DEBT OVERHANG PARADOX AND PUBLIC INVESTMENT ON ECONOMIC GROWTH IN INDEBTED COUNTRIES: A SOUTHERN AFRICAN DEVELOPMENT COMMUNITY COMPARATIVE DEBT LEVEL ANALYSIS

by

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DECLARATION

I declare that the **Dissertation** hereby submitted to the University of Limpopo, for the degree Master of **Commerce in Economics** has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

FULL NAMES	DATE
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ABSTRACT

A multitude of Highly Indebted Poor Countries (HIPC) receive debt relief under the HIPC initiative. As a result, there has been a stimulating debate regarding the effect of elevated levels of external borrowing on economic growth. Over the years, there has been an ever-increasing level of unemployment, price instability, and inequality in the SADC region reflecting rapid declines in economic growth and inefficiency. This study was aimed at investigating the impact of the debt overhang paradox of external debt and debt service cost, and public investment on economic growth in Highly Indebted Countries (HIC) and Less Indebted Countries (LIC) in the SADC region. Panel Vector Error Correction Model (PVECM) and Impulse Response Function (IRF) were employed to determine the short and long-run relationship and to forecast the behaviour of economic growth during the period 2004 to 2020.

The PVECM test was conducted which indicated that in HIC debt service cost and public investment have a negative long run relationship with economic growth. The opposite was realised for external debt. In the short run, all the variables were found to have a negative impact on economic growth with the exception of public investment in HICs. The relationship between the explanatory variables and economic growth was found to be statistically insignificant in the short run. Comparably, external debt and public investment in LICs had a positive long run relationship with economic growth, though, a negative relationship was realised between debt service cost and economic growth. The IRF indicated that in HIC, changes in GDP yield either a negative or positive response to past values of GDP. Interestingly, GDP responded positively to debt service cost and public investment while, on the contrary, GDP responded negatively to external debt. Conversely, in LICs, changes in past values of GDP yielded a positive impact on GDP. In contrast, GDP responded negatively to external debt and debt service costs but responded positively to public investment.

The results implied that governments in the selected SADC countries spend more than they are able to generate for the average spending needs. Thus, dependency on external borrowing has brought about growth limitations. It is imperative for policymakers to redirect policy to rethink current means of sourcing revenue into more fundamental strategies that enable economic growth and debt repayment simultaneously.

Keywords: external debt, debt service costs, public investment, economic growth, SADC

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ADB:	African Development Bank
ADF:	Augmented Dickey-Fuller
AIC:	Akaike Information Criterion
ECT:	Error Correction Term
FDI:	Foreign Direct Investment
FPE:	Final Prediction Error
GDP:	Gross Domestic Product
GFC:	Global Financial Crisis
GFCF:	Gross Fixed Capital Formation
HIC:	Highly Indebted Country
HIPC:	Highly Indebted Poor Countries
HQ:	Hannan-Quinn
IMF:	International Monetary Fund
IRF:	Impulse Response Function
LIC:	Less Indebted Country
MDRI:	Multilateral Debt Relief Initiative
PP:	Phillips Perron
SADC:	Southern African Development Community
SARB:	South Africa Reserve Bank
SC:	Schwarz Information Criterion

SOE: State-Owned Enterprises

VECM: Vector Error Correction Model

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

A multitude of Highly Indebted Poor Countries (HIPC) receive debt relief under the HIPC initiative. As a result, there has been a stimulating debate regarding the effect of elevated level of external borrowing on economic growth (Ejigayehu & Persson, 2013; Mavhinga (2015); Kharusi & Ada, 2018; Hung, 2021). Given the need to combat socio-economic challenges and achieve higher levels of economic growth, it becomes necessary for countries to substantially invest in quality infrastructure. Of concern, however, is that African countries have frequently funded infrastructure development projects through deficit financing which entails increases in external debt. This was done in hopes that improvements in infrastructure would stimulate growth (Sogoni, 2014). Thus, the increase in external borrowing has become a worrying issue for policymakers as they question whether such an increase improves or hinders growth in the long-term. It is worth noting that in the SADC region, high levels of debt can compromise the implementation of essential macroeconomic development strategies (Makhoba, Kaseeran, & Greyling, 2022).

Relatively, through the HIPC Initiative, some of the countries were able to source growth, as the initiative is aimed at the elimination of debt overhang. This is done because debt overhang hinders investment and economic growth and consequently, establishes an implicit tax on private investment (Djimeu, 2018). Public debt levels increased significantly during the wake of the 2008 Global Financial Crisis (GFC) and following this, a considerable number of African countries were categorized as high-risk debt economies by the World Bank and IMF (Benno & Stephen, 2021). According to Mclean and Charles (2017), rational borrowing can boost productivity in developing economies by accumulating capital and improving production capabilities. Though developing countries are also known for limited stocks of capital, it is possible to bring about rates of return better than that of advanced economies by attracting investment opportunities.

The Southern African Development Community (SADC) consists of Angola, Botswana, Comoros, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Eswatini, South Africa, Seychelles, Tanzania, Zambia, and Zimbabwe. Of the aforementioned countries, those benefiting from the HIPC Initiative include DRC, Madagascar, Malawi, Mozambique, Tanzania, and Zambia. Those that rely mainly on external debt as a source of revenue include Botswana, Lesotho, and Eswatini. Meanwhile, Mauritius, Namibia, and South Africa dependent on domestic financial markets as a source of revenue. Seychelles and Zimbabwe on the other hand, are regarded as countries that are characterised by notable debt overhang amid defaults in loan repayments (Djeutane, 2014). The rate of financial transparency among the countries is quite limited, although Seychelles, Zambia, and Mauritius are financially transparent.

The SADC region has a financial transparency index of -0.63 against the set target of 2.44. From the period 2000 to 2009, Mauritius reported the highest growth rate in debt (le Roux & Moyo, 2015). Since 2010, the rate at which debt has been accumulated in the SADC region has caused alarming concerns about debt stability, further undermining the productiveness of monetary policy. The general public debt level in the SADC increased from 34.9% as a share of gross domestic product (GDP) in 2010 to 54.9% in 2018, and this reflects both domestic and external debt. The inclining debt levels indicated the essential rise in the primary budget deficit and foreign exchange market depreciation. The introduction of the HIPC Initiative and Multilateral Debt Relief Initiative (MDRI) yielded an increase in the countries' borrowing capacity (Mupunga, Ngudu, & Makena, 2019).

Of the sixteen listed SADC member countries, this study focuses on eleven countries. The reason behind this is to be able to analyse the different growth levels of the eleven countries. As there has been debt development over the years, the SADC countries analysed such developments utilizing a public debt-to-GDP macroeconomic convergence (African Development Bank (AfDB), 2021). In comparison, Zambia, Mozambique, Malawi, and Mauritius are categorized as highly indebted countries within the SADC region, whereas Namibia, Botswana, South Africa, and Eswatini are classified as less indebted countries (Biyase, 2019). With the target set at 60% of GDP, by the end of 2013, almost all the listed SADC countries had debt levels below 60% of GDP with the exception of Zimbabwe, Angola, and Mozambique which are the

most indebted SADC countries recording public debt levels of 75%, 75.2%, and 110.1%, respectively in 2018. Moreover, Zimbabwe, Zambia, Seychelles, and Mozambique exceeded the debt-to-GDP target in 2018 (AfDB, 2021) and (Biyase, 2019). Seychelles found itself in this position because of the substantial government budget deficit that prevailed before the 2008 IMF reform program, as the country had an additional default account on its USD 30 million Eurobond during October 2008. This yielded from the decline in tourism revenue during the GFC as well as the government's remnants from spending throughout the years. The default would have been avoided had the external loans been utilized for policy reformation and rational government spending. However, the country's debt-to-GDP ratio remained high although it declined significantly over the years, from 117% in 2009 to 68.8% in 2013.

Following the decline in debt levels, the country recorded debt-to-GDP ratio of 96.48% in 2014 as the tourism sector declined drastically. Zimbabwe had about 80% of overdue public debt organized as payment arrears, with the risk of debt overhang originating from the early 2000s when the country began collecting arrears due to external and internal circumstances related to political instability. With regard to Malawi, Mozambique, Madagascar, Zambia, and DRC, the introduction of debt relief programs assisted in the reduction of external debt stock, which consequently allowed the continuance of a public debt-to-GDP ratio below the 60% target (Djeutane, 2014; AfDB, 2021).

Conversely, there has been both academic and policy debate on the position of public investment. It is argued that public investment is overall insignificant and that at times it is rather significant and contributes positively towards economic growth (Fournier, 2016; Makuyana & Odhiambo, 2018; Dey, 2020). Public investment can be directed as gross fixed capital formation (GFCF) and it is through this capital (tangible or intangible) that government can afford to deliver essential public services such as inclusive education, health care, social welfare, public safety, and transportation. With gains from the investment in basic services, there can be a direct improvement in the rate of economic growth. Moreover, investment in government services influences the aggregate economy and its productivity levels although the level of influence depends on the efficient utilization of funds (Murova & Khan, 2017).

Although for the period 2004 to 2010 most SADC countries were able to manage their debt obligation by halving the average growth-to-debt ratio from almost 80% to less than 40%, the economies' debt obligation remained high (SADC, 2012). Thus, most SADC countries were categorized as HIPCs by the World Bank. The historic debt concern in developing countries has created significant concerns regarding their capability to negatively influence productivity (Maleka, Biyase, & Zwane, 2019). Additionally, government debt in the SADC region has become a burden to citizens amid higher tax rates. Also, since external loans are regarded as easily obtained revenue they tend to be misused. The misuse of external loans creates a debt burden that is carried to the next generation and since there is incompetent leadership and poor allocation of public resources, the interest cycle is effectuated, resulting in increases in poverty levels (Mbandiwa, 2020). In light of the above, the main focus of the study is on the impact of debt overhang (external debt) and public investment on economic growth in less developed countries, particularly in the SADC region.

1.2 THE PROBLEM STATEMENT

Over the past years, there has been a significant rise in unemployment rates, price instability, and inequality in the SADC region. This is reflective of rapid declines in economic growth and development. Also, economic growth has remained weak, and the inability of decision makers to effect solutions to socio-economic challenges has exacerbated the growth tragedy even further (Chirwa, 2017; SADC, 2019). This follows the spillover effect of the global financial crisis which left most African countries with persistent and implausible debt levels due to past multi-national debt crisis (Mojapelo, 2020). In 2019 Africa's GDP growth rate was reported at 3.6% compared to 3.2% in 2018, which indicated an improvement in economic conditions. Even so, the slight shift in the growth rate was linked to the inability to accelerate economic and social development and poverty reduction. Also, relatively lower growth rates implied that African countries were not efficient enough to create much-needed jobs in the continent.

The global growth rate contracted from 2.9% in 2019 mainly due to declining commodity prices, unsustainable trade policy, increased trade conflicts, and rising debt levels. Similarly, the SADC region's economic growth declined by 4.8% in 2020,

compared to 2.1% in 2019 (SADC, 2021). It is sufficient to note that the advent of the covid19 pandemic presented an economic shock globally. The Southern Africa region was the most affected by COVID-19. While economic growth in the region contracted by -3.0%, it has been forecasted that the region will recover by 3.3% in 2021 and 3.4% in 2022. South Africa and Angola, regarded as the SADC region's largest economies, contributed more to the contracted growth.

