

Evaluating Savings Through Sustainable External Debt Management And Food Price Inflation In Selected African Countries

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Abstract

This study examined the effects of external debt burden and food inflation on savings in selected African countries over the period 2000 to 2022 using panel ARDL as the baseline estimator, with FMOLS and DOLS employed for robustness analysis. Savings were measured by gross national savings and current account balance, while external debt burden was proxied by the ratio of external debt, debt service ratio, debt per capita, and foreign exchange reserves. Food inflation was captured using the food price index, wholesale price index, and retail price index, with exchange rate and interest rate included as control variables. The ARDL results reveal that external debt burden exerts both positive and negative significant effects on savings, whereas food inflation consistently reduces savings. The error correction estimates indicate adjustment speeds ranging from 2 percent to 16 percent across the estimated models. The FMOLS and DOLS results confirm the robustness of the baseline findings. The study recommends prudent external debt management, timely debt servicing, and effective inflation control, particularly food inflation, to strengthen savings and improve economic welfare across African countries.

Keywords Savings, Sustainable External Debt, Food Price.

INTRODUCTION

Savings are of great importance for achieving national economic growth and development. National savings play a crucial role in economic development due to the ubiquitous role they play in the economy as a key source of funds for both private and public investment (Kazgan 1984). It provides the funds necessary for capital formation, which includes investments in infrastructure, technology, education, and other critical sectors which are vital for increasing productivity and economic growth (Aydin 2015). In terms of capital formation, investment financing, macroeconomic stability, interest rate and inflation control, development of financial markets, recourse allocation, sustainable economic growth, and reduction of foreign debts, savings play a crucial role in the economy (Yildirim, Kahraman, & Tasdemir, 2001). However, as a convention, the rate of savings is influenced by many factors which include but are not limited to external debt burden, food inflation, financial liberalisation, inflation rate, interest rate, relative prices, income and productivity growth, wealth revaluation, and age of the population (Aydin 2015). External debt burden can adversely impact national savings through various channels, including economic instability, higher interest rates, inflation, exchange rate volatility, and reduced public and private investment. Food price inflation hampers savings since it affects disposable income and investment (Anwar & Guha, 2023). The burden of external debt can significantly influence national savings in diverse ways and thwart macroeconomic flows in the economy (Ogbeifun, 2007). When a country has a high level of external debt, a substantial portion of its fiscal resources is directed towards debt servicing (i.e., paying interest and principal on the debt). This can crowd out public investment and reduce the resources available for other government expenditures, including those that could stimulate savings and investment (CBN, 2010). It can also create

economic uncertainty and instability, and lower levels of private savings as economic agents prioritize immediate consumption over future savings (Wang, 2009), due to concerns about future economic conditions, potential tax increases, and inflationary pressures resulting from excessive external borrowing (CBN, 2010). Also, external debts affect the viability of the economy since they cause higher interest rate which increases the cost of borrowing for businesses and consumers, discourage investment reduce disposable income, and lower the overall savings rate in turn (Hameed et al. 2008). However, if a country resorts to printing money to service its external debt, it can lead to inflation which would erode the real value of money, diminish the purchasing power of households and reduce the real return on savings since people may be less inclined to save, preferring to spend their money before it loses more value (Elbadwi et al. 1997).

Furthermore, food inflation is another factor that influences saving in the economy and hampers the health and well-being of households. It significantly influences national savings in several ways, by exerting negative effects on the savings rate of households and the broader economy (Wen et al. 2021). When food prices rise, households need to allocate a larger portion of their income to meet basic food needs. This reduces the disposable income available for savings (Adjemin et al. 2023). Also, food inflation can erode the purchasing power of money, and this implies that even if nominal incomes remain the same, the real value of income declines (Adjemin et al. 2023), leading to a reduction in real income and forcing households to adjust their spending habits, which often results in lower savings. A rise in food prices can lead to changes in consumption patterns, where households might cut back on other expenditures to afford essential food items, and this shift would diminish discretionary spending and savings, as non-essential purchases and savings contributions are often the first to be reduced (Li & Li, 2021). While food inflation generally reduces the ability to save, it can also prompt some households to increase precautionary savings if they anticipate further price increases or economic instability businesses might hold back on investments due to uncertainty, and households might either save less due to decreased real income or save more as a precaution (Derindag, et al. 2023).

However, several studies have been conducted in an attempt to explore the influences of external debt burdens and food inflation on savings and have made insightful contributions in various degrees (see: Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghouli, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others. Despite their efforts to seek improvement of savings in their respective studies, savings, especially in developing economies like African countries have remained low over the years. According to one of the stylized facts, despite the economic reforms that many African countries attempted in the last decade, there is little evidence of these having a major impact on savings and investments in countries (World Bank 1994), only a couple of serious reformers saw some modest improvements in their savings performers. By 1990, the only SSA economies (besides Angola and Gabon) with domestic saving rates above 20 per cent were Kenya and Zimbabwe. One of the characteristics of all the data on domestic saving rates is that they declined for most countries in the period 1980-96 and have not even been revived yet. (Elbadawi and Mwega 1998). Noteworthy, most countries in Africa that prepared development plans in the 1960s and 1970s usually had a planned saving rate of 20-25 per cent, which was derived based on Harrod-Domar type models (Todaro 1997). By the 1980s, most of such development planning had been abandoned due to difficulty in meeting targets. However, working with planned saving rates was not that easily abandoned, but the achieved average saving rate of 8 per cent up to 1994 was substantially lower than the targeted regional saving rates of 16.6 per cent for 1995 and 20 per cent for 2000 which Calgagovski et al. (1991) estimated was necessary to achieve overall macro-economic growth targets in Africa.

However, seeing the gap in the literature, we extended the existing knowledge by investigating the effect of external debt burdens and food inflation on savings in selected African countries (Bashir Jama, 2021, Zaghouli, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023). This study departs from the existing studies by firstly, estimating the relationship that exists between external debt burdens and saving since external debt burdens can hamper the savings flows by eroding household disposable income which can lead to a reduction in savings. Governments burdened with high external debt may implement policies aimed at stabilizing the economy, which can sometimes have mixed effects on savings. High external debt burdens often correlate with slower economic growth, as resources are diverted from productive investments to debt servicing. Slower economic growth means lower income levels, which can reduce the overall savings rate in the economy. Also, a heavy external debt burden can affect a country's credit rating and overall investment climate and lower credit ratings make it more expensive to borrow both domestically and internationally, further constraining economic growth. Therefore, we thoroughly measured the external debt burden by using the debt-to-GDP ratio, debt service ratio, debt per capita, external debt-to-export ratio and foreign exchange reserve, unlike previous studies.

Secondly, we examined the effects of food inflation on savings since food inflation has a multifaceted influence on savings, primarily by reducing disposable income and real income, altering consumption patterns, and creating economic instability and this can collectively lead to lower savings rates, which can have broader negative

implications for economic growth and development. In the long run, persistent food inflation can undermine economic growth by reducing the resources available for productive investment, constraining the ability to save, creating a vicious cycle of low savings and low investment, leading to social unrest and economic instability, straining government budgets, especially if subsidies or social welfare programs need to be expanded to support low-income populations, leading to lower income levels, further reducing the national savings rate, reduces the ability to save, prompt some households to increase precautionary savings if they anticipate further price increases or economic instability, lead to changes in consumption patterns, and erodes the purchasing power of money. Thus, to see the effects of food prices on savings, we thoroughly examined food inflation by investigating the effects of the food price index, wholesale price index, farm price index and retail price index unlike previous studies (Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) and accessing their effects on saving in Africa.

Thirdly, we estimated the effects of external debt burden and food inflation on saving in Africa using the panel autoregressive distributed lag model (ARDL) which is consistent in measuring both long-run and short-run impacts of external debt burdens, food inflation and savings and robustly checked the findings by re-estimating the relationships using the panel fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) which are consistent in taking care of endogeneity, cross-sectional dependence, country-heterogeneity and country-specific effects which ARDL could not account for to obtain consistent results. The remainder of this study was organised as follows: section 2 contains the literature review, section 3 concentrates on the methodology, section 4 contains the empirical results and discussion of findings, and section 5 discusses the summary, conclusion and policy recommendations.

