significant at the 10% level. The evidence from the study further shows that institutional quality impacts inflation both negatively and positively at 1% significance level. However, the magnitude of the coefficient of the institutional quality above the estimated threshold is greater than that below the estimated threshold. This can mean that there is more impact of the institutional quality on inflation above the threshold than below the threshold. The increase in the institutional quality below the estimated threshold appears to mitigate inflation

Further, the study used the lag of inflation, log of government size, GDP, log of money supply, log of exchange rate, food production index, and short-term interest as control variables in the regression, and these variables are the standard determinants of inflation. The finding shows that GDP has a positive but weak relationship with inflation in SSA countries, and it is also statistically insignificant even at the 10% level. Money supply, on the other hand, is statistically significant at 1%, and its magnitude of 2.7 reflects its importance in inflation control. Government spending exerts a negative impact on inflation in SSA, and it is significant at the 5% level. Similarly, the interest rate and food production index are also significant and inversely related to inflation.

The lag (previous period) of inflation has a surprisingly negative impact on the current inflation. However, the magnitude of the impact on the current inflation is not very strong, and its significance level is at 10%. Exchange rate impacts inflation negatively in SSA countries, and the impact is statistically insignificant.

4.5.3. Conclusion

Inflation is a key macroeconomic problem in developing countries since it has negative welfare effects that often lead to poverty, unequal distribution of resources, and unemployment. Reducing inflation to acceptable levels is still one of the top priorities for governments and policymakers in developing countries, including SSA. Therefore, stabilizing inflation in SSA countries should start with the identification of the determinants of inflation in SSA. Although the direct macroeconomic causes of inflation dynamics have been studied widely and are still important, recently, many researchers have focused on the role of institutional quality on inflation performance. The argument is that the current poor macroeconomic outcomes and economic mismanagement in developing countries are the symptoms of the poor or weak quality of institutions in these countries. Institutions have become important in analysing inflation dynamics in developing countries.

Therefore, weak quality institutions have been found to be associated with high inflation both in developing and developed countries. Strong quality institutions, on the other hand, are associated with low inflation. This study investigated the bivariate causal relationship between institutional quality and inflation for many individual countries in SSA and for the full sample. The study employed the Toda and Yamamoto (1995) Granger causality test to investigate the causal relationship between the two variables. The findings show that institutional quality Granger causes inflation for most of the countries of SSA. Moreover, the existence of a causal relationship between the two variables was also confirmed to exist for the full sample. The causal relationship has been found to run from the direction of the institutional quality to inflation in SSA countries, and it is statistically significant. However, a few countries in the sample have a causal relationship running from inflation to institutional quality and were found to be statistically significant. This shows that inflation can be used by policymakers to improve institutional quality in their countries. Thus, high inflation can also compel governments to improve the quality of institutions to lower inflation.

Identifying the direction of a causal relationship between institutional quality and inflation is a necessary step to confirm the existence of the relationship between the two variables before undertaking the step of estimating the threshold levels of

institutional quality on inflation. In that light, the dynamic panel threshold technique was employed to estimate the threshold effects of institutional quality on inflation for the SSA countries. It was found that institutional quality has a threshold effect on inflation, and it is statistically significant. Further, it has been found to have both negative and positive impacts on inflation in SSA countries. However, the magnitude of the positive impact on inflation is economically larger than the negative impact. The policy implication of this finding is that institutional quality has asymmetric effects on inflation below and above the estimated institutional quality threshold. Thus, its effects are stronger in increasing inflation than in reducing inflation.

The relevance of the estimation of the threshold level of institutional quality on inflation in an institutional quality-inflation nexus provides information about the exact threshold level below or above which inflation changes in SSA countries. Therefore, to control inflation, knowledge of the overall institutional quality threshold level is vital. Equally important is also the knowledge of the estimated threshold levels of the dimensions of the institutional quality, which may vary, and their impact on inflation can also differ. This information is crucial for policymakers to prioritize institutional quality dimensions that have more impact on inflation in their countries, provided they know the threshold levels.