Therefore, the unstable nature, profile, and level of debt in most SADC countries achieved frightening and implausible levels, such that critical services including transport and telecommunication, water and sanitation, infrastructure, health, and education continue to be adversely affected as various governments have utilized their scarce and limited resources to settle enormous amounts of debts (Muchena, 2019). As a result, Muchena (2019) argued that this created instability in most countries because it is uneasy to utilise resources and funds meant to improve people's standards of living to settle debts. With the high-interest rates related to debt, consequently, most countries have failed to honour their debt obligation. Therefore, in most cases, this yields a violation of human rights because SADC countries faced with debt overhang and poor public investment frameworks cannot deliver crucial public goods and infrastructure. And, such public services are considered and recorded in the Bill of Rights, hence they are a constitutional obligation, meaning that the long-term development goals are recognized to be at critical risk.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim of the study

This study aims to investigate the impact of the debt overhang paradox and public investment on economic growth among indebted SADC countries.

1.3.2 Objectives of the study

To analyse the effect of external debt on economic growth.
To investigate the impact debt service costs, have on economic growth.
To determine the relationship between public investment and economic growth.

To determine the causality between external debt, debt service costs, public investment, and economic growth.

1.4 RESEARCH QUESTIONS

What is the effect of external debt on economic growth?
What is the impact of debt service costs on economic growth?
What is the relationship between public investment and economic growth?
Is there causality between external debt, debt service costs, public investment, and economic growth?

1.5 DEFINITION OF CONCEPTS

Debt overhang

Debt overhang refers to a case in which government assumes that the stock of external debt surpasses the country's ability to pay back its debt with anticipated future probability, including debt service increasingly relying on a country's production capacity (Sichula, 2012).

Economic growth

This is the increase in the capabilities of an economy to produce more goods and services in a given comparative period. As such, the overall increase in the value of a country's total output or expenditure is referred to as economic growth (Pettinger, 2019).

External Debt

It is defined as the payable amount of actual current and non-contingent liabilities that are obliged for repayment of the principal amount and the interest by the borrower at a given period in the future (IMF, 2003).

Debt Service Cost

The amount of interest the national government is obliged to pay in addition to the outstanding government debt per annum. The debt is inclusive of outstanding amounts owed to individuals, businesses, foreign central banks, and intragovernmental reserves (Amadeo, 2022).

Public Investment

It is the gross fixed capital formation, that is, the estimated sum of acquisitions less disposals, and fixed assets by the government either through the central or local government, and/or state-owned enterprises. The investment incorporates tangible assets in the form of infrastructure such as transport and telecommunication, and also investment in humans such as education, skills, and knowledge (IMF, 2020).

1.6 ETHICAL CONSIDERATIONS

This study utilized secondary data, in which the plagiarism policies of the University of Limpopo are compiled. Also, sources that provide quantitative and qualitative originality of the results are recognized throughout the proposal. Therefore, the information in the study has been analysed with integrity and formality.

1.7 SIGNIFICANCE OF THE STUDY

Based on the literature reviewed to this point on the relationship between economic growth, external debt, and public investment, there remains mixed conclusions among scholars (e.g., Knoll, 2013; Manasseh et al., 2018, Kharisu & Ada, 2018; de Rugy & Salmon, 2020; Salmon, 2021). Additionally, macroeconomic policy formulation aimed at identifying and combating challenges that hinder economic growth in the SADC region requires further support from considerable research. Thus, drawing inspiration from Sichula (2012) empirical research is unavoidable. Furthermore, the literature review has revealed that the accumulation of debt in LIC has been given little attention, and the issue has been a growing concern given a significant threat that is likely to disrupt macroeconomic stability, private sector lending, government budget, and overall productive capabilities (Djeutane, 2014). As such, the impact of external debt and public investment on economic growth are among the most daily debated and argued economic phenomenon. Different views and arguments are presented by researchers, occasionally confusing readers. Hence, this study is envisaged to contribute to the literature by analysing the relationship between external debt and public investment and their impact on economic growth in SADC. The novelty of this study is that it does not only focus on SADC countries only but on both HIC and LIC

countries in the region. Also, the study makes use of the recent data, which is an extension of the period covered by other studies on the same topic.

1.8 STRUCTURE OF THE STUDY

The dissertation is structured as follows: chapter 2 outlines the overview of external debt, debt service cost, and public investment in selected HIC and LIC SADC countries. Chapter 3 provides the theoretical framework indicating the theories regarding external debt, its servicing cost, and public investment followed by the literature review. Chapter 4 presents the research methodology that is applied to the study while Chapter 5 presents the empirical results of the study. The summary, conclusion, and recommendations of the study are presented in chapter 6.

CHAPTER 2

AN OVERVIEW OF EXTERNAL DEBT, DEBT SERVICE, AND PUBLIC INVESTMENT IN SELECTED HIGHLY INDEBTED AND LESS INDEBTED SADC COUNTRIES

2.1 INTRODUCTION

With notable improvements in macroeconomic performance, supportive international liquidity, and even slow-paced growth rates, some SADC countries increased their borrowing to fund infrastructure and development expenditure. Thus, the countries' debt levels reflect mainly on budget deficits and exchange rate depreciation (Mupunga, Ngubdu, & Makena, 2019). Due to the political and economic adaptations that the SADC region went through, there has been a drastic change in its debt framework and debt structure (Makoto, Mumvuma, & Kadenge, 2020). Following the 2008 global financial and economic crisis, African countries suffered the most loss and the SADC region was no exception. The countries entered the crisis with low debt levels, but experienced shock yielding the demand for external borrowing and liquidity shortages, placing SADC countries in compromising situations (Ncube & Zuzana, 2015).

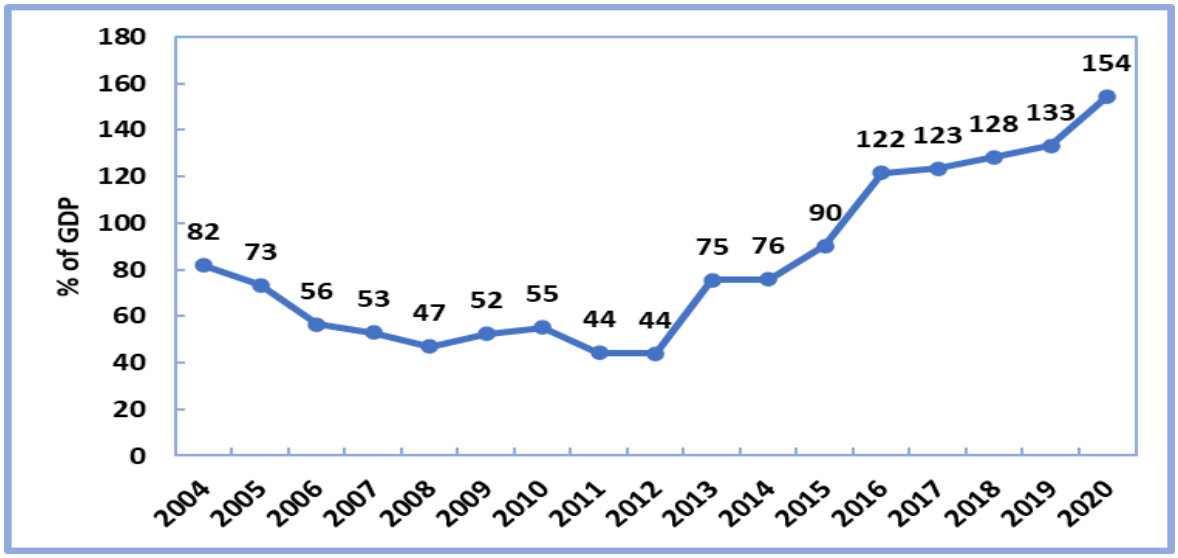
The SADC region has normalised borrowing from developed countries due to factors inclusive of public sector deficits, immense infrastructure investment, war, and natural disasters faced by the countries. External loans undertaken by the government become a burden to the people, as the people's ability to remain productive in the economy contributes to repaying the debt obligation and its interest (Mbandlwa, 2020). Inversely, Kose, Ohnsorge, and Sugawara (2020) argue that external borrowing has advanced over the years, providing a platform that brings about attractive choices to finance growth-enhancing programs inclusive of investment in human and physical capital. This is aligned with the fact that countries with reserved currencies can be able to take advantage of foreign borrowing as it presents low-interest rates enabling them to allocate the accumulated capital for essential economic expenditures, the trio further argued.

2.2 OVERVIEW OF EXTERNAL DEBT AND SERVICING COSTS IN HIGHLY INDEBTED SADC COUNTRIES

2.2.1 External debt and servicing costs in Mozambique

For decades, Mozambique has been led by cautious policies regulated by the IMF. The policies were meant to alleviate poverty levels in the country by enhancing the education and health care systems (Beste & Pfeiffer, 2016). Mozambique has been battling with its debt crisis for years, and the country is regarded as highly indebted. It is also one of the world's poorest countries, having lost at least a third of its currency value in 2016, the country resorted to external borrowing (Strohecker, 2019). Furthermore, among other countries in the SADC region, Mozambique's sovereign debt levels are supposedly influenced by corruption. As a result, the IMF withdrew all its support and other foreign governments discontinued the provision of aid yielding a plunge in the country's currency (Koen, 2021). An overview of external debt in Mozambique for the period 2004 to 2020 is shown in Figure 2.1 below.

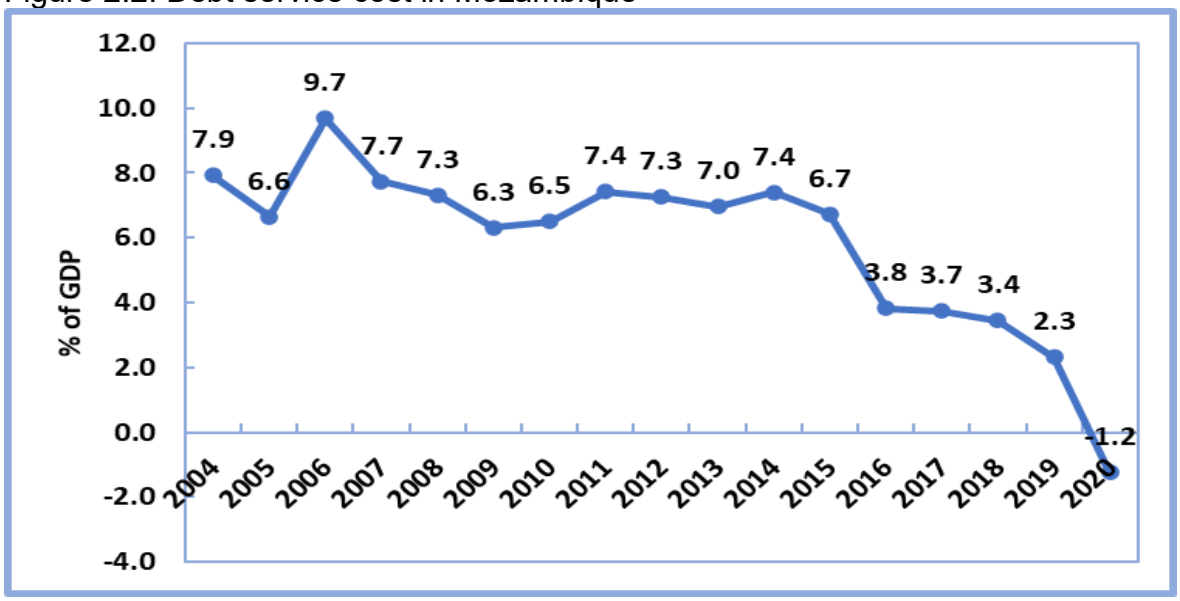
Figure 2.1: External debt as a share of GDP in Mozambique



Source: author's computation using World Bank Data

According to the illustration in Figure 2.1, external debt in Mozambique is extremely high where in 2004 the country's external debt stood at 81.72%. The country's external debt rose significantly in 2013, rising from the already high 75.48% to the highest record of 154.41% in 2020. This yielded a record that is above 100% for five consecutive years. Among other reasons, these high external debt figures can be attributed on the country's corrupt economic environment (Koen, 2021).