2. LITERATURE REVIEW

2.1 Theoretical Review

According to the classical school, saving is the source of capital accumulation (Kazgan, 1984). In addition, saving was accepted as a virtue in classical economics. For this reason, it is seen that an understanding of encouraging savings prevails in the classical economic period (Skousen, 2016). Adam Smith accepted saving and investment as identical and analysed them as a function of profit. In addition, Smith limited the power of saving and investment to income level (Kazgan, 1984). It was argued that saving is a better form of spending because it is used to raise the necessary capital to increase production (Skousen, 2016). Malthus argued that in times of prosperity, the wealthy spend most of their income growth on savings (Kazgan, 1984). Senior, on the other hand, argued that saving is giving up the immediate utility and pleasure that money can provide. For this reason, he claimed that saving is a phenomenon that should be waited for patiently due to the services it will cause in the future (Aydın, 2015). In addition, according to the classics, savings are an increasing function of interest. Savings increase as the interest rate increases. Interest is the price of giving up today's consumption (ie saving). Individuals distribute their income between their present and future consumption in a way that maximises their utility. A positive interest rate will enable individuals to consume more in the future than they do today. Thus, rising interest rates will lead individuals to save more from their income (Yıldırım, Kahraman and Taşdemir, 2001).

The literature field of economic growth, viz., external borrowing, is awash with the perceived negative relationship between foreign debt and investment, which consequently results in lower capital formation. Krugman (1988) defines this negative relationship as a “debt overhang” where the potentials for repayment of outstanding facilities fall lower than the signed value. The study gave a straightforward definition of the problem of debt overhang as being the anticipated current value of any potential resource allocation that is not up to its outstanding loan. Several scholars have supported the theoretical case for debt overhang. Some of the studies include Krugman (1988) and Sachs (1988). Others like Greene and Villanueva (1991), Elbadawi et al. (1997) and Chowdhury (2001) reaffirmed this by coming up with ample proof that backs the debt overhang phenomenon. In those economies with heavy indebtedness, “debt overhang” is considered a leading cause of distortion and slowing down of economic growth (Sachs, 1989; Bulow and Rogoff, 1990).

2.2 Empirical Review

2.2.1 External Debt Burden and Savings

Qureshi & Liaqat (2020) investigated the long-term consequences of external debt on economic growth using panel vector autoregression using 123 countries across the globe for the panel data from the period 1990 to 2015. The sample countries included in the study were based on the level of their income. Their study found that there is a positive relationship between external debt and economic growth in lower- and middle-income countries, while the overall external debt effect was found to have a negative relationship with the economic growth of the country. This shows that the effect of external debt on economic growth varies based on the level of the countries.

Bakarr and Jalloh (2021) examined the nexus between external debt and economic growth for ECOWAS member states using panel co-integration through Fixed Effect Model (FEM) and Random Effect Model (REM). Utilising the panel data from the period 2000 to 2019, their study revealed that there is a nonlinear relationship between the external debt of the member states and the real GDP of the sample nations. However, it is found that the effect of external debt is below the threshold (111%), implying the nonlinear relationship between the variables.

Epaphra and Mesiet (2021) examined the linkage between external debt and economic growth for a panel of 45 African countries from the study period 1990–2017. From Fixed Effects (FE) and Random Effects (RE) techniques of estimation, it was found that the effect of external debt on economic growth is based on the level of magnitude of the debt-to-GDP ratio. Accordingly, their study found that the low-level debt-to-GDP ratio has a positive effect on the economic growth of the sample of 45 African countries. This was not the case for a considerably high level of external debt during the study period. Bashir Jama (2021) and Nwakoby et al. (2026a,b) investigated the effect of external debt on the economic growth of East African countries using the ARDL bound testing approach during the study period 2011–2019. It was concluded that there is no empirical result that detects the relationship between external debt and economic growth in the long run in East African countries for the period under investigation. The result from the fixed effect model, however, shows the presence of a negative and significant relationship between the two variables, which mainly resulted from improper debt management in the countries.

Zaghdoudi (2020) examined the impact of external debt and economic growth in low- and middle-income countries using panel data from the study period 2002–2016 using a dynamic panel threshold estimation technique. From 109 sample countries included in the study, it was concluded that there is a statistically significant relationship between external debt and the economic growth of the countries. Further, the finding of this study revealed that external debt improves the economy in middle- and low-income countries under low regimes, while it deteriorates the economic growth of the middle-income countries included in the sample. On the other hand, the study by Ring et al. (2021) examined the relationship between external debt and economic growth using the GMM estimation technique and panel data analysis for the data from 2011–2014 with the main objective of understanding the role of government quality in the countries included in the study. Their study found that the right policy was more important than that of good governance during the study periods. However, their study also assured that high governance countries were found to have a moderate level of quality institution concern in the country.

In another study, Omotor et al. (2020) examined the impact of external debt on economic growth through the use of a direct effect hypothesis with the major objective of identifying the major role of institutional quality in 32 SSA countries from the study period 2005–2017. From the OLS techniques of estimation applied to their study, the result of their study revealed that quality of governance has a direct positive effect on economic growth, while external debt burden was found to negatively impact the economic growth of the SSA countries. Other similar works by Mumba and Li (2020a) and Mumba and Li (2020) in the same year have found that both short- and long-term external debt affect the economic growth of nine southern African countries for the sample study period from 2000 to 2018. The study implied that southern African countries need to limit themselves from severe dependence on external debt to accelerate their economic growth in both short and long periods. This shows that there is a difference in argument among literature in different regions of the world.

Relatedly, Guei (2019) has investigated the linkage between external debt and economic growth in emerging economies using a panel of 13 emerging countries in the sample study period 1990–2016. From the panel ARDL technique of estimation employed, it was concluded that the effect of external debt, in the long run, is not robust in the sample countries. However, this was not found in the short run as a negative and significant relationship between the two variables was found. The study by Azolibe (2022) found that external debt affects the economic growth of SSA countries over the study period 1990–2017 in the panel sample of 20 countries. From the generalised method of moments estimation technique employed in the study, external debt is found to adversely affect economic growth, confirming the debt overhang theory held in the SSA countries during the periods under investigation.

The recent empirical investigation carried out by Makun (2021) confirmed that external debt imposes a greater negative adverse impact on economic growth over the study periods of 1980–2018 for the panels of the Pacific Islands. Applying panel ARDL in the context of neoclassical growth theory, the study found a negative effect of external debt on economic growth and recommended better fiscal management and cutting unproductive expenditure. Reehan Hameed et al. (2021) examined the effect of public debt on economic growth using the panel vector autoregressive method through the fixed effect model estimation technique. Their study found that there was a negative relationship between public debt and economic growth in Southeast Asian countries during the study period 1990–2019. Their study found that productive and efficient debt utilisation can change the negative effect of external debt on economic growth.

In another extensive study, Asafo (2019) employed a two-step GMM model to investigate the effect of external debt on economic growth in SSA for the study period 1990–2017. From 48 sample countries, the study found that

external debt has a significant negative relationship on economic growth, while this is not the case for the lag of external debt, as it is found to stimulate growth. It was also found that this affects both rich and poor countries in SSA Africa. Shkolnyk and Koilo (2018) studied the impact of external debt and economic growth in emerging economies from the period 2006–2016, covering 20 years. From 10 emerging sample countries included in the study and the panel ARDL employed in the study, their study found that there is no significant impact between the two variables when no linearity assumption is applied. However, in the case of the non-linearity assumption, it is found that external debt adversely affects economic growth when the marginal impact of external debt on GDP growth is negative. The overall implication of their study is the appropriate integration of different organisations to bring appropriate debt management.

Jarju et al. (2016) employed a fixed effect model to examine the relationship between external debt and economic growth in the West African monetary zone. The study confirmed that the linkage between external debt and economic growth during the study period is in line with debt overhang theory, indicating that debt overhang beyond a certain limit hurts economic growth. From the panel data set from the period 2004–2016, their study also found a crowding out effect, implying that public investment needs to be productive in the region. Gachunga (2019) employed the panel Generalised Method of Moments estimation method to examine the effect of external debt on the economic growth of SSA for the study period 1990–2016, covering 26 years in 38 sample countries in the region. It was found that external debt negatively affects the economic growth of SSA countries. In addition to this, the income of the country also matters as there is a severe negative effect of external debt observed in middle-income countries compared to low-income countries.

Hoti et al. (2022) investigated the effect of government debt on the long-term growth of Western Balkan countries using panel data from the period 1997–2019. Employing the pooled mean group estimator, their study concluded that the effect of the public debt, in the long run, is not contributing to long-term growth for Western Balkan countries. Recently, Lau et al. (2022) studied the effect of external debt on the economic growth of developing countries in Asia using panel data for 16 selected countries in the region for the study period 1980–2016. From the panel data analysis, they found that external debt has a negative and significant impact on growth in most Asian developing countries. The study implied that fiscal discipline that targets an appropriate debt-to-GDP ratio is very crucial to bring sustainable development in the region.