4.5.4. Policy Recommendations

The results of this study have shown that institutional quality Granger causes inflation in the long run for the majority of the SSA countries. Therefore, to achieve price stability, more work must be done on the quality of the institutions in SSA countries. Hence, policymakers can also consider non-monetary factors such as the quality of institutions in achieving low inflation for sustainable economic growth. Therefore, the fiscal and monetary authorities should collaborate and consider an inflation policy mix that has both conventional monetary policy instruments and other institutional factors to achieve price stability. This is practicable in other SSA countries, whereby the fiscal authority could be the same person as the monetary authority, or there may be separate officials between the fiscal institution and the monetary institution, but their roles could be blurred. Therefore, in this environment, cooperation between the fiscal authority and the monetary authority is of utmost importance to jointly bring down price stability in the countries affected.

Further, the results have shown that institutional quality below the estimated threshold has more impact on inflation than institutional quality that is above the estimated threshold. The implication is that institutional quality that is below the estimated threshold will aggressively increase inflation in SSA countries. This further elevates the importance of improving the institutional quality to be at least the same level as the estimated threshold. Therefore, strong institutional quality is associated with better economic outcomes, including the stabilization of the price level. Improved institutional quality leads to better governance, which in turn leads to sound macroeconomic policies. The goal is the attainment of a stable macroeconomic environment, which will have a positive effect on inflation rates and thereby improve the welfare of the citizens in the SSA countries. Policymakers in the countries can prioritize institutional quality dimensions that impact inflation and mobilize resources around them to improve their quality. Thus, the fiscal authorities in SSA countries must pay more attention to all the dimensions of governance.

Countries that have inflation significantly affecting the institutional quality, as reported in the causal relationship results, suggest that the central bank authority has an important role in controlling inflation in SSA, and perhaps the adoption of inflation-targeting policy regimes by SSA countries could improve the quality of institutions. They can also establish independent central banks or strengthen the effectiveness of the existing independent central banks by making them charge with the sole responsibility of controlling inflation.

Government size has become an important factor in inflation dynamics in SSA countries. It is therefore recommended that governments of SSA countries should increase government expenditure to acceptable levels to stabilize inflation. However, expenditure funded by debt could counter the effectiveness of optimal expenditure to stabilize the price level.

Countries are encouraged to be members of regional bodies such as WAEMU, CAEMC, SADC, and AMU, which foster the establishment of democratic institutions and the practice of good governance for their members. The importance of SSA countries joining these regional bodies has been justified by the inflation performance of the members of these bodies. For example, CFA members have average inflation rates in single-digit numbers compared to non-CFA countries, which have double-digit

numbers of inflation rates. Moreover, the latter have instances of hyperinflation for some countries over the sample period.

Institutions play an important role in the macroeconomic outcomes. Studies have shown that the quality of institutions affects inflation. Generally, SSA countries are at different levels of institutional quality. The estimated thresholds of the different dimensions of institutional quality do differ in sign and their impact on inflation in SSA countries. To know the level of institutional quality that is optimal for inflation in individual SSA countries, one must estimate it for the different countries. This is very important for each country to know the exact institutional quality threshold for each dimension of institutional quality, and which one matters based on the country's context for the policymaking process.

Therefore, a study to estimate the effects of institutional quality on inflation for the individual SSA countries is recommended.

CHAPTER FIVE

5. SUMMARY, CONCLUSIONS, AND POLICY RECOMMENDATIONS

5.1. Introduction

This chapter summarises the three independent papers that make up this thesis-all the chapters in the study. It is divided into five sections, namely, a summary of the research and its findings, research contribution, policy implications, limitations, avenues for future research, and the closing statement.