Figure 2.2: Debt service cost in Mozambique



Source: author's computation using World Bank Data

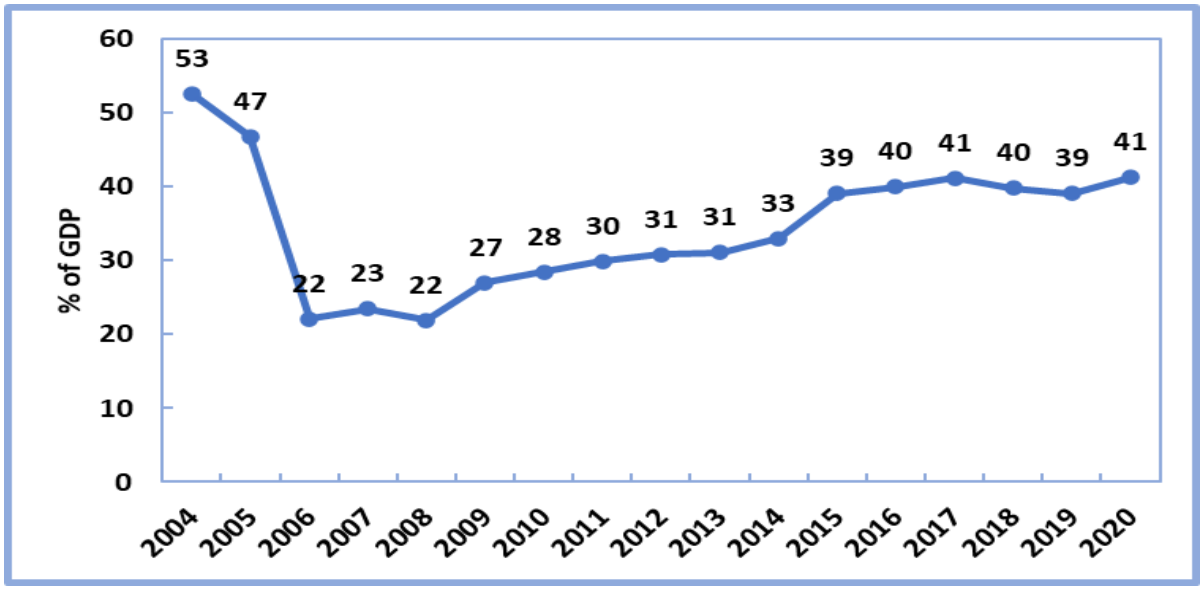
When analysing Figure 2.2, Mozambique experienced high levels of external debt, thus the country's debt levels are linked to its ability to service the debt it accumulated from 2004 to 2020. That is, Figure 2.2 above is an illustration of debt service cost in the country. Mozambique has been fairly able to service its debt because the figure for the servicing cost is low and the country has high levels of external debt. Following the country's indebtedness, low rates such as 4.8% in 2004 were significant because it was during such a period that the country had high levels of external debt, though observations suggest that the country managed to service the accumulated debt. Notwithstanding, during 2007 and 2020 the country's ability to service its debt was poor given relatively high debt service costs which stood at 11.8% and 11.3%, respectively. Thus, according to Gebregziabher and Sala (2022), the discovery of Mozambique's hidden debts created conflicts that resulted in an economic downturn. Furthermore, the country's FDI diminished as international investors lost confidence, and concessional lending by international financial institutions became limited, overall, there were debt defaults, and the servicing cost due were high.

2.2.2 External debt and servicing cost in Tanzania

Tanzania is among the many countries that are working persistently to achieve sustainable economic growth, though issues related to fiscal deficit have been hindering the country's effort to do so. As such, Marobhe (2018) states that given the many measures to impede fiscal deficit such as enhancing revenue collection or

reducing unproductive expenditures, the issue seems to remain intact pressurizing the country to resort to external borrowing. This as a tool to combat fiscal deficit has led to more fiscal problems in the country, especially, when the debt has to be serviced, which yields a debt burden overtime. Tanzania receives debt relief under the HIPC initiative (Marobhe, 2018). It also benefits from the MDRI, which together with the HIPC has provided debt relief of at least $ 3 billion to Tanzania, this relief significantly reduced Tanzania's debt burden, which resulted in substantial declines in debt indicators in the country over the years (Were & Mollel, 2020).

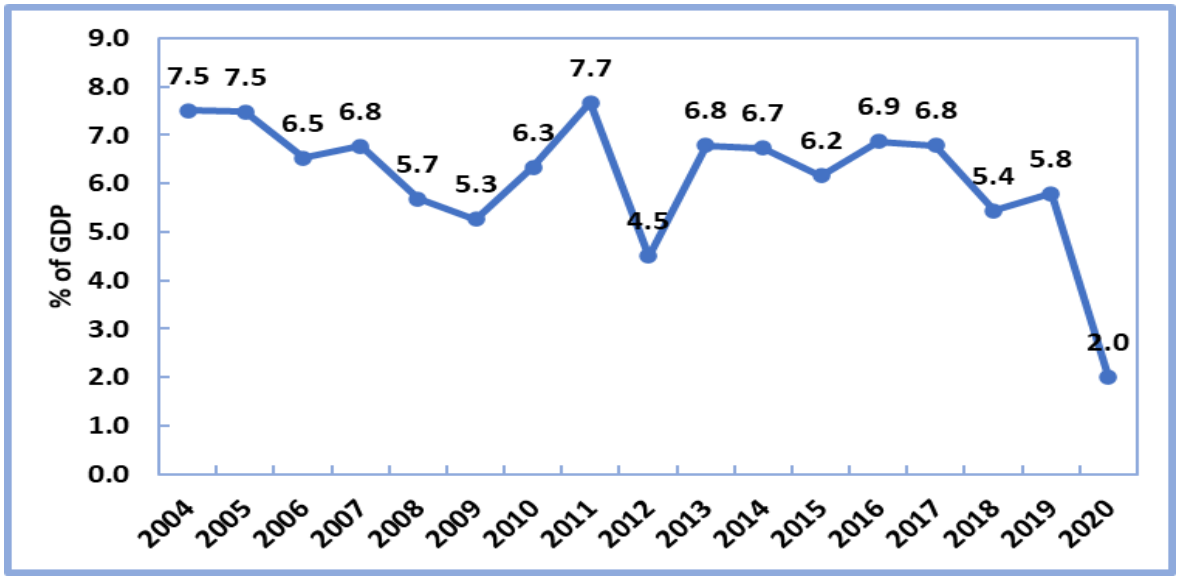
Figure 2.3: External debt in Tanzania



Source: author's computation using World Bank Data

As shown in Figure 2.3, external debt in Tanzania has been moderately high over the years. 2004 the country experienced the highest trend of external debt to GDP of 52.54% in 2004, followed by a 5.79% decline in 2005 which is still high as compared to the years to follow. In years to follow, the debt to GDP rate remained low, with the lowest of 21.93% in 2008. Furthermore, an upward trend began in 2009, where little but significant increases were realized, ranging from a 1% to a 5% increase. The sustained level of external debt in Tanzania was associated with the debt relief the country received from the HIPC and MDRI initiatives over the years (Were & Mollel, 2020).

Figure 2.4: Debt service cost in Tanzania



Source: author's computation using World Bank Data

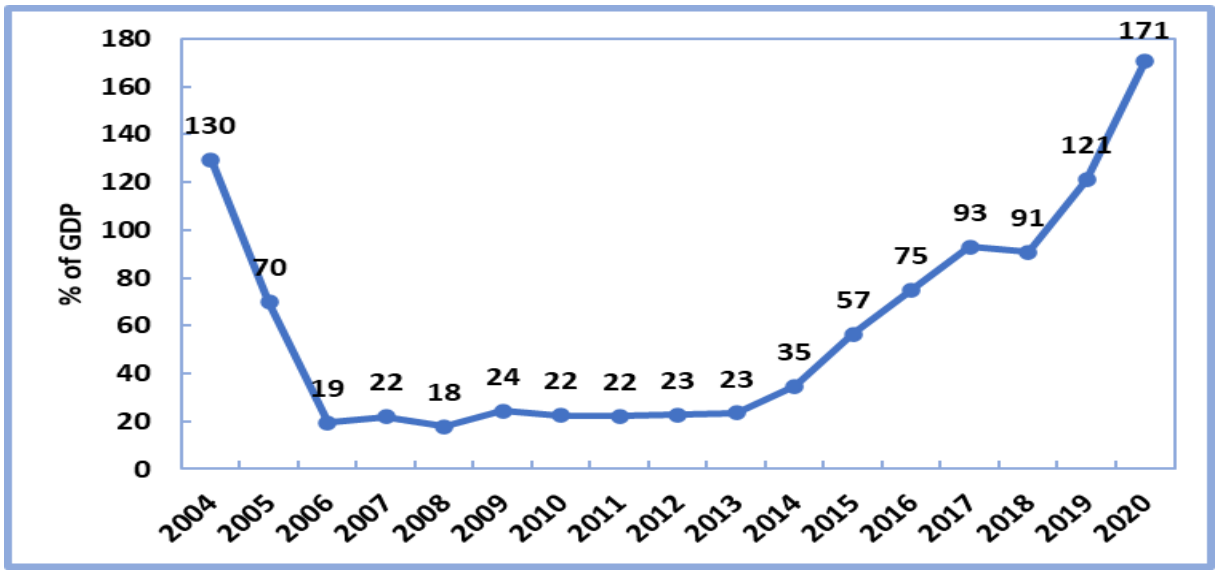
The Tanzanian government has for several years sustained moderately low levels of external debt, and that was due to the incentives it received from the HIPC initiative as indicated in Figure 2.4. Evenly, the country's servicing cost has been significantly low ranging at less than 1% from 2004 to 2014. This tells us that Tanzania has been able to service its debts through the help of the debt relief initiatives, from 2015 onwards, the county began to experience an upward trend thus the cost of servicing the accumulated debt began increasing reaching a peak of 2.02% in 2020 and this was the highest level of debt service cost that the country experienced.