Previously, Law et al. (2021) found that better institutions tend to reduce the negative effect of external debt on the economic growth of the region. This finding was derived from 71 developing countries during the study period 1984–2015 employing a dynamic panel threshold econometric technique of estimation. Their study further concluded that the negative effect of public debt on economic growth is high in the countries with high public debt while it is low in the low public debt countries. Sandow et al. (2022) employed a system GMM to examine the linkage between external debt and economic growth of 31 SSA countries from the period 2005–2017. Their study was conducted with the main objective of understanding whether public sector management can create a difference in the relationship between the two variables in SSA and revealed that public sector management matters.

Agyeman et al. (2022), in their extensive study, employed the panel GMM estimation technique for the data covering 15 years from 2000 to 2015 for selected SSA countries. They focused mainly on identifying how capital flight affects the linkage between external debt and economic growth in the region. Accordingly, the effect of external debt on economic growth was found to be negative even when combined with the level of capital flight during the time of the investigation. In a country-specific study, Akinlo (2020) studied the relationship between external debt and economic growth for the economy of Nigeria through the use of time series data for the period 1970–2016. Employing the Markov regime-switching approach, their study found that the impact of external debt on economic growth varies based on whether the external debt belongs to the public or private. However, for the study period under consideration in Nigeria, both variables were found to be negatively and significantly affecting the economic growth of the country.

Ohiomu (2020), who investigated the link between external debt and economic growth in Nigeria, found that external debt adversely affects the economic growth of Nigeria. By employing the ARDL bounds testing econometric technique, their study suggested that debt management systems should be strict in addition to debt reduction strategies that should be carefully implemented. A similar argument was also provided by the study of Manasseh et al. (2019), who conducted an impact analysis on the linkage between external debt and economic growth for the economy of Nigeria but came up with contradicting results. Employing annual time series data from the period 1970–2015, their study concluded that external debt has a positive and significant impact on the economic growth of the Nigerian economy. This shows that there is no consensus in the literature on the relationship between external debt and economic growth.

A study conducted in Ethiopia by Getinet (2020) found that public external debt affects the economic growth of the country using ARDL techniques of estimation and time series data from the period 1983–2018. It was mainly concluded that the major source of the negative impact of public external debt was improper public debt management and spending the public debt on unproductive activities such as war. A similar study was conducted

in Jordan by Moh'd AL-Tamimi and Jaradat (2019) to examine the linkage between external debt and economic growth using annual time series data from the period 2010–2017. From the econometric analysis, their study found that the effect of external debt is negative and significant for the economy of Jordan.

Antoine et al. (2021) studied the linkage between external debt and economic growth with the main objective of identifying the optimum level of external debt using time series data from the period 1986–2015 and VECM. Their study found that the relationship between external debt and economic growth is dependent on the size of the GDP in the Republic of Congo for the study period under consideration. It follows that the larger the size of the GDP of the country, the smaller the negative effect of the external debt of a country. Their study also found an inverted “U” shape curve with a threshold ratio of 21.61%, supporting the Laffer curve debt hypothesis. James Tumba Henry (2022) investigated the effect of external debt on the economic growth of Nigeria with the main objective of whether debt overhang happens to the economy between study periods 1977–2019, employing the econometric estimation technique dubbed the vector error correction model. The result of their study revealed that there is a negative and significant effect of external debt on the economic growth of Nigeria during the study period. This implies that there is an implication of debt overhang in the country. Further, they have found that the long-run effect of debt burden reduces the economy of Nigeria by 2.2 per cent. A similar study by Bob Hadji (2022) found the same result for the economy of Sierra Leone using time series data from the period 1973 to 2021 and employing ordinary least squares (OLS) techniques of econometric estimation.

Yasar (2021) found that there is a negative linkage between external debt and economic growth in the long run by employing ARDL and VECM for the study period 1995–2018. From the causality analysis conducted in the study, it was found that there is a unidirectional relationship between the two countries that runs from foreign debt to the economic growth of Commonwealth-independent states. Chindengwike (2021) employed a time series of data from the period 1988 through 2020 covering 32 years to investigate the effect of foreign debt on the economic growth of Tanzania. The result of the study revealed that there is a positive and significant relationship between external debt and the economic growth of Tanzania during the study under consideration. Nzeh (2020) investigated public debt and economic growth in Nigeria using annual data spanning a period of 1981–2018 and under the framework of the Autoregressive Distributed Lag (ARDL) bounds technique; the results of the findings revealed that public debt contributes to the growth of the economy both in the short-run and in the long-run. The study also found the optimal threshold level of debt to be 40.2% in both the long-run and short-run. Also, findings revealed that while trade openness contributes positively to GDP, both inflation and fiscal deficit adversely affect GDP.

Didia and Ayokunle (2020) examined the impact of public and publicly guaranteed debt on the economic growth of Nigeria. The study disaggregates total public and publicly guaranteed debt into external debt and domestic debt and examines whether the two kinds of debt have differential impacts on economic growth in Nigeria. Utilising data from the Central Bank of Nigeria, the World Bank and the Vector Error Correction Model (VECM) and covering 1980 – 2016 revealed that domestic debt has a statistically significant positive relationship with economic growth in the long run, while external debt exhibits a negative relationship with economic growth that was not statistically significant. As a policy recommendation from this study, the Federal Government of Nigeria may want to start paying more attention to the mix of domestic debt and external debt in Nigeria's loan portfolio. Ehikioya et al. (2020) examined the relations between public external debt and economic growth in African countries. The paper used the Johansen Cointegration test and system Generalised Method of Moments (system) to examine the dynamic relations between external debt and economic growth in 43 African countries over the period 2001–2018. The study used data from World Development Indicators (WDI) as published by the World Bank and the World Economic Outlook database as provided by the International Monetary Fund (IMF). The study provides an understanding of how the importance of external debt could be short-lived due to its misapplication. The result reveals evidence to support a long-run equilibrium relationship between external debt and economic growth in Africa. The result demonstrates that beyond a specific capacity, the short-run converges to equilibrium in the long run, and external debt would start to have a deteriorating impact on economic growth in Africa. The findings of this study reinforce the need for policymakers to ensure the proper application of external debt on economic activities that would lead to sustained long-term economic performance. Moreover, the government and development partners must put in place a monitoring mechanism to ensure the efficient use of borrowed funds.

Olusegun et al. (2020) investigated the impact of public debt on economic growth in Nigeria between 1981 and 2018 using the ARDLECM estimation technique. The variables used in the study were tested for stationarity using the Augmented Dickey-Fuller. The result revealed that EDS, DDS, FDI and GOVE were stationary at first differencing, while GDPGR was stationary at level. The study revealed that external debt and foreign direct investment positively affect economic growth, while domestic debt and government expenditure hinder economic growth in Nigeria. The error correction model coefficient, which is -0.969, means that nearly 96.9 per cent of any disequilibrium in economic growth is corrected by the external debt, domestic debt, foreign direct investment and government expenditure within one period (one year). The study recommends that the country can borrow from

external sources when the need arises; however, caution should be taken to avoid putting the country into debt crises. Also, the government should reconsider its spending structure to favour infrastructure development, which would motivate both local and foreign investors to invest and, in turn, enhance economic growth. Lastly, government and policymakers should formulate policies that would attract foreign investors and provide an enabling environment vis-à-vis the security of lives and properties.

2.2.2 Food Inflation and Savings

Studies on agricultural productivity and food prices can be found in the work of Njegovan and Simin (2020), which examined inflation and prices of agricultural products. They found that agricultural food prices will not decrease except if constant population growth exerts higher pressure. In his essay “Agricultural Productivity and the Impact of Food Price Change on Welfare in Africa”, Manzamaso (2020) found that balancing the preferences of the demand and supply advances the promotion of the newly developed variety, especially if production is driven by consumption along the seed-food value chain. Hasan and Mashi (2018) investigated the determinants of food price inflation in Malaysia by employing the Nonlinear ARDL technique to determine the linearity and symmetry of the focused variables. The study reported the presence of long-run co-integration among the study variables. The vector error correction model (VECM) and the Variance decomposition analysis reported that the exchange rate is the most exogenous variable. In addition, NARDL found the relationship between the food price and exchange rate to be symmetric in the long run but asymmetric in the short run. Since the exchange rate is the most exogenous variable in the study and the fact that Malaysia adopts a flexible exchange regime, it is hard for policymakers to control the fluctuations of the Malaysian exchange rate to control food prices. The study concluded that adjustment and control of food prices should be made through the reduction of food imports to minimise the exchange rate pass-through effect on food price inflation.