5.2. Summary of the research and research findings

This study examined the importance of government size on economic activity in SSA countries. It specifically investigated the threshold effects of government size on output volatility in SSA countries. This was motivated by the research gaps in the extant literature regarding research on the threshold effects of government size on output volatility in SSA countries. This is despite the relatively high output volatility of these countries compared to other developing countries. The findings show that government size exerts a significant impact on output volatility in SSA countries. Moreover, the results show that there is a threshold level for government size below and above which output volatility can be decreased. This is important for the fiscal authority to know the exact level of government expenditure that can reduce output volatility in SSA countries.

The impact of the government size on inflation in SSA countries was also investigated. The study was justified given the high inflation in SSA countries and the research gaps, despite inflation being a key problem for policymakers in this sub-region. The study aimed to specifically estimate the asymmetric effects of government size on inflation alongside the causal long-run relationship between the two variables of interest in SSA countries. The findings are that inflation responds negatively to both the increases and decreases in government size in SSA countries. The results further show that the response of inflation is not identical to both increases and decreases in government size over time. Thus, the decrease in government size has a greater impact on inflation than an increase in government size. This finding is important for both the fiscal and

monetary authorities to know which policy actions to apply to control inflation, considering the unequal responses of inflation to government size changes. It was also reported that the causal relationship between government size and inflation appears to be bi-directional. This highlights the importance of these variables in the macroeconomy.

The existing literature has focused on the macroeconomic causes of inflation, ignoring the importance of institutional quality on the macroeconomic outcomes. This has motivated this study to look at the threshold effect of institutional quality on inflation in SSA countries. The findings of the study are that institutions impact inflation in SSA countries, and specifically, institutional quality Granger causes inflation in most of the SSA countries. Further, institutional quality has a threshold level below which inflation can increase in SSA countries. The identification of the exact level below which the institutional quality can induce inflation to rise is important for both the fiscal authority and the monetary authority to forecast and stabilize inflation in SSA countries. Therefore, this study has answered the three questions, namely: What is the threshold level of government size below or above which output volatility can be reduced in SSA? Are there any asymmetric effects of government size on inflation in SSA? What are the threshold effects of the institutional quality on inflation in SSA?

5.3. Research contribution

This study has made an immense contribution to research. The study has revealed that government size not only impact output volatility in SSA countries, but the exact level of government size below or above which output volatility can increase or decrease has been identified. This study therefore provides fresh evidence on the threshold effects of government size on output volatility in SSA countries; thus it is the first panel study in SSA to be conducted on the threshold effects of government size on output volatility. The identification of the exact level of government size that can reduce output volatility in SSA will benefit policymakers. Moreover, theoretically and empirically, large government size can serve as insurance against external risk to provide necessary relief through social grants to the unemployed, people with disabilities, the elderly, and children.

The other contribution to research this study has made is that it has investigated the asymmetric effects of government size on inflation in SSA countries. Besides using

refined econometric techniques such as the panel Non-linear ARDL technique with its associated flexibility in panel estimation, this study is the first panel study to investigate the asymmetric effects of government size on inflation in SSA countries. Unlike the existing empirical literature, today we know that the magnitude of response of inflation in SSA is not identical to both decreases and increases in government size over time. This study has revealed that the impact of a decrease in government size on inflation is larger than the impact of an increase in government size on inflation over time. Further, the finding is that the causal long-run relationship between government size and inflation appears to be bi-directional in SSA countries. The implication is that both variables are important in policy formulation and suggest that both the fiscal and monetary authorities must cooperate to achieve price stability in the sub-region.

Lastly, the contribution is that this study has provided fresh evidence of the existence of threshold levels of institutional quality on inflation in SSA countries, and no other study has undertaken research on this topic in SSA. The study revealed that institutional quality has a threshold for inflation in SSA countries. Moreover, it is also reported that institutional quality impacts inflation both below and above the estimated threshold. However, the impact above the threshold is larger than below the threshold. It has also been found that institutional quality Granger causes inflation in most of the SSA countries, which makes this study a further contribution to research. The advantage of determining the exact threshold of institutional quality below which inflation can increase will assist policymakers in targeting the institutional quality by way of improvement to reduce inflation in SSA.