2.2.3 External debt and servicing cost in Zambia

In the SADC region, Zambia is among the countries that have been battling with socio-economic development, characterised by declining levels of GDP per capita, limited capital, insufficient levels of productivity and immense poverty rates. Banda-Muleya (2021) noted that debt levels have become a worrying issue, given that the country's external debt increased rapidly in 2016 due to government utilization of securities to cover expenditure. Further analysis indicated that this led to budget deficit expanding and uncertainty in capital investment, resulting in high rates of inflation and interest rate. Nonetheless, the country has benefited from the HIPC and MDRI initiatives over the years, which enabled it to reduce its debt levels from US$ 7 billion in 2001 to US$ 93.4 million in 2006. And as a result, the country was able to access resources to service its debt and also contribute to the country's fiscal space as a way to open the economy for investment. The capital accumulated from external borrowings was

invested in critical infrastructure projects which were viewed as a limitation to the growth and development of the economy (Halwampa, 2015). The country's debt levels are considered to be high and infeasible, with the rapid rise in debt being clearly explained by the country's low level of revenue and high exchange rate, together with the debt servicing obligation and government expenditure. The country also remains unable to pay the debt it accumulated or the service cost thereof (Musamba & Phiri, 2020).

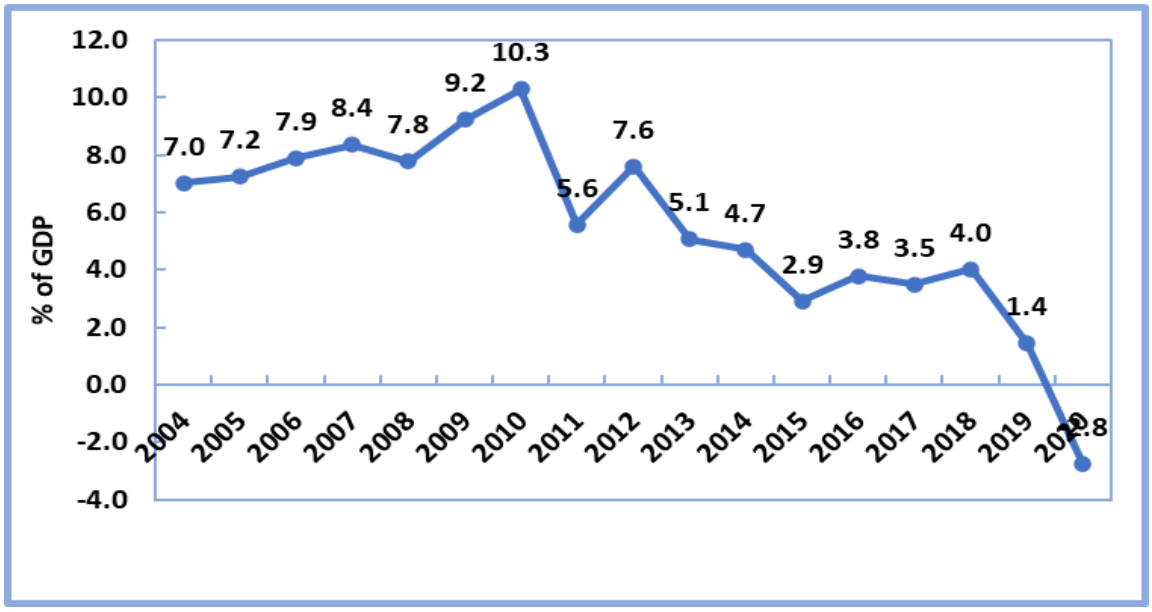
Figure 2.5: External debt in Zambia



Source: author's computation using World Bank Data

Given Zambia's inability to sustainably manage its borrowing, the country has been experiencing a considerably high level of external debt. As shown in Figure 2.5, in 2004 the country realized a higher rate of external debt to GDP at 129.5%, wherein there was debt stabilization from 2006 to 2015 with acceptable debt rates. Musamba and Phiri (2020) stated that as of 2016, the country was having revenue shortages and unable to finance its government expenditure and as a result, more borrowings were realized which yielded an excessively high rate of external debt to GDP at 170.7% in 2020.

Figure 2.6: Debt service cost in Zambia



Source: author's computations using World Bank Data

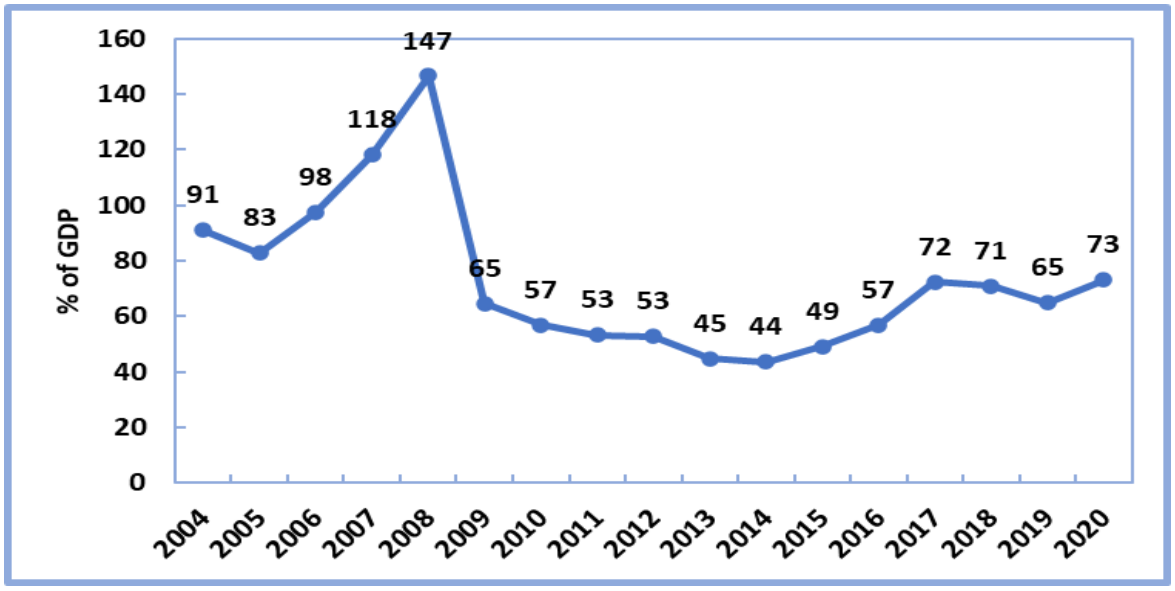
Zambia's external debt rates were high but rescued but the HIPC and MDRI debt relief programs. Figure 2.6 above indicates that the country has experienced low debt servicing costs though the cost was high in 2004, it significantly decreased from 2005 thereon. Though their rates were low for at least a decade, the servicing cost began to increase at a rapid rate from 2016, which by 2019 was over 10% and in 2020 it was above 20%, thus implying the burden and cost of servicing the debt became uncontrollable for Zambia and that is in line with the high levels of external debt that the country had during those periods.

2.2.4 External Debt and servicing cost in Zimbabwe

According to Jones (2011) Zimbabwe's debt history has been categorized through its experience of political oppression, economic instability, and social division. Thus, the country has been in defaults on most of its external debt, the debt seems to have been acquired mostly in the 1980s and 1990s. The author posits further that the government acquired the debt from foreign lenders to finance productive economic activities though most of the projects had doubtful benefits which led to the devaluation of the currency, overall making it difficult to repay the debt. The country is considered heavily indebted as it has a debt stock of at most USD 8.4 billion. The country carries an insignificant debt burden, which is indicated by the high external debt-to-GDP ratio of almost 200%, this debt is considered to be a debt overhang and it has caused a restriction that limits the country from accumulating external debt any further

(Munzara, 2020). Mutsakani (2022) states that due to insufficient capital investment, a toxic trading environment, political unrest, and drought in the country, the Zimbabwean economy has suffered exploiting conditions which led to its dependence on the agricultural sector, financial sector, and manufacturing sector production declining rapidly over the years. The author also affirms that technological improvements and capital are required for better and effective economic functioning, and the government lacks the funding needed to achieve these improvements. The level of indebtedness in the country has shown continuous increasing debt levels, and because of its debt distress and inability to service the debt since 2000, Zimbabwe currently has limited resources necessary to access the international credit market and also experiences higher borrowing costs because it is viewed as a high premium economy (Mugumisi, 2021).

Figure 2.7: External debt in Zimbabwe

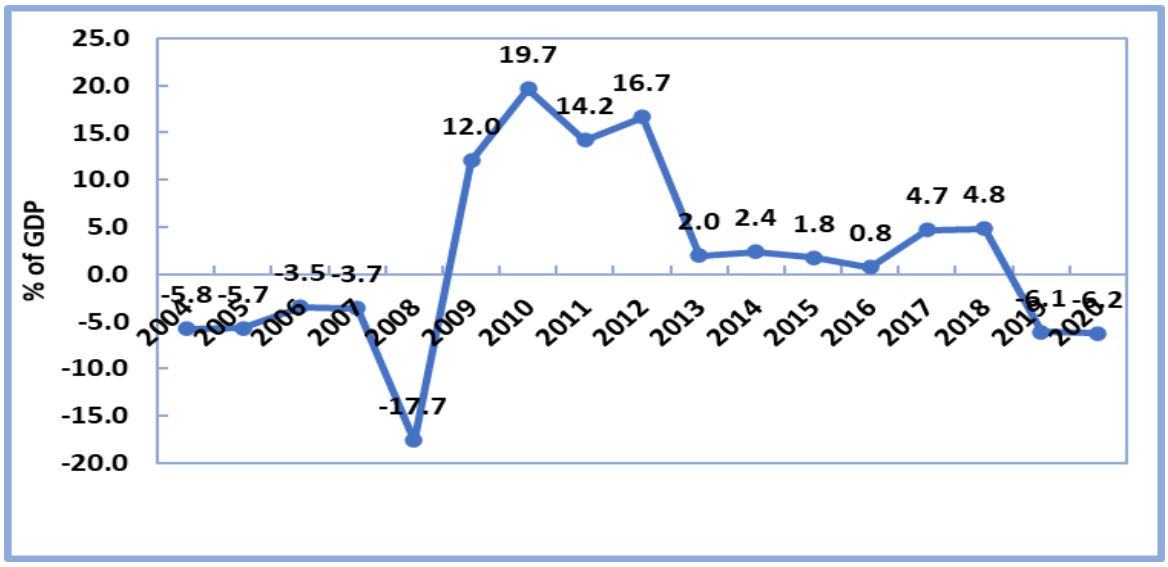


Source: author's computation using World Bank Data

As shown in Figure 2.7, Zimbabwe experienced rapidly high levels of external debt to GDP rate from 2004 to 2008, with the highest rate throughout the years being over 100% at 118.04% and 146.52% in 2007 and 2008, respectively. Following these higher trend levels, the country began realizing a downward slopping trend, which was declining significantly as of 2009. Thus, for the years to follow the 2008 global financial crisis, the economy had external debt rates that were moderately low compared to other years, with the lowest rate being realized at 43.62% in 2014. Post that, the rates

began to increase with a low increase of 5.59% and the highest at 15.52% as can be seen in Figure 2.7 above.