Ismaya & Anugrah (2018) investigated the determinants of food inflation in Indonesia using quarterly data from 2008Q1 to 2017Q4 with a GMM estimator. It was reported that backwards-looking and forward-looking expectations have a strong impact on food inflation. Furthermore, food production, agriculture sector output, infrastructure, food import, agriculture sector credit, demand level (M1/consumption), and seasonal events (Eid Mubarak), were significant determinants of food inflation in Indonesia. Backwards-looking and forward-looking expectations, domestic oil prices, and level of demand contributed to high food prices. In a more recent study, Mbah et al. (2022) examined agricultural productivity, food prices and inflation in Nigeria using time series data for Nigeria between 1981 and 2021 and a 3-variable structural vector autoregressive model (SVAR). They found that the transmission of agricultural productivity to inflation in Nigeria is a long-run phenomenon. However, increased agricultural productivity induces a positive change in food prices, while an increase in food prices is accompanied by a fall in inflation in the long run. Additionally, Li and Li (2021) examined the EPU impact on food prices in India while employing the TVP-SV-VAR approach. Researchers discovered that rising trade costs and declining overall imports cause food prices to rise due to economic policy uncertainties. Likewise, Wen et al. (2021) looked into the impact in India using the nonlinear ARDL technique. They discovered that negative fluctuations in policy uncertainty have a stronger influence on food prices compared to positive fluctuations in policy uncertainty.

In an extensive study, Derindag et al. (2023) examined food price response to global and national factors with research data from January 1999 to August 2022 using three local and six global variables as independent variables. They found a substantial association between local prices of food and the independent factors across various frequencies and times. Headey & Ruel (2023) investigated food inflation on wasting and stunting among 1.27 million preschool children from 44 developing countries in low- and middle-income countries and discovered that, on average, a 5 per cent increase in the real price of food increases the risk of wasting by 9 per cent and severe wasting by 14 per cent. Anwar & Guha (2023) investigate the dynamics of food inflation in India using a time series econometric technique for monthly data available from January 2015 to March 2020. They found no long-run relationship between food and non-food prices, and no long-run or short-run relationship is found between food prices and rural wages. Relatedly, Chinezelum et al. (2023) investigated the relationship between Nigeria's monetary policy and food inflation using a quantitative research method based on ex-post facto research design, non-linear autoregressive distributed lag model approach (NARDL) and annual time series data covering 1980 and 2021. They found that a long-run association exists between Nigeria's monetary policy rates and food inflation, and both the money supply and the monetary policy rate have favourable impacts on food inflation in Nigeria.

Iddrisu and Alagidede (2020) used quantile regression to assess the impact of monetary policy on food inflation in South Africa. According to their findings, monetary policy has a favourable impact on food prices that is consistent throughout all the quantiles. As a result, if monetary policy is tight, the nation's increasing food costs will be disrupted even more. Bhattacharya and Jain (2020) investigated the effectiveness of monetary policy in maintaining food prices using quarterly data from developed and emerging nations and a panel VAR approach. The findings imply that a tight monetary policy, which is unusual for both emerging and advanced economies,

has a favourable effect on food inflation. In particular, the researchers noted that when an actual inflation impetus is fuelled by food inflation, a tight monetary policy distorts both food inflation and total inflation.

Ginn and Pourroy (2019) used the dynamic general equilibrium (DSGE) model for middle-income countries and showed that a coordinated response of government and monetary policy through subsidised pricing may boost welfare amid financially restricted consumers and families with a major proportion of consumption expenditure. Subsidy softens prices and expenditures, notably for financially constrained families. On data from the United States, Adjemin et al (2023) investigated the factors affecting food inflation by using a structural VAR model with monthly data from 2004 to 2022. Although the findings showed that supply-side factors are the most dominant in influencing food inflation, money supply indicates a strong correlation with recent food price increases.

3. METHODOLOGY

3.1 Meaning of Data and Sources

Mainly, this study estimated the effects of external debt burden and food inflation on savings in selected African countries owing to data availability. We employed an ex post facto research method, which implied that the study relied on already existing information for the analysis, and this implies that a dataset from secondary sources and a panel data format were utilized for the analysis. The data covered the period of 2000 to 2022, given data availability in the African countries selected. After conducting an extensive review of the literature, we utilized the following variables: Gross national savings (GNS) and current account balance (CAB) were used to measure savings, while external debt burdens were measured with the ratio of external debt (RDT), debt service ratio (DSR), debt per capita (DPC), and foreign exchange reserves (FER). Furthermore, we measured food inflation with indicators such as food price index (FPI), wholesale price index (WPI), and retail price index (RPI); while exchange rate (EXR) and interest rate (INTR) served as their control variables. The choice of the variables and scope of the study was based on the availability of data in the sampled countries at the time of the study. However, the aforementioned variables and their sources are presented below in Table 1 to improve the understanding of the reader.

Table 1: Definition of the Variables

Acronym	Definition	Source	Sign
Dependent Variable			
GNS	Gross National Savings	World Bank's World Development Indicators (WDI)	To be determined
Explanatory Variables			
RDT	The ratio of External debt.	World Bank's World Development Indicators (WDI)	Negative
DSR	The debt servicing ratio	World Bank's World Development Indicators (WDI)	Negative
DPC	Debt per capita	World Bank's World Development Indicators (WDI)	Negative
DER	The debt-to-export ratio.	World Bank's World Development Indicators (WDI)	Negative
FER	Foreign exchange reserves	World Bank's World Development Indicators (WDI)	Positive
FPI	The food price index	Food and Agricultural Organization of the United Nations	Positive
WPI	Wholesale Price Index	World Bank's World Development Indicators (WDI)	Positive
RPI	Retail Price Index.	World Bank's World Development Indicators (WDI)	Positive
Control Variables			
EXR	Exchange Rate	World Bank World Development Indicators (WDI)	Positive
INTR	Interest Rate	World Bank World Development Indicators (WDI)	Positive

Source: Authors' Concept

Model Specification

3.3.1 Baseline Autoregressive Distributed Lag (ARDL) Model

This study examines the effects of external debt burden and food inflation on savings in selected African countries from 2000 to 2022, following the approach of Manasseh et al. (2022). The baseline analysis employs the dynamic panel autoregressive distributed lag (ARDL) model developed by Pesaran et al. (1999, 2001). Although several cointegration techniques, including Engle and Granger (1987), Johansen (1991, 1995), and Johansen and Juselius (1990), have been widely applied in empirical research, the ARDL approach offers important advantages. It accommodates variables integrated of order $I(0)$ and $I(1)$, performs well in small sample settings, and estimates both the short run and long run relationships within a unified error correction framework (Banerjee et al. 1993; Ghatak and Siddiki 2001; Pesaran et al. 2001). In addition, the ARDL model effectively addresses serial correlation and endogeneity through appropriate lag selection while providing consistent estimates of long run equilibrium and short run dynamics (Pesaran et al. 2001). These advantages make the dynamic panel ARDL model an appropriate and reliable estimation technique for analysing the relationship among external debt burden, food inflation, and savings in the selected African countries. Thus, below is the outline of the empirical ARDL model for the study.

$$\Delta \ln MES_{t-1} = \alpha_0 + \sum_{i=1}^n \alpha_1 \Delta \ln MES_{it} + \sum_{i=1}^n \alpha_2 \Delta \ln RDT_{it} + \sum_{i=1}^n \alpha_3 \Delta \ln DSR_{it} + \sum_{i=1}^n \alpha_4 \Delta \ln DPC_{it} + \sum_{i=1}^n \alpha_5 \Delta \ln DER_{it} + \sum_{i=1}^n \alpha_6 \Delta \ln FER_{it} + \sum_{i=1}^n \alpha_7 \Delta \ln FPI_{it} + \sum_{i=1}^n \alpha_8 \Delta \ln WPI_{it} + \sum_{i=1}^n \alpha_9 \Delta \ln RPI_{it} + \sum_{i=1}^n \alpha_{10} \Delta \ln EXR_{it} + \sum_{i=1}^n \alpha_{11} \Delta \ln INTR_{it} + \phi_1 \ln MES_{it} + \phi_2 \ln RDT_{it} + \phi_3 \ln DSR_{it} + \phi_4 \ln DPC_{it} + \phi_5 \ln DER_{it} + \phi_6 \ln FER_{it} + \phi_7 \ln FPI_{it} + \phi_8 \ln WPI_{it} + \phi_9 \ln RPI_{it} + \phi_{10} \ln EXR_{it} + \phi_{11} \ln INTR_{it} + \varepsilon_{it} \quad (1)$$