5.4. Policy Recommendations

The study has revealed the role government size and institutions play in the SSA economies, particularly their impact on the output volatility and inflation of these countries. The study further showed that government size exerts a significant impact on output volatility in SSA countries, and it also has a threshold effect on output volatility. It is therefore recommended that policymakers balance their government consumption expenditure ratio to GDP to be above the estimated threshold if they seek to achieve better results in mitigating output volatility in SSA countries. Government consumption expenditure to GDP ratios that are below the estimated threshold may amplify output volatility as reported by the studies. However, large debts

or deficits may be unsustainable in the future, which in turn can aggravate output volatility. Similarly, government capital expenditure should be monitored not to exceed the estimated threshold, since government capital expenditure beyond this threshold level will increase output volatility.

Further, since SSA countries are prone to large shocks coupled with the lack of mechanisms to dampen these shocks, economic diversification and the development of the financial sector are key to mitigating the effects of these shocks, which may be global and or domestic in origin. The focus on financial sector development in the region should be given priority, given the relatively little average credit provided to the private sector compared to developed and OECD countries. The practical approach would be to attract the private sector by strengthening governance and focusing on the development of financial intermediaries, which have been proven to have financial allocation efficiency between lenders and borrowers. Tax concessions and other investor-friendly government policies could be ideal to lure foreign direct investment.

Regarding price stability, government size has become an important factor in inflation dynamics in SSA countries. It is therefore recommended that governments of SSA countries should increase government expenditure to acceptable levels to stabilize inflation. However, expenditure funded by debt could counter the effectiveness of optimal expenditure to stabilize the price level. If both the fiscal authority and the monetary authority are the same official, as exists in some African countries, cooperation between the two institutions to jointly fight inflation is vital. The fiscal authority should act responsibly by guarding against public expenditure that is not funded by tax revenue but instead by debt. Thus, the fiscal authority's responsibility should be to reduce debt, and the monetary authority should reduce inflation that is induced by the business cycle.

The results of the causality test between government size and inflation are also relevant for policymakers. For instance, the policy implications of these findings suggest that the SSA countries can comfortably regulate the levels of inflation in the economy by controlling the levels of government expenditure. The use of fiscal policy to combat inflation is therefore supporting the Keynesian model of demand management. To curb inflation, the government should decrease expenditure. Similarly, to achieve a high level of inflation to boost economic activities, government

expenditure should increase. However, this fiscal policy manipulation, although lending credence to the Keynesian paradigm, may be incongruent with monetary policy on inflation control.

This study further revealed that institutional quality Granger causes inflation and has a threshold effect in the long run for the majority of the SSA countries. Therefore, to achieve price stability, more work must be done on the quality of the institutions in SSA countries. Hence, policymakers can also consider non-monetary factors such as the quality of institutions in achieving low inflation for sustainable economic growth. Therefore, the fiscal and monetary authorities should collaborate and consider an inflation policy mix that has both conventional monetary policy instruments and other institutional factors to achieve price stability. This is practicable in other SSA countries, whereby the fiscal authority could be the same person as the monetary authority, or there may be separate officials between the fiscal institution and the monetary institution, but their roles could be blurred. Therefore, in this environment, cooperation between the fiscal authority and the monetary authority is of utmost importance to jointly bring down price stability in the countries affected.