Figure 2.8: Debt service cost in Zimbabwe



Source: author's computation using World Bank Data

The country has faced its fair share of high rates of external debt. Figure 2.8 above indicates the country's cost of servicing its debt. The country's debt service cost rates fluctuate at uneven rates, though the trend does not exceed 10%. Zimbabwe managed to service its debt from 2006 to 2009, with 2009 being the lowest rate the country experienced at 1.3%. Thereafter, the cost rose significantly reaching 8.3% in 2011 which is high and indicates that the country was having difficulties servicing the cost of the debt it accumulated. Though the rate fell by 3.92% in 2012 and fell further at considerable rates for years to follow, in 2019, the country experienced the highest debt servicing cost of 8.4%. The cost of services may appear low, but it is the actual debt level that poses a risk to the servicing cost.

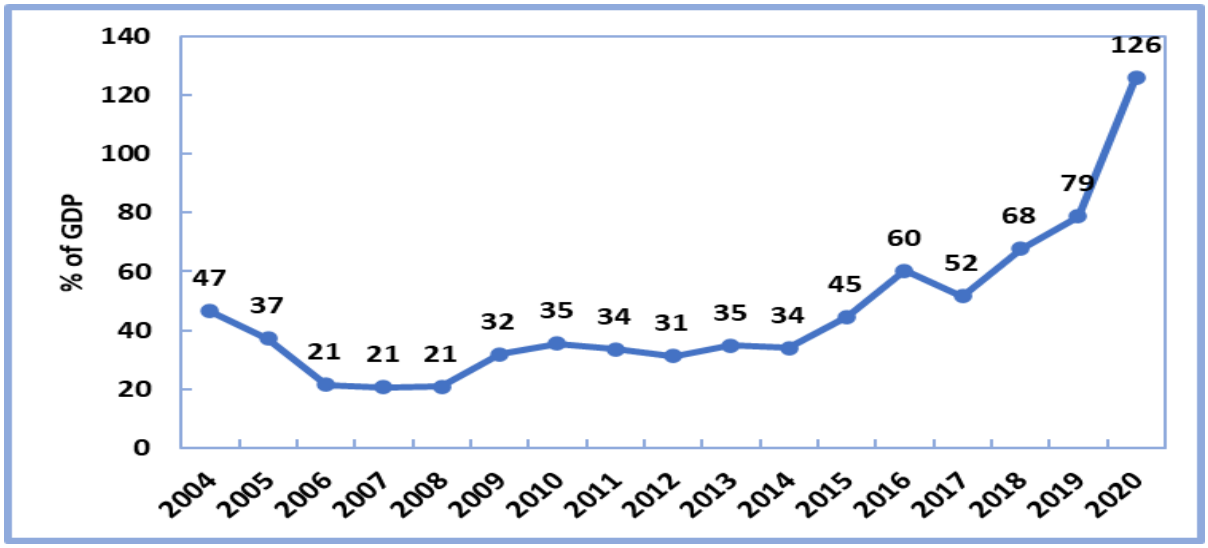
2.3 OVERVIEW OF EXTERNAL DEBT AND DEBT SERVICE COST IN LESS INDEBTED SADC COUNTRIES

2.3.1 External Debt and servicing cost in Angola

Angola remains a remote country in the SADC region given its poor infrastructure development, insufficient developments in mine clearance, and little relocation of the informal settlement population. The country has managed to maintain a favourable

external relations environment. The burden of external debt has eased over the past years due to the restructuring of official bilateral debt obligations, thus the country became less dependent on the external sources of income (OECD, 2006). Even so, the World Bank (2018) states that Angola's economy has presented financing gaps since 2004, this has been aligned with the country's currency devaluation in which it was found that debt was dominating in foreign currencies. Such was a result of inadequate debt management policies and substandard communication and transparency with the market. Compared to other economies the country has a substantially high debt-growth ratio. Reports by the Caixa Bank (2020) showed that in 2019, external debt rose rapidly in the country due to the decline in oil prices. Angola's external debt escalation was also caused by currency depreciation and dependency on foreign borrowing to fund public investment projects (Caixa Bank, 2020).

Figure 2.9: External debt in Angola

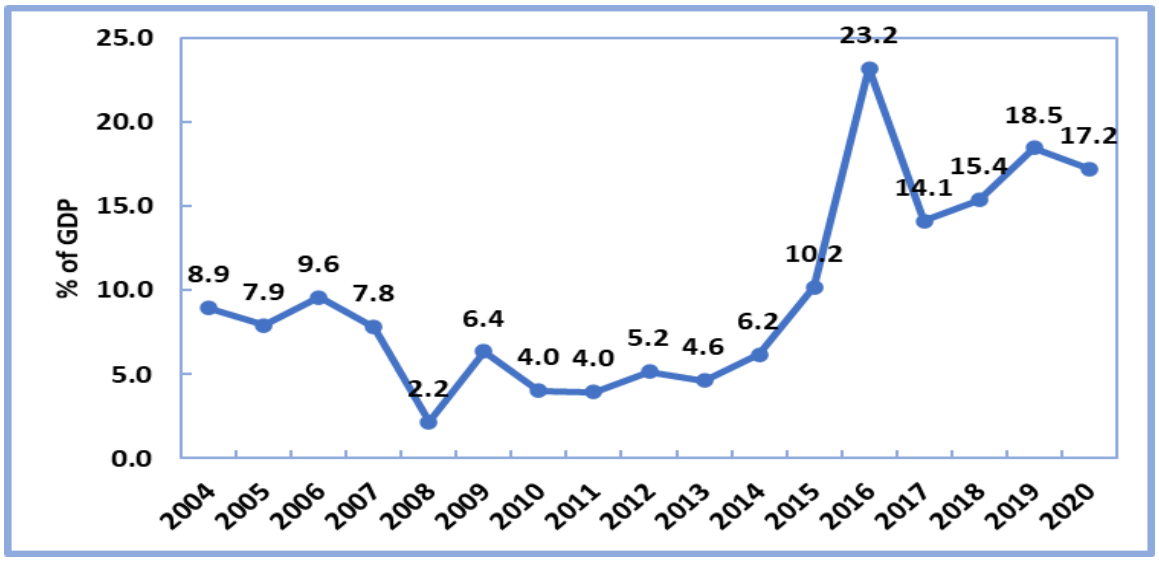


Source: author's computation using World Bank Data

Angola has over the years participated in the accumulation of external borrowing to finance its poor infrastructure and development. Figure 2.9 above indicates that the country's external debt has been trending at less than 50% from 2004 to 2015, with the lowest debt accumulated being at 20.70% of GDP in 2007. The country began experiencing trends over 50% of GDP in 2016 with a high debt accumulation rate of 60.33%, which was followed by a small but significant decline in 2017 of 51.62%. Moreover, from 2018 the country's external debt began to increase at a rather rapid rate, yielding outcomes which were extremely high compared to other years. The

increase was over 10% and in 2020 the country's debt to GDP outcomes was over one hundred percent, recording the highest external debt accumulation in the country.

Figure 2.10: Debt service cost in Angola



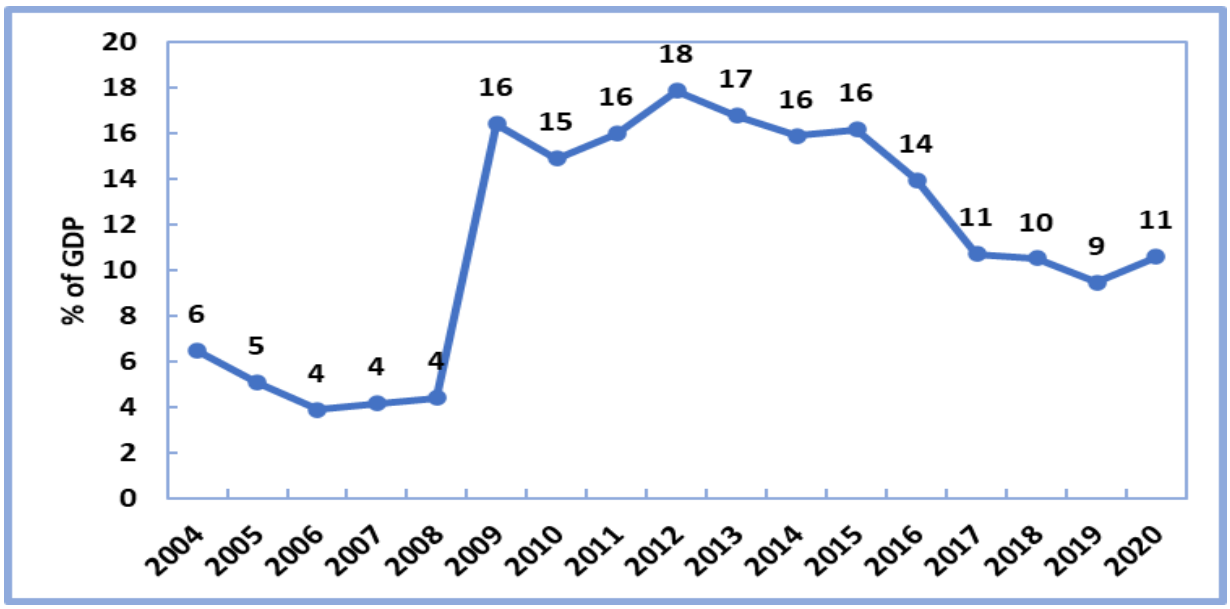
Source: author's computation using World Bank Data

Given the country's ability to maintain low external debt rates for at least a decade, Angola has been able to service the debt it accumulated. Figure 2.10 above presents the debt service cost analysis, where from 2004 to 2015 the country has accumulated debt low than 50%, and relatively the service cost during the same period is less than 10%. As of 2016, the country's servicing cost increased by more than 10% and remained above 10% for the years following. Simultaneously, in Figure 2.9 the country's external debt increased post-2015, and thus in Figure 2.10, it shows that at high debt levels, it cost the country more to service accumulated debt.

2.3.2 External Debt and servicing cost in Botswana

Like many other countries, Botswana was also economically devasted by the 2008 global recession, as it resulted in declining demand for minerals in the country, given that minerals significantly contributed to the government's total revenue. As a result, the government resorted to foreign exchange reserves, thus borrowing externally to finance planned projects and sustain the overall budget (Taye, 2011).