Where: MES represent measures of savings which include gross national savings (GNS) and current account balance (CAB) which are used to measure savings and also the dependent variables, RDT is the ratio of external debt, DSR is the debt service ratio, DPC is the debt per capita, FER is the foreign exchange reserves, FPI is the farm price index, WPI is the wholesale price index, FPI is the farm price index, RPI is the retail price indices, EXR is the exchange rate and INTR is the interest rate. In addition, α_0 is the constant, ϕ_1 to ϕ_{11} represent the coefficients of the long-run impacts, α_1 to α_{11} , is the coefficients of the short-run dynamics, Δ , is the first difference operator, and $\ln$ is the natural logarithm, while ε_{it} is the white noise error term. However, if the F-statistic lies above the upper-bound critical value for a given significance level, the conclusion is that there is a non-spurious long-run level relationship with the dependent variable. If the F-statistic lies below the lower-bound critical value, the conclusion is that there is no long-run level relationship with the dependent variable. If it lies between the lower and the upper limits, the result is inconclusive. The general form of the null and alternative hypotheses for the F-statistic test is as follows:

$$\begin{aligned} H_0: & \phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = \phi_7 = \phi_8 = \phi_9 = \phi_{10} = \phi_{11} = 0 \\ H_1: & \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq \phi_5 \neq \phi_6 \neq \phi_7 \neq \phi_8 \neq \phi_9 \neq \phi_{10} \neq \phi_{11} = 0 \end{aligned} \quad (2)$$

If the cointegration between variables is identified, then one can undertake further analysis of the long-run and short-run (error correction) relationship between the variables. The error correction representation of the series can be specified as follows:

$$\Delta \ln MES_{t-1} = \alpha_0 + \sum_{i=1}^n \alpha_1 \Delta \ln MES_{it} + \sum_{i=1}^n \alpha_2 \Delta \ln RDT_{it} + \sum_{i=1}^n \alpha_3 \Delta \ln DSR_{it} + \sum_{i=1}^n \alpha_4 \Delta \ln DPC_{it} + \sum_{i=1}^n \alpha_5 \Delta \ln DER_{it} + \sum_{i=1}^n \alpha_6 \Delta \ln FER_{it} + \sum_{i=1}^n \alpha_7 \Delta \ln FPI_{it} + \sum_{i=1}^n \alpha_8 \Delta \ln WPI_{it} + \sum_{i=1}^n \alpha_9 \Delta \ln RPI_{it} + \sum_{i=1}^n \alpha_{10} \Delta \ln EXR_{it} + \sum_{i=1}^n \alpha_{11} \Delta \ln INTR_{it} + \partial ECT + \varepsilon_{it} \quad (3)$$

Where ∂ is the speed of adjustment parameter and ECT is the error correction term (the residuals obtained from equation 1). The coefficient of the lagged error correction term ∂ is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship between the variables.

3.3.2 Robustness Check Model – FMOLS and DOLS

Having observed that the ARDL model is deficient in some areas, such as not being able to handle some econometric estimation problems, we re-estimated the models by employing the panel dynamic fully modified ordinary least squares (FMOLS) and panel dynamic ordinary least squares (DOLS) models as robustness checks for the study findings in the ARDL model. This is to ensure that we obtain a robust result that would be consistent in policymaking. The DOLS and FMOLS are also very efficient in estimating long-run coefficients if the coefficients are cointegrated. DOLS and FMOLS were both capable of correcting sequence correlation and endogeneity. The FMOLS, being a non-parametric approach, takes into account cross-sectional heterogeneity. It eliminates the connection between the explanatory variable and the random interference components, correcting autocorrelation and heteroscedasticity issues. The parametric DOLS methodology beats the FMOLS method (Kao and Chiang 2001). However, Pedroni (2001), on the other hand, proved that DOLS had less size distortion than

the FMOLS estimation technique. DOLS, on the other hand, is a parametric technique. To reduce the link between explained variables and error terms, this technique adds the lag term of the explanatory variable to the cointegration equation. The FMOLS and DOLS are specified as follows:

$$\beta_{FMOLS} = [N^{-1} \sum_{i=1}^N (\sum_{t=1}^T (P_{i,t} - P_{i,t}))] X' [(\sum_{t=1}^T (P_{i,t} - P_{i,t}))] S_{i,t} - T \Delta_{\varepsilon u} \quad (4)$$

$$\beta_{DOLS} = [N^{-1} \sum_{i=1}^N (\sum_{t=1}^T (W_{i,t} + P_{i,t}))^{-1} (\sum_{t=1}^T (P_{i,t} - P_{i,t}))] S_{i,t} - T \Delta_{\varepsilon u} \quad (5)$$

Where p represents explanatory variables, S denotes a dependent variable, and Z shows the regressor's vector ($W=P-P$) respectively. Thus, emphasis has been laid on the problem of heterogeneity with differences in means among the individuals and differences in individual responses to short-run disturbances from cointegrating equilibrium as the main reasons for concern in estimating dynamic cointegrated panels (Pedroni, 2001) and the FMOLS (equ. 4) is consistent in addressing the problems. Worthy to note, the DOLS outperforms the OLS, ARDL and FMOLS estimators in finite samples in terms of unbiased estimation based on Monte Carlo simulations. It also addresses endogeneity in the model, thereby providing a robust correction for endogeneity in the explanatory variables.

4. RESULTS AND DISCUSSION OF FINDINGS

The sole aim of this study was to investigate the effects of external debt burden and food inflation on savings in 50 selected African countries, using annualised time-series data from 2000 to 2022. Before the estimation of the specified models, we carried out several econometric tests such as descriptive statistics, Spearman's correlation test, unit root tests which encompasses – Levine Lin and Chu (2002), Im, Pesaran and Shin (2003), Fisher-ADF and Fisher-PP as proposed by Madala and Wu (1999) and Pedroni (2004) and Kao (1999) cointegration tests to ensure the variables as well as the models passed the basic econometric assumptions (Gujarati, 2003). In addition, evidence from the above-mentioned tests would aid the researcher in decision-making in the study and help in making possible conclusions. However, we describe the variables below.

4.1 Data Description

The first step taken by the researcher was to describe the variables used for the analysis to sift their basic characteristics and nature so that their behaviour would be foretold. In this stance, descriptive statistics were utilized and the results are presented in Table 2 below. The descriptive statistics measure the basic summary of the model variables using the mean, median, standard deviation, skewness and Kurtosis. From the results, it shows that the total variation in the variable moves from -9.437694 to 18.36085, which represents the lowest and highest values in the series. In addition, the results further revealed that the mean, median, standard deviation, skewness and Kurtosis values did not drift so much from each other, while the probability values of the Jarque-Bera statistic for all the variables are less than 0.05 implying that the variables are normally distributed, which shows that the variables are suitable for the analysis of the external debt burden and food inflation on savings in selected African countries.

Table 2: Results of Descriptive Statistics

Variable	GNS	RDT	DSR	DPC	DER	FER	FPI	CAB	WPI	RPI	EXR	INTR
Mean	1.166	1.155	0.298	-0.021	-0.754	4.288	-1.123	1.192	-1.180	-1.221	-0.580	-0.969
Median	1.591	0.476	0.628	-0.587	-0.511	4.376	-0.866	-0.241	-0.991	-0.981	-0.679	-0.995
Maximum	10.61	10.61	4.148	5.687	6.611	6.182	0.350	10.41	0.149	0.249	3.054	4.545
Minimum	-7.397	-6.295	-7.001	-5.763	-19.71	-2.278	-6.706	-8.745	-4.857	-5.727	-8.271	-6.554
Std. Dev.	3.115	2.803	1.384	1.555	2.163	0.887	1.156	3.711	0.887	1.152	1.888	1.372
Skewness	0.146	0.324	-0.825	1.006	-1.489	-2.330	-1.658	0.301	-1.247	-1.027	-0.172	0.067
Kurtosis	2.618	3.108	5.106	7.512	11.87	18.10	6.524	1.916	4.793	3.678	3.174	4.867
Jarque-Bera	10.47	21.43	233.1	1172.	4311.	1236	199.1	13.75	64.88	67.16	1.583	48.94
Probability	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.004	0.000
Observations	1083	1187	781	1153	1181	1188	204	215	165	344	253	335

Source: Author's Concept.¹

¹Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Djibouti, Egypt, Equatoria Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory-Coast, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius,

To describe the data further, the researcher conducted a correlation test on the variables to sift through if there is an existence of correlations between external debt burden, food inflation, and savings in selected African countries, and the Spearman's correlation test was utilized for this purpose. The guiding principle for this test is that if the rank is between 0 and ± 0.20 , there is no correlation; if the rank is between ± 0.21 and ± 0.40 , there is a weak correlation; if the ranking is between ± 0.41 and ± 0.60 , we say the correlation is moderate; if the rank is between ± 0.61 and 0.80 , there is a strong correlation; and if the rank is between ± 0.81 and ± 1.00 , it is considered a very strong correlation. Hence, the results of the estimated Spearman's correlation test are presented in Table 3 below.