Moreover, the results of the study have shown that institutional quality that is above the estimated threshold has more impact on inflation than institutional quality that is below the estimated threshold. The implication is that institutional quality that is above the estimated threshold will aggressively increase inflation in SSA countries. This further elevates the importance of improving the institutional quality to be at least the same level as the estimated threshold. Therefore, strong institutional quality is associated with better economic outcomes, including the stabilization of the price level. Improved institutional quality leads to better governance, which in turn leads to sound macroeconomic policies. The goal is the attainment of a stable macroeconomic environment, which will have a positive effect on inflation rates and thereby improve the welfare of the citizens in the SSA countries

Policymakers in the countries can prioritize institutional quality dimensions that impact inflation and mobilize resources around them to improve their quality. Thus, the fiscal authorities in SSA countries must pay more attention to voice and accountability, political stability and absence of violence, and control of corruption, institutional quality dimensions. These dimensions of institutional quality have scored the lowest

estimates as reported in the study. Moreover, political stability and absence of violence have the lowest estimated threshold, suggesting that countries should prioritise this institutional quality dimension by improving it to fight inflation in SSA countries.

In some countries, the relationship between inflation and institutional quality runs from the direction of inflation to institutional quality. In this situation, the central bank authority has an important role in controlling inflation in SSA, and perhaps the adoption of inflation-targeting policy regimes by SSA countries could improve the quality of institutions. They can also establish independent central banks or strengthen the effectiveness of the existing independent central banks by ensuring that they assume the sole responsibility of controlling inflation.

The SSA countries are also encouraged to be members of regional bodies such as WAEMU, CAEMC, SADC, and AMU, which foster the establishment of democratic institutions and the practice of good governance for their members. The importance of SSA countries joining these regional bodies has been justified by the inflation performance of the members of these bodies. For example, CFA members have average inflation rates in single-digit numbers compared to non-CFA countries, which have double-digit numbers of inflation rates. Moreover, the latter have instances of hyperinflation for some countries over the sample period.

In a nutshell, the fiscal authority should manipulate expenditure to stabilize output volatility and inflation in SSA countries. A stable macroeconomic environment coupled with strong institutional quality attracts investment and ensures sustainable growth. This will not benefit investors only, but also a reduction in unemployment, poverty, and inequality in SSA countries. A large government also implies increases in the social welfare budget for the benefit of children, old age people, women, and people with disabilities.

5.5. Limitations and directions for future research

A limitation of this study is the relatively small sample size of SSA countries used. The unavailability of data over a longer time frame and the inability to include more countries prevented a comprehensive analysis of the dynamics between government size and output volatility in SSA, institutional quality, and inflation. Additionally, the results are generalised across the SSA region, despite the small sample size. Future

research should extend the time horizon and explore the threshold effects of government size and institutional quality on output volatility and inflation for individual SSA countries. This would allow for the estimation of country-specific thresholds, enabling the customisation of fiscal policy for each nation.

5.6. Closing statement

The size of government and the quality of institutions have been empirically proven to play important roles in the performance of economies. They impact both the output volatility and inflation rates of the developing countries. A reasonably larger government size reduces output volatility in SSA countries and provides increases to welfare budgets, which assist the unemployed, the elderly, the disabled, and the children. It is a common practice by the nations of the world to provide fiscal stimulus packages during recessions or financial crises to provide relief to the unemployed and businesses, as observed during the recent COVID-19 pandemic. However, the excessive government expenditure that is funded by debt is also associated with inflationary pressures.

In this study, the effects of government size and institutional quality on output volatility and inflation, respectively, have been found to be non-linear. This non-linear relationship helps policymakers to identify the exact minimum levels of government size and institutional quality, below which output volatility and inflation can increase, respectively. Therefore, the fiscal authority can be able to manipulate government expenditures to reduce output volatility with the guidance of the estimated threshold of the government size. Further, the reported results have shown that the magnitude of the response of inflation to government size changes is not identical over time. The impact of a decrease in government size on inflation has also been found to be larger than the response of inflation to an increase in government size. Therefore, to achieve price stability and output volatility in SSA countries, countries should focus on the optimal government size and optimal institutional quality as revealed by this study and put more effort into improving the institutional quality.

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