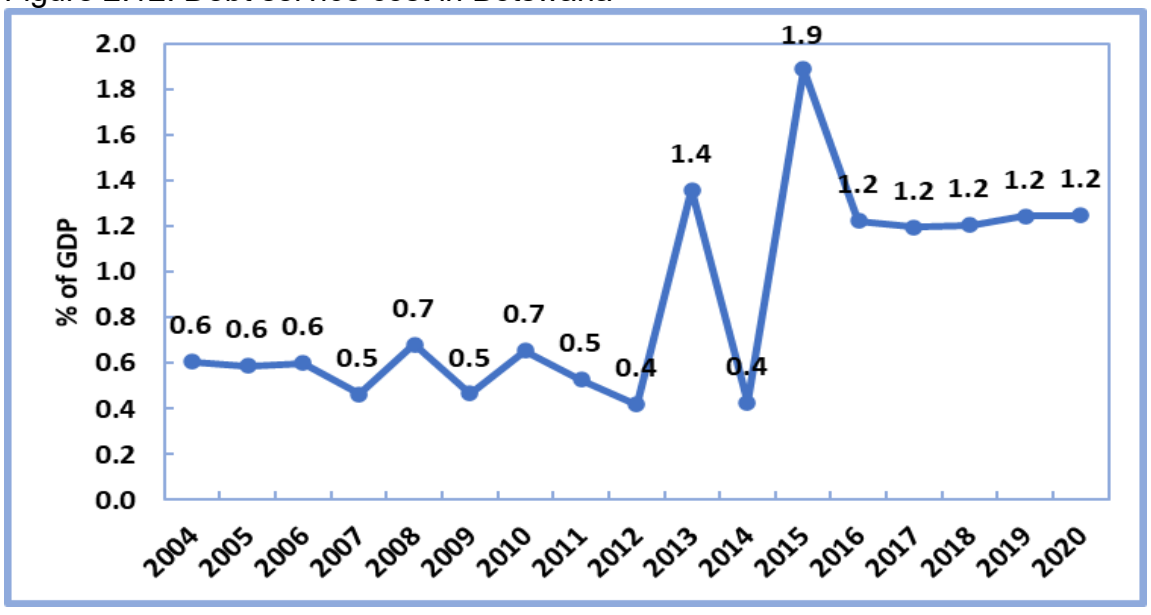
Figure 2.11: External debt in Botswana



Source: author's computation using World Bank Data

Compared to other SADC countries, Botswana has low external debt to GDP ratios. Figure 2.11 above shows that Botswana has trended below 20% of GDP and the country has over the years managed to sustain its external debt level, with the lowest trend of 3.89% in 2006, which was followed by a 0.27% increase, thereof a significant and rapid increase was experienced as of 2009, with trends above 15%, the highest being 17.83% in 2012. From 2013 a decline was experienced reaching 9.46% in 2019 which was the lowest since 2009.

Figure 2.12: Debt service cost in Botswana



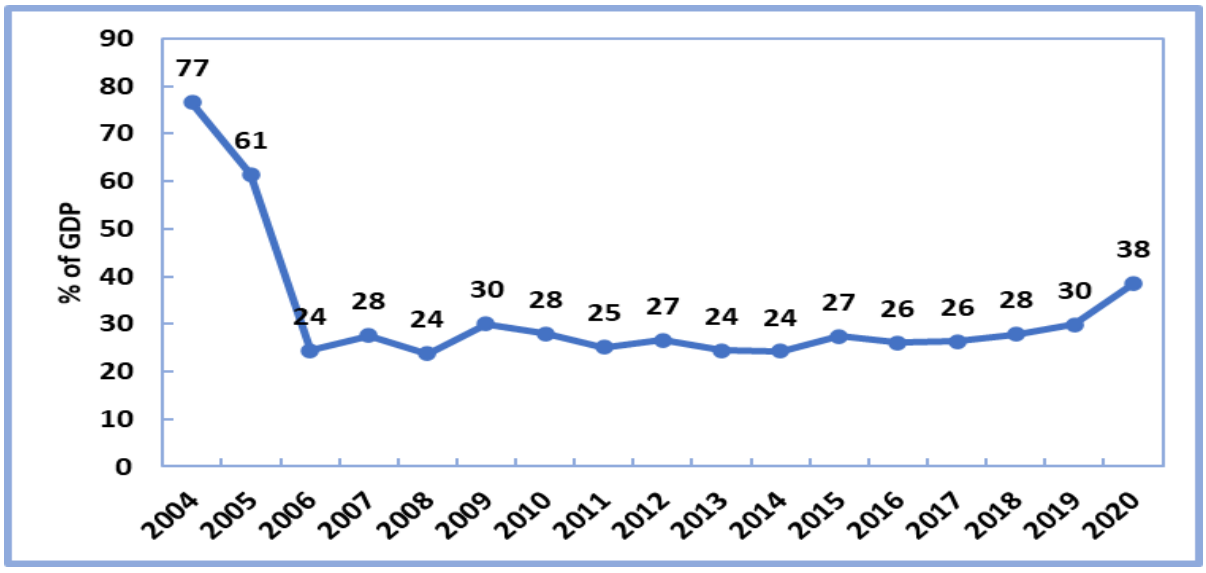
Source: Author's computation using World Bank Data

Over the years, Botswana has managed to maintain low external debt rates, and as such, it is indicated in Figure 2.12 that the country has been able to sustain the debt with low levels of debt servicing costs. That is, Botswana has been able to afford the amount of debt it accumulated. Where, the highest debt service cost was 1.9% in 2015, and thereafter maintained a 1.2% throughout 2020. One can conclude that Botswana is a SADC envy on debt management.

2.3.3 External Debt and servicing costs in Madagascar

Over the years, Madagascar has been considered to have a tolerable external debt level, which is greatly sustained, indicating little possibility of causing any deprivation to the country's economy. The country has been benefiting from the Minority Depository Institution (MDI) for over a decade. That is, though the country remains in a budget deficit and depressed growth rate, compared to its neighbouring countries, the government has low debt accumulated, but this along with political unrest in the country has the potential of suddenly declining the country's already fragile economy, thus impacting the social and economic outcomes (Unicef, 2018). This is illustrated by Figure 2.13, which indicates external debt in Madagascar from 2004 to 2020.

Figure 2.13: External Debt Madagascar

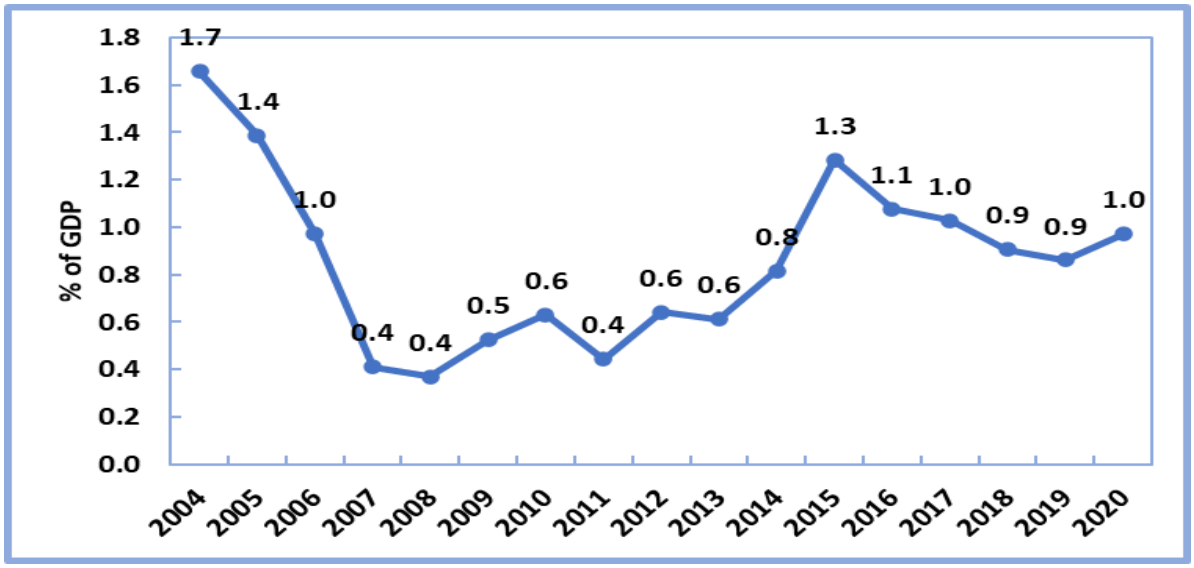


Source: author's computation using World Bank Data

As illustrated in Figure 2.13 above, Madagascar has been experiencing moderately high rates of external debt. In 2004 and 2005, the country recorded the highest external debt at 76.58% and 61.45%, respectively. From an all-time high of 76.58% in

2004, the country experienced a decline of over 37.02% as of 2006, this continued for years to follow where increases and declines were recorded ranging from 2% to 4%. In 2020, 38.45% of external debt was experienced which was an 8.55% increase, the highest in the last 14 years. According to Nogueira-Budny and van der Werf (2022), high rates of external debt in Madagascar can be attributed mostly to continuous political instability which lowered investors' confidence, restricted access to capital resources, along with a drop in the tourism industry. This became worse during the pandemic in 2020, thus the country's poverty levels were pushed to the extreme given the loss of income that was warranted by the lockdown. The pandemic exhausted the fiscal resources available, the resources were essential for investment attraction and social relief programs, and thus the country resorted to external borrowing to sustain its economy (World Bank, 2020).

Figure 2.14: Debt service cost in Madagascar



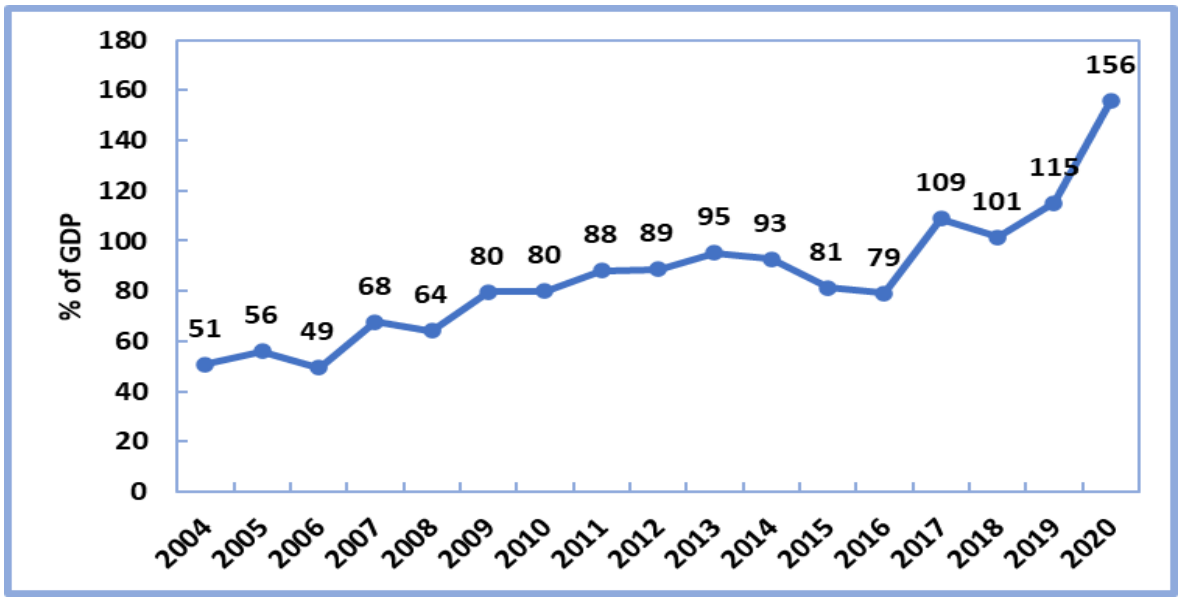
Source: author's computation using World Bank Data

Given that Figure 2.13 has indicated high external debt rates in Madagascar, the country's debt service cost is relatively low. Over the years Madagascar has benefited from the MDRI debt relief initiative and that resulted in low rates of external debt which enabled the country to afford the servicing costs of the debt it has accumulated. This is shown in Figure 2.14 above where there is a fluctuation in the debt service cost, though compared to other countries in the SADC region Madagascar has been able to service the debt it had accumulated which averaged between 0.5% and 1.5%.