Table 3: Estimated Spearman's Correlation Results

Var	GNS	CAB	RDT	DSR	DPC	DER	FER	FPI	WPI	RPI	EXR	INTR
GNS	1											
CAB	-0.758	1										
RDT	-0.635	-0.426	1									
DSR	0.842	0.079	-0.041	1								
DPC	-0.532	0.228	-0.016	0.102	1							
DER	-0.549	-0.514	-0.002	0.024	-0.767	1						
FER	-0.872	-0.038	-0.270	-0.117	-0.149	0.455	1					
FPI	-0.793	0.084	0.133	-0.452	0.186	-0.062	-0.152	1				
WPI	-0.803	0.061	0.137	-0.698	0.133	-0.044	-0.194	0.822	1			
RPI	-0.498	0.055	0.099	0.037	0.088	-0.031	-0.061	0.688	0.689	1		
EXR	-0.836	0.181	0.023	0.086	0.713	-0.028	-0.176	0.437	0.397	0.299	1	
INTR	-0.653	0.039	0.017	0.019	0.178	-0.019	-0.055	0.201	0.169	0.126	0.242	1

Source: Gross national savings (GNS) is measured as the dependent variable, while the explanatory variables comprise current account balance (CAB), ratio of external debt (RDT), debt service ratio (DSR), debt per capita (DPC), debt to export ratio (DER), foreign exchange reserves (FER), food price index (FPI), wholesale price index (WPI), farm price index (FPI), retail price index (RPI), exchange rate (EXR), and interest rate (INTR).

Findings from the results revealed that the ratio of external debt (RDT) has strong negative correlations with savings in Africa, while the debt service ratio (DSR) portrayed strong positive correlations with savings in Africa. It was also found that debt per capita (DPC) and debt-to-export ratio (DER) have moderate correlations with savings in Africa. Deepening our investigations, we found that foreign exchange reserves (FER), farm price index (FPI), and wholesale price index (WPI) have strong negative correlations with savings in Africa. In addition, the researcher discovered that retail price indices (RPI) have moderate correlations with savings, while the exchange rate (EXR) and interest rate have strong negative correlations with savings in Africa. Conclusively, there is evidence of negative correlations between external debt burden, food inflation and savings in selected African countries.

4.2 Testing for Stationarity

Morocco, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe.

To determine the order of integration and verify the stationarity properties of the variables, this study employed four complementary panel unit root tests: LLC (Levin, Lin, and Chu, 2002), IPS (Im, Pesaran and Shin, 2004), Fisher ADF, and Fisher PP (Maddala and Wu, 1999). The null hypothesis assumes the presence of a unit root, while the alternative hypothesis indicates stationarity. The null hypothesis is rejected when the probability value is less than 0.05. As reported in Table 4, the results show that the variables are integrated at either level, $I(0)$, or first difference, $I(1)$, with no variable integrated beyond the first difference, thereby satisfying the stationarity requirement for the subsequent panel ARDL analysis.

Table 4: Results of Unit Root Tests

Variables	LLC	IPS	Fisher-ADF	Fisher-PP	Level	First Diff.
GNS	-3448 (0.000)	-971.4 (0.000)	1285 (0.000)	316.9 (0.000)	$I(0)$	–
CAB	-12.88 (0.000)	-14.91 (0.000)	430.5 (0.000)	1281. (0.000)	–	$I(1)$
RDT	-27.27 (0.000)	-9.159 (0.000)	659.3 (0.000)	261.4 (0.000)	$I(0)$	–
DSR	-2.147 (0.015)	-4.598 (0.000)	191.4 (0.000)	584.5 (0.000)	$I(0)$	–
DPC	-3.834 (0.000)	-5.426 (0.000)	189.3 (0.000)	314.2 (0.000)	$I(0)$	–
DER	-5.611 (0.000)	-4.060 (0.000)	267.8 (0.000)	276.6 (0.000)	$I(0)$	–
FER	-6.003 (0.000)	-5.364 (0.000)	218.5 (0.000)	262.4 (0.000)	$I(0)$	–
FPI	-13.77 (0.000)	-15.37 (0.000)	448.7 (0.000)	1425. (0.000)	–	$I(1)$
WPI	-9.376 (0.000)	-15.66 (0.000)	446.0 (0.000)	1809. (0.000)	–	$I(1)$
RPI	-12.69 (0.000)	-16.47 (0.000)	475.8 (0.000)	1896. (0.000)	–	$I(1)$
EXR	-21.33 (0.000)	-16.52 (0.000)	636.5 (0.000)	978.9 (0.000)	–	$I(1)$
INTR	-3.933 (0.000)	-4.294 (0.000)	207.5 (0.000)	531.3 (0.0000)	$I(0)$	–

Source: ***, **, and * represent 1%, 5% and 10% integration order; while (.) represents the probability value.

4.3 Testing for Cointegration

We carried out the analysis of cointegration in this section to ascertain if there is an existence of cointegration between external debt burden, food inflation and savings in selected African countries. We employed the Pedroni (2004) cointegration test and robustly checked the results using the Kao (1999) cointegration test. The seven (7) cointegration tests, which were proposed by Pedroni (2004) include panel v -statistic, panel rho-statistic, panel pp-statistic, and panel ADF-statistic under “within dimension,” as well as group rho-statistic, group pp-statistic and group ADF-statistic under “between dimension” The test has a null hypothesis – no cointegration and an alternative hypothesis – cointegration, as well as a decision rule to reject the null hypothesis if the probability value is less than 0.05. However, we present the results of the cointegration tests in Table 5 below.

Table 5: Estimated Cointegration Results

Pedroni Cointegration Test					
Within Dimension					
	Model 1	Model 2	Model 3	Model 4	Model 5
Panel v-Statistic	-1.538 (0.938)	-3.236 (0.009)	-3.073 (0.008)	-2.804 (0.017)	-7.950 (0.000)
Panel rho-Statistic	3.948 (0.000)	4.442 (0.000)	4.154 (0.000)	3.889 (0.001)	-3.048 (0.998)
Panel PP-Statistic	-4.208 (0.000)	-2.850 (0.002)	-3.971 (0.000)	-3.688 (0.000)	4.655 (0.000)

Panel ADF-Statistic	-3.518 (0.000)	-2.176 (0.014)	-3.322 (0.000)	8.928 (0.000)	-2.579 (0.0069)
Between Dimension					
Group rho-Statistic	8.676 (0.000)	8.752 (0.000)	8.929 (0.000)	8.399 (0.000)	-1.930 (0.028)
Group PP-Statistic	-4.089 (0.000)	-2.292 (0.010)	-3.493 (0.000)	-6.143 (0.000)	8.635 (0.000)
Group ADF-Statistic	-1.788 (0.368)	-0.070 (0.471)	-0.492 (0.311)	12.13 (0.000)	-2.687 (0.003)
Kao (1999) Cointegration Test (Robustness Check)					
ADF-Statistic	-8.398 (0.000)	-8.438 (0.000)	-7.938 (0.000)	-8.409 (0.000)	-2.792 (0.001)

Source: Authors' Concept. Kindly note that ***, **, and * represent 1%, 5% and 10% integration order, while (.) represents the probability value.

Findings from the estimated results of Pedroni cointegration tests revealed that there is the existence of cointegration between external debt burden, food inflation and savings in selected African countries since over 5 out of 7 Pedroni cointegration tests are statistically significant across models 1 to 5 and this led to the rejection of the stated null hypothesis and therefore conclude that there is existence of cointegration between external debt burden, food inflation and savings in selected African countries. Specifically, from the results of the robustness checks using Kao (1999) cointegration test, it was confirmed that cointegration exists between external debt burden, food inflation and savings in selected African countries since the probability values of the ADF statistics of KAO cointegration test across the models (1-5) are less than 0.05.

4.4 ARDL Analysis - Baseline Model

To analyse the effects of external debt burden and food inflation on savings in selected African countries, we employed the panel autoregressive distributed lag model (ARDL) as the baseline model as proposed by Pesaran et al. (2001). As a baseline model, ARDL can estimate simultaneously long-run and short-run impacts, especially when the variables are integrated at level $I(0)$ or first difference $I(1)$. Before the estimations, we ensure that the specified models pass through basic econometric pre-estimation tests, which include the normality test, serial correlation test, Ramsey RESET specification test and White Heteroscedasticity test, to ascertain if they obey the assumptions of basic econometric models. As evidenced from the results, we found that the errors of the models are normally distributed, serially uncorrelated and homoscedastic, and the results of the Ramsey specification test show that the models (1-5) are correctly specified and there is no specification bias (see Table 6). Furthermore, to select the best models for the analysis for each of the specified models, we carried out the Hausman test, and the results show that the fixed effects (FE) model is the most suitable model for analysing models 1, 3, 4 and 5, while the random effects (RE) model was suitable for estimation of model 2 (see Table 6).