2.3.4 External Debt and servicing cost in Mauritius

Mauritius is regarded as one of the countries in Africa to have a well-developed financial system, with favourable debt levels. The country's increase in borrowing has shown sensitivity to the economy's adverse growth, interest rate, and fiscal shocks. Even so, Mauritius retains a substantial track record of credit eligibility and also maintains compelling institutional strength, integrated domestic markets, and a feasible debt profile (Afrexim Bank, 2020). Whilst the country has experienced declines in external debt over the years, it has progressively developed alternative measures to finance its budget deficit (Fauzel and Jugreet, 2018).

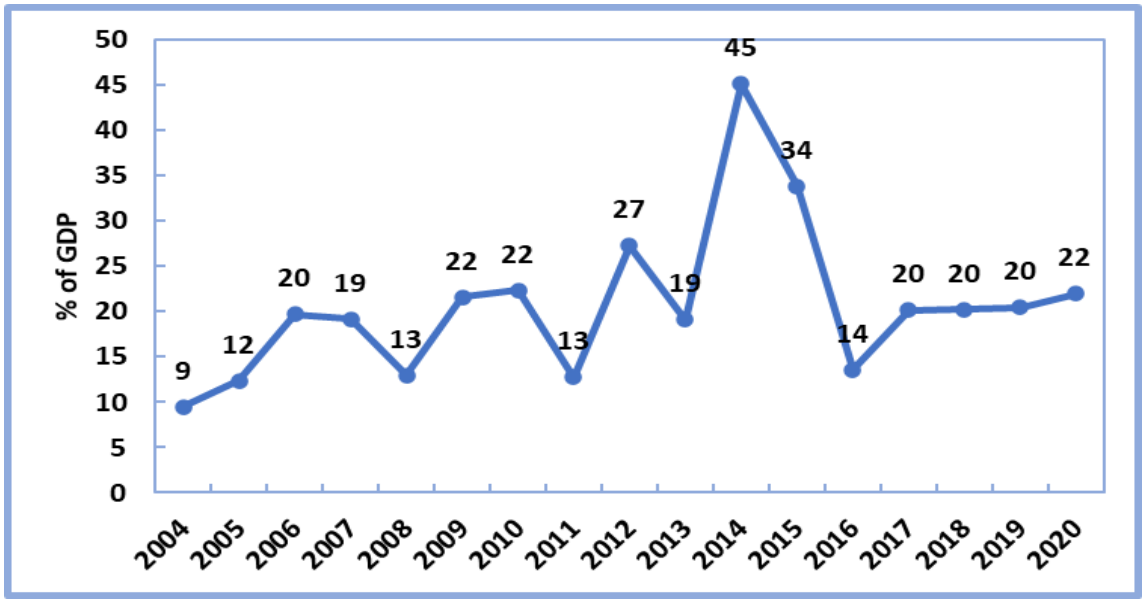
Figure 2.15: External debt in Mauritius



Source: Own Computation with World Bank Data

Though considered a low-indebted country, Mauritius has significantly high levels of external debt. As shown in Figure 2.15, Mauritius's external debt trends are considerably high, with the lowest being 49.49% in 2006 and the highest being 156%. Fauzel and Jugreet (2018) explain that even with such a high level of external debt, Mauritius has been able to fund and finance its deficits and maintain sustainable growth rates. As of 2009, higher trends were recorded and the trend continued upwards over the years and became excessively high from 2017 onwards as it began to trend over the one hundred percentiles, reaching a frightening 155.66% in 2020. This is the highest level of external debt to GDP to ever be experienced by Mauritius.

Figure 2.16: Debt service cost in Mauritius



Source: author's computation using World Bank Data

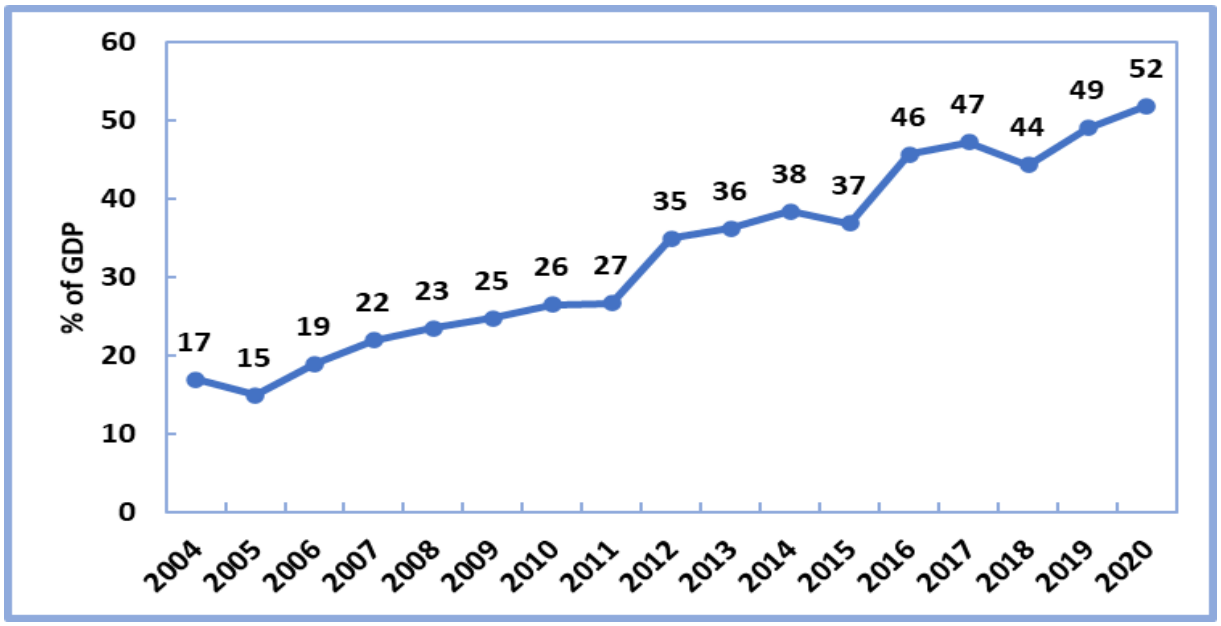
Mauritius has accumulated high levels of external debt, and therefore the rate at which the country has been servicing the debt cost has also been high. As shown in Figure 2.16 above, Mauritius's debt service costs have been considerably high with the lowest being 9.48% in 2009, the rate increased to over 10% thereafter reaching a peak of 45.11% in 2014 which shows that the country was unable to service the cost of the debt it has accumulated. Although the cost fell by 11.24% in 2015 and a consecutive decline of at most 20% was realized, this is in line with the debt to GDP decline rate that the country experienced. Following this, the country maintained its servicing cost at the 20 percentiles, which was a burden as the country reached an external debt rate of over 100%.

2.3.5 External Debt and servicing cost in South Africa

Researchers and policymakers worry about the increasing levels of external debt in South Africa. That is, for years borrowing externally has created a shortfall in revenue against government spending. Consequently, yielding resource mismanagement has weakened South Africa's economic foundations (Olamide & Maredza, 2023). Over the past few years, the government has collected less revenue through taxation, financially rescuing SOEs, and experienced political imbalances, resulting in the need to borrow externally, and related servicing costs have been hindering the country's output. That is, besides the realization of little growth due to debt repayment, the country's socio-economic issues began to overlap (Bernstein, 2019). This according

to Saungweme and Odhiambo (2019) has been problematic, as the country's servicing cost dates back to pre-democracy (the 1960s/70s/80s) and as a result, the country has a huge debt and the burden to service the debt. Given that, the government has for years mandated the national treasury to process the repayment of the country's excessive debts to enable sustainability in the annual debt analysis. Thus, the country's ability to service its debt has been influenced by the general level, structure, and composition of the debt.

Figure 2.17: External debt in South Africa

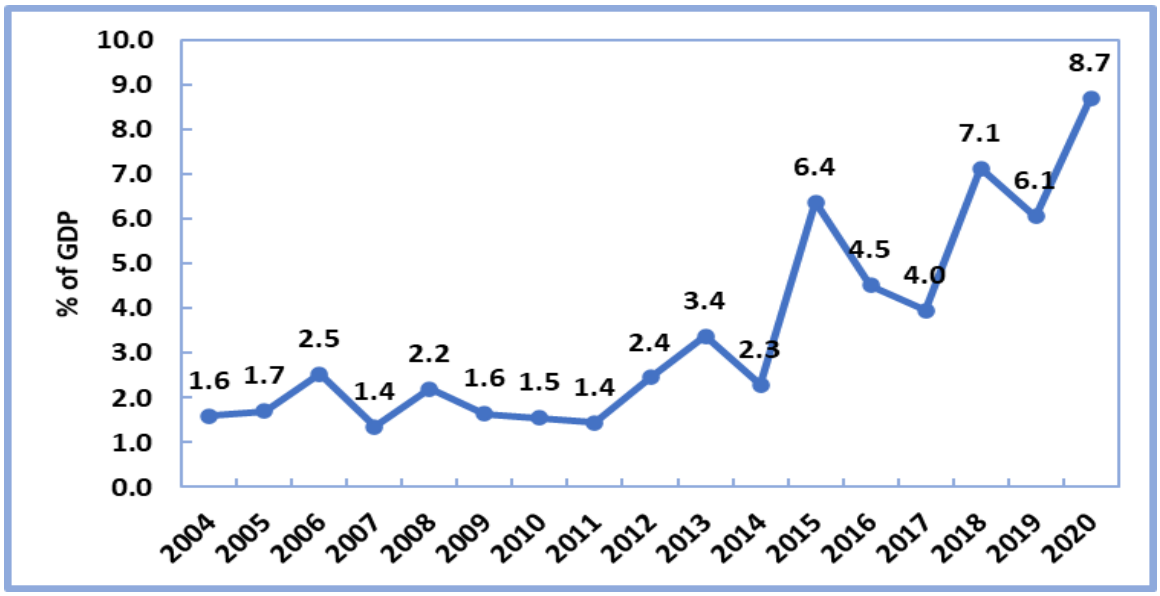


Source: author's computation using World Bank Data

As shown in Figure 2.17 above, South Africa compared to other SADC countries has a low level of external debt to GDP. Despite this, the country has been experiencing an upward-trending external debt level which has been increasing at a slow rate since 2006. The country during the presented period has had a low trend of 14.91% in 2005, which has increased over the years and also remained below 50%, though, in 2020, the country recorded a significant increase to 51.77% which is the highest trend the country ever recorded since 2004. This can be attributed to the COVID-19 pandemic which caused an economic shock globally and South Africa was no exception. Due to the budget deficit and high levels of government spending the South African economy has been in a downward circle for some period now, and this has caused the government to resort to external borrowing as a way to attempt to balance its expenditure. Also, pre-pandemic the country's economy was already weak, and the

impact of the pandemic was devastating, yielding higher levels of debt for the country (Hlongwane & Daw, 2022).

Figure 2.18: Debt service cost in South Africa



Source: author's computation with World Bank Data

South Africa has had a continuous growth rate in its external debt from 2004 to 2020 as shown in Figure 2.17. Figure 2.18 gives a representation of the country's debt service cost for the same period. For a decade the country has been able to significantly maintain its debt servicing cost at a low rate. The country's debt service cost rate has been below 10% overall and 5% for the majority of the year. Thus, though the country has accumulated substantial amounts of debt, it has been able to service the cost related to the debt. This indicates that South Africa has been able to afford its debt.

2.4 OVERVIEW OF PUBLIC INVESTMENT IN HIGHLY INDEBTED SADC COUNTRIES

According to Miller and Mustapha (2016), public investment can be referred to as spending undertaken by the government on economic infrastructure inclusive of airports, water and sanitation, sewages, public electricity utilities, and public social infrastructure. Thus Alter, Ghilardi, & Hakura, 2015 state that regardless of an abundance of natural resources revenue, most African countries experience overload capacity constraints and institutional inadequacies enabling them to thoroughly

manage their public investment. The trio further argues that efficiently managed public investment is dependent on governance factors such as, the ability to enforce, choose, and appraise government projects. These factors go hand in hand with the environment government operates in, corruption, and the skilled availability of human capital. Post the 2008 global financial and economic crisis, public investment in numerous countries declined drastically, especially for economies that were faced with market pressures. Low levels of public investment, when sustained for a long period often yield a decline in public expenditure and improve long-term production (Jong, Ferdinandusse, Funda, & Vetloo, 2017).

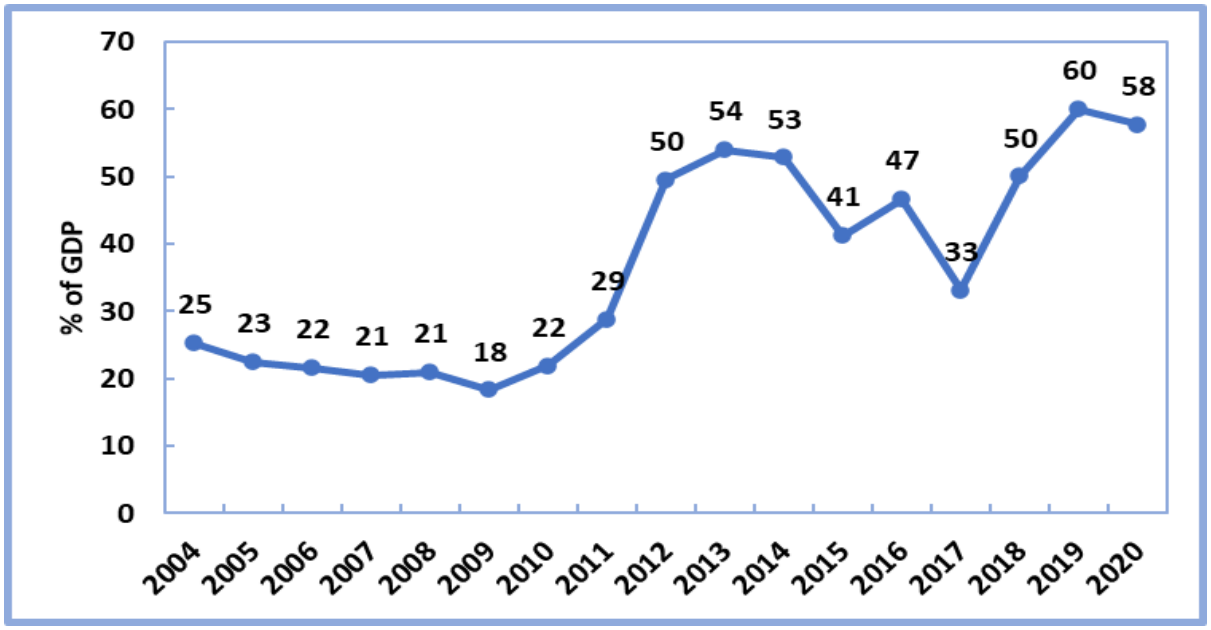
In SSA, less attention has been given to the effectiveness of public investment even with the extensive narrative evidence concerning projects plagued by overwhelming costs, time delays, and inefficient maintenance, thus a detailed analysis of what determines effective public investment is scarce. The SSA region has long struggled with central policies necessary to promote high-quality investment. Governments in the region identified inefficient levels of public investments as limitations to achieving extensive economic growth and creating employment. For low-income countries, the inability to acquire significant public investment can result in economic challenges such as a low investment trap.

This is because public investment is considered to be effective only if it can enhance economic growth above the threshold and also sustain its vitality effects significantly (Bayraktar, 2018). Whilst in the SADC region, investment has been regarded as essential, given that it brings about capital necessary for projects and other programs implemented to advance the SADC mandate of Regional Integration and Economic Development. Though, due to political unrest and safety challenges in the region, the level of public investment undertaken has always been relatively low. Even so, policies to promote substantial cooperation among the member countries have relieved struggling member countries of such challenges over the years and resulted in a significant attraction and acquisition in public investment (SADC House, 2022). Hence, it now becomes imperative to disseminate the public investment environment in the SADC region in the selected countries.

2.4.1 Public investment in Mozambique

Post its conflicting history, Mozambique has had comparably high levels of public investment. The government secured investment with support from foreign grants and debt financing, and also with rapid increases in domestic financing recently. The country's public investment has been mainly spent on infrastructure inclusive of water and sanitation, power plants and electricity, schools and hospitals, roads, and ports, among other public needs. This was done because the existing infrastructure was either damaged or inadequately maintained, thus the need for infrastructure was crucial. Through numerous developments in the natural resources sector, the country was able to generate more public investment to finance its infrastructural needs (Melina & Xiong, 2013). According to Miklyaev, Jenkins, Matanhire, and Adeshina (2022), Mozambique has made great progress in creating a sturdy institutional system to enable proper management of its public investment, aimed toward the contribution of public goods and services' effective delivery. And also, investment in government development programs has yielded the implementation of essential policies and development goals. The development of programs such as the Electronic National Public Investment Subsystem (ESNIP), which was developed in 2018 to technically assist the World Bank and the Department of International Development (DFID), has ensured that the country's public resources are effectively allocated to programs and projects presenting the highest socio-economic outcomes of public investment. Therefore, Mozambique is currently experiencing a systematic investment process that regulates how public investment should be recognized, planned, appraised, and chosen.

Figure 2.19: Public Investment in Mozambique



Source: author's computation using World Bank Data

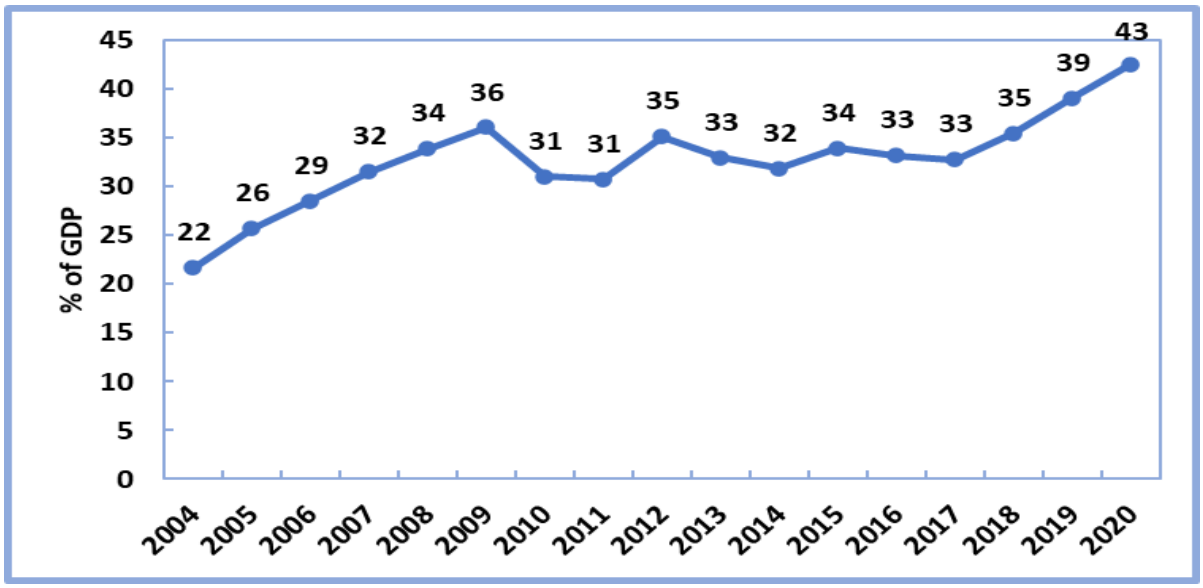
As illustrated in Figure 2.19 above, Mozambique has had a significantly low trend in its public investment to GDP levels, which where trending at less than 30% from 2004 to 2011, with the lowest public investment rate recorded being 18.32% in 2009. From there onwards the country began experiencing a rapid increase, in which the upward trend of the investment rates where above 50%, hence, Miklyaev et al., (2022) argued that Mozambique has implemented effective policies toward their public investment management and as a result, the country began experiencing systematic improvements.

2.4.2 Public investment in Tanzania

Tanzania remains one of the least developed countries in Africa, where poor savings and investment are regarded as factors attributing to insignificant growth. Public investment in the country is focused more on infrastructure, especially in the transportation and energy sector which has yielded an improvement in economic performance over the years (Epaphra & Massawe, 2016). Since 2000, Tanzania has been presenting substantial improvements in political stability and economic growth, this has then opened the country up for foreign aid, which has been allocated to improve public infrastructure (Asmah & Levin, 2008). The United States Department of State (2020) argue that the country has maintained political stability, implemented valid macroeconomic policies, and even became flexible to external shocks. The adaptation of the Government of Tanzania (GoT) has brought uncertainty to the

country's short-term and long-term economic outcomes, especially investment and business operations. Thus, the Tanzania Investment Report (2018) states that the country's political state and the availability of natural resources made the country approachable for trade and investment. There has been a sustained economic growth rate of 7% which was coupled with ongoing development in public infrastructure such as air, road, and rail infrastructure. It was such activities that were expected to bring about investment inflow to Tanzania.

Figure 2.20: Public Investment in Tanzania



Source: author's computation using World Bank Data