With gross national savings as the dependent variable, findings from the results revealed that the past values of the gross national savings (GNS(-1)) have significant negative impacts on the current values of the gross national savings in Africa, except for model 1, which has negative and insignificant impacts on the current value. The result also evidenced that the ratio of external debt (RDT) has a significant negative impact on savings in Africa. Also, we found that the debt service ratio (DSR) has significant positive effects on savings in Africa. In addition to this, debt per capita (DPC) portrayed an insignificant positive impact on savings. But the debt-export ratio (DER) has a significant negative impact on savings, while the foreign exchange reserves have an insignificant negative impact on savings in Africa.

Our results also show that the food price index (FPI) has significant negative impacts across the models except for model 3, which has a negative but insignificant impact on savings in Africa. Contrary, the wholesale price index (WPI) has significant positive impacts on African savings across models 1 – 5, while the retail price indices (RPI) have significant negative impacts on savings in the selected African countries. Our results further revealed that while exchange rates (EXR) portrayed positive and significant impacts on savings, the interest rate (INTR) showed negative and significant impacts on savings across the models (1-5), except for model 1, which showed negative and insignificant impacts on savings.

Summarily, this study concludes that external debt burden has both negative and positive significant impacts on savings, while food price inflation has negative and significant impacts on savings in Africa. These findings are in line with the previous findings made by scholars such as (Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghoui, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et

al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others.

Table 6: Estimated ARDL (p, q) Results

Variable	1	2	3	4	5
GNS (-1)	-0.784 (0.974)	-0.174 (0.000)	-0.279 (0.000)	-0.241 (0.000)	-0.231 (0.000)
RDT	-0.582 (0.000)				
DSR		0.226 (0.000)			
DPC			0.086 (0.630)		
DER				-0.051 (0.002)	
FER					-0.197 (0.367)
FPI	-1.424 (0.000)	-0.902 (0.001)	-0.755 (0.097)	-1.527 (0.000)	-1.195 (0.016)
WPI	1.284 (0.000)	1.423 (0.000)	2.901 (0.000)	2.143 (0.000)	2.542 (0.000)
RPI	-0.340 (0.000)	-3.030 (0.000)	-3.901 (0.000)	-3.635 (0.000)	-3.713 (0.000)
EXR	2.176 (0.000)	3.130 (0.000)	2.497 (0.000)	2.917 (0.000)	2.895 (0.000)
INTR	-0.086 (0.399)	-0.719 (0.000)	-0.686 (0.015)	-0.269 (0.293)	-0.571 (0.020)
Obs.	961	963	963	963	963
Normality	10.29 (0.005)	12.12 (0.000)	18524 (0.000)	4207 (0.000)	4192 (0.000)
Serial Correlation	0.947 (0.861)	1.856 (0.156)	1.813 (0.163)	0.263 (0.763)	0.254 (0.955)
Ramsey	-0.182 (0.000)	-0.179 (0.004)	0.001 (0.000)	0.085 (0.000)	0.079 (0.000)
Heteroscedasticity	5.914 (0.675)	7.108 (0.184)	23.99 (0.585)	58.52 (0.069)	2.232 (0.558)
Hausman	35.64 (0.000)	13.94 (0.052)	14.693 (0.040)	14.081 (0.049)	14.78 (0.038)

Source: Computed by the Author. Note that ***, **, and * represent 1%, 5% and 10% integration order; (.) represents the probability value.

4.5 Analysis of the Short-Run Impacts

In this section, the successive short-run component of the ARDL equation was used to estimate the effect of external debt burden and food inflation on savings in selected African countries as proposed by Pesaran et al. (2001). According to the assumptions of the ARDL model, the coefficient of the error correction term (ECM) must possess a negative sign and must be statistically significant to be able to measure the speed of the adjustments in the long run. Thus, our results are presented in Table 7 below. Findings from the results revealed that the coefficients of the error correction model across the specified models 1 – 5 possess negative signs and are statistically significant at various levels of significance (see Table 7). As such, based on the values of their coefficients, it was suggested that the speed of adjustments was measured by the magnitudes of 16%, 5%, 3%, 2% and 3% respectively for models 1 – 5. This implies that it would take about 16%, 5%, 3%, 2% and 3% speeds of adjustment to correct the long-run impact of external debt burden and food inflation on savings in the short run. More so, we found that the wholesale price index (WPI) has significant impacts on saving in Africa in 2, 3 and 5. These findings corroborate the previous findings made by scholars like (Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghoudi, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others.

Table 7: Estimated Results of the Short-Run ARDL (p, q)

Variable	1	2	3	4	5
ECM (-1)	-0.165 (0.039)	-0.051 (0.000)	-0.035 (0.002)	-0.028 (0.007)	-0.031 (0.005)
Δ RDT	0.413 (0.896)				
Δ DSR		0.512 (0.464)			
Δ DPC			0.173 (0.653)		
Δ DER				-0.031 (0.879)	
Δ FER					-0.027 (0.926)
Δ FPI	0.013 (0.923)	-0.046 (0.338)	-0.055 (0.690)	-1.843 (0.379)	-0.406 (0.219)
Δ WPI	-0.415 (0.405)	-1.189 (0.016)	-1.132 (0.020)	-0.921 (0.053)	-1.236 (0.004)
Δ RPI	0.760 (0.067)	0.339 (0.525)	0.345 (0.489)	0.605 (0.067)	0.428 (0.384)
Δ EXR	-0.376 (0.186)	0.079 (0.739)	-0.617 (0.764)	-0.566 (0.984)	-0.165 (0.394)
Δ INTR	-0.055 (0.895)	-0.017 (0.985)	0.195 (0.664)	-0.265 (0.565)	0.377 (0.408)

Source: Authors' Concept. ***, **, and * represent 1%, 5% and 10% integration order; (.) represents the probability value. Δ is the first difference operator.

4.6 Robustness Checks – FMOLS and DOLS

From the previous estimation of the effects of external debt burden and food inflation on savings in selected African countries with the ARDL baseline model, we found that external debt burden has significant positive and negative effects on savings, while food inflation has significant negative effects on savings in selected African countries. However, according to theory, the ARDL model is incapacitated from addressing some estimation issues like endogeneity, cross-sectional dependency issues, country heterogeneity and country-specific effects, we robustly checked findings from the ARDL results by re-estimating the specified models with the panel fully modified ordinary least squares (FMOLS) and panel dynamic ordinary least squares (DOLS) as proposed by Philips and Hansen (1990), Saikkonen (1992) and Stock and Watson (1993) which can take care of the aforesaid estimation problems. In addition, we introduced another indicator – current account balance to measure savings to ascertain if there could be changes from the previous findings. However, the results of the FMOLS are presented in Table 8 below.

Findings from the estimated results of the FMOLS suggest that the past values of savings have significant positive effects on the current values of savings in Africa across the specified models. It was further discovered that the ratio of external debt (RDT) has insignificant negative effects on savings in Africa, while the debt services ratio (DSR) has positive but insignificant effects on savings in Africa. Further, the debt per capita (DPC) portrayed significant positive effects on savings; the debt-to-export ratio (DER) has significant negative effects on Africa's savings, while the foreign reserves (FER) have significant positive effects on savings in Africa. We discovered that the food price index (FPI) has significant negative effects on savings across models 1-5 except in model 4, where it showed positive and significant effects on savings. More so, we found that the wholesale price index (WPI) has insignificant negative effects on savings across the models, while retail price indices (RPI) have significant negative effects on savings in Africa. The study further discovered that exchange rate (EXR) and interest rate (INTR) respectively have significant positive and negative effects on savings in Africa. In addition to this, the R-squared results for each of the specified models, which measured the goodness of fit revealed that a greater percentage of the dependent variable – current account balance (CAB) was explained by the explanatory variables. These evidences found tallied with previous empirical findings made by scholars like (Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghoudi, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others.

Table 8: Robust Model – FMOLS

Variable	1	2	3	4	5
CAB (-1)	0.461 (0.000)	0.455 (0.000)	1.266 (0.000)	1.228 (0.000)	0.074 (0.000)
RDT	-0.039 (0.432)				
DSR		0.021 (0.485)			
DPC			0.410 (0.002)		
DER				-0.451 (0.000)	
FER					0.264 (0.000)
FPI	-1.148 (0.016)	-1.172 (0.014)	-1.082 (0.022)	0.856 (0.017)	-1.158 (0.000)
WPI	-0.598 (0.241)	-0.509 (0.318)	-0.324 (0.525)	0.263 (0.272)	-0.192 (0.568)
RPI	-0.758 (0.001)	-0.764 (0.001)	-0.874 (0.000)	-0.570 (0.000)	-0.801 (0.000)
EXR	2.064 (0.001)	2.075 (0.001)	2.193 (0.000)	1.068 (0.000)	2.021 (0.000)
INTR	-1.073 (0.000)	-1.122 (0.000)	-1.135 (0.000)	-0.628 (0.000)	-1.172 (0.000)
Obs.	1024	1027	1021	1027	1027
R-squared	0.647	0.881	0.755	0.661	0.850

Source: Authors' Concept. ***, **, and * represent 1%, 5% and 10% integration order; (.) represents the probability value.

From the estimated results of the panel dynamic ordinary least squares (DOLS) presented in Table 9 below, we found that across models 1 – 5, the past values of savings – measured with the current account balance (CAB) have significant positive effects on the current values of savings in Africa. We also found that the ratio of external debt (RDT) had insignificant negative effects on savings in Africa, while the debt service ratio portrayed positive and insignificant effects on savings in Africa. About this, we found that debt per capita (DPC) showed a significant positive effect on savings, while the debt-to-export ratio (DER) and foreign exchange reserve (FER) have insignificant positive effects on savings in Africa. Furthermore, we found that the food price index (FPI) has significant effects on savings across models 1 – 5 in Africa.

We discovered that the wholesale price index (WPI) has significant positive effects on savings, while retail price indices (RPI) have significant negative effects on savings in Africa. Observingly, the exchange rate (EXR) and interest rate (INTR) have significant positive and negative effects on savings in Africa across the models. Our results further entail that R-squared – a measure of goodness of fit greatly explained the variations in the dependent variable across the models. These findings are in correspondence with the earlier findings made by scholars like (Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghouli, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others.

Table 9: Robust Model – DOLS

Variable	1	2	3	4	5
CAB (-1)	0.057 (0.000)	0.861 (0.016)	1.155 (0.000)	0.573 (0.000)	0.055296 (0.0000)
RDT	-0.039 (0.441)				
DSR		0.029 (0.330)			
DPC			0.312 (0.023)		
DER				0.430 (0.466)	

FER					0.227 (0.061)
FPI	-1.018 (0.034)	-1.029 (0.032)	-0.982 (0.039)	-1.063 (0.026)	-1.025 (0.046)
WPI	-0.559 (0.274)	-0.485 (0.344)	-0.366 (0.475)	-0.539 (0.291)	-0.249 (0.643)
RPI	-0.615 (0.009)	-0.629 (0.008)	-0.693 (0.003)	-0.616 (0.009)	-0.652 (0.007)
EXR	1.699 (0.007)	1.709 (0.006)	1.806 (0.004)	1.773 (0.004)	1.678 (0.012)
INTR	-0.967 (0.000)	-0.994 (0.000)	-1.002 (0.000)	-0.995 (0.000)	-1.024 (0.000)
Obs.	1027	1028	1028	1028	1028
R-squared	0.864	0.764	0.673	0.563	0.567

Source: Authors' Concept. ***, **, and * represent 1%, 5% and 10% integration order; (.) represents the probability value.

4.6 Discussion of Findings

This study examined the effects of external debt burden and food inflation on savings in 50 selected African countries from 2000 to 2022 due to data availability. After a careful review of the literature, the following variables are selected: Gross national savings (GNS), current account balance (CAB), ratio of external debt (RDT), debt service ratio (DSR), debt per capita (DPC), foreign exchange reserves (FER), farm price index (FPI), wholesale price index (WPI), retail price indices (RPI), exchange rate (EXR) and interest rate (INTR). The unit root test results show that there is no evidence of unit roots, and the variables were integrated of I(0) and I(1) and not I(2). The result of Pedroni (2004) and Kao (1999) cointegration tests shows that there is the existence of cointegration between external debt burden, food inflation and savings in selected African countries. We found from the ARDL results that external debt burden has both negative and positive significant impacts on savings, while food price inflation has negative and significant impacts on savings in selected African countries, while in the short-run ARDL results, we found that the speed of adjustments was measured by the magnitudes of 16%, 5%, 3%, 2% and 3% respectively for models 1 – 5. However, from the results of the robustness check FMOLS and DOLS, we found that external debt burden has both negative and positive significant effects on savings in Africa, while food inflation has significant negative influences on savings in Africa.

Based on the study's objective, we found the ratio of external debt has an insignificant impact on savings in Africa. Also, the debt service ratio was found to have significant negative impacts on savings in Africa. For objective three, we discovered that debt per capita has a significant impact on savings in Africa, while the results show that foreign exchange reserves have a significant impact on savings in Africa, and the retail price index has a significant effect on savings in Africa. These findings are in line with some of the reviewed studies (Qureshi & Liaquat, 2020, Bakarr & Jalloh, 2021, Epaphra & Mesiet 2021, Bashir Jama, 2021, Zaghoui, 2020, Ring et al. 2021, Neigovan & Simin, 2020, Wen et al. 2021, Li & Li, 2021, Serinfag et al. 2023, Anwar & Guha 2023, Chinezelum et al. 2023, Adjemin et al. 2023) among others.

The unique distinct factors that made this study stand out from the previous studies are stated as follows. Firstly, we thoroughly studied savings in selected African countries by using two measures of savings – gross national savings and current account balance, unlike previous studies, and this avails us the opportunity to critically investigate savings in Africa. Secondly, we examined external debt burden by employing indicators like the ratio of external debt, debt service ratio, debt per capita, and foreign exchange reserves, unlike previous studies, which we specified in models 1 – 5 to avoid multicollinearity and found that external debt burden has both negative and positive impacts on savings in Africa.

Thirdly, unlike previous studies, we estimated food inflation with three different indicators: food price index, wholesale price index, and retail price indices. By this means, we were able to extensively measure the effects of food inflation on savings in Africa. Fourthly, we carried out a robustness check on our findings from the ARDL results by employing the FMOLS and DOLS estimation techniques and also by using another measure of savings – the current account balance (CAB), primarily to see if there could be any changes in savings in Africa after the estimation and also to take care of the cross-sectional dependency, heterogeneity and country-specific effects which ARDL did not account for. The study therefore concludes that the external debt burden has both negative and positive significant effects on savings, while food inflation has significant negative effects on savings in Africa.

5. CONCLUSION AND POLICY RECOMMENDATIONS

Summarily, we investigated the effects of external debt burden and food inflation on savings in 50 selected African countries from 2011 to 2022. We considered the following variables Gross national savings (GNS), current account balance (CAB), ratio of external debt (RDT), debt service ratio (DSR), debt per capita (DPC), foreign exchange reserves (FER), farm price index (FPI), wholesale price index (WPI), farm price index (FPI), retail price indices (RPI), exchange rate (EXR) and interest rate (INTR) after conducting an extensive review and the choices of the variables as well as the study period was based on the data availability. The unit root test results show that there is no evidence of unit root, and the variables were integrated of $I(0)$ and $I(1)$ and not $I(2)$.

The result of Pedroni (2004) and Kao (1999) cointegration tests, shows that there is an existence of cointegration between climate finance, digital financial services and microfinance development in Africa. From the ARDL results, we found that external debt burden has both negative and positive significant impacts on savings, while food price inflation has negative and significant impacts on savings in selected African countries, while in the short-run ARDL results, we found that the speed of adjustments was measured by the magnitudes of 16%, 5%, 3%, 2% and 3% respectively for models 1 – 5. However, from the results of the robustness check FMOLS and DOLS, we found that external debt burden has both negative and positive significant effects on savings in Africa, while food inflation has significant negative influences on savings in Africa.

Based on the study findings, this study concludes that external debt burden has both negative and positive significant impacts on savings, while food inflation has a significant negative impact on savings in Africa. Based on the research findings as well as the objectives of the study, this study made the following recommendations. It is recommended that the government should implement strategies like fiscal consolidation, economic diversification, enhanced export competitiveness, efficient debt management, utilisation of concessional financing, structural reforms, strengthened monetary policy, improved transparency and accountability, and engagement in international debt relief initiatives to reduce the external debt burden in Africa. Also, the government can increase their national savings rates, providing a strong foundation for long-term economic development and stability, which requires a comprehensive approach involving prudent fiscal and monetary policies, financial sector development, public awareness, and education, pension and social security reforms, corporate savings encouragement, government initiatives, and maintaining economic stability and growth. The governments of African economies should stabilise food prices by using a multifaceted approach which involves enhancing agricultural productivity, improving supply chain efficiency, implementing effective policy and regulatory measures, promoting diversification and resilience, improving market transparency, strengthening institutional frameworks, fostering international cooperation, encouraging healthy competition, and raising consumer awareness.

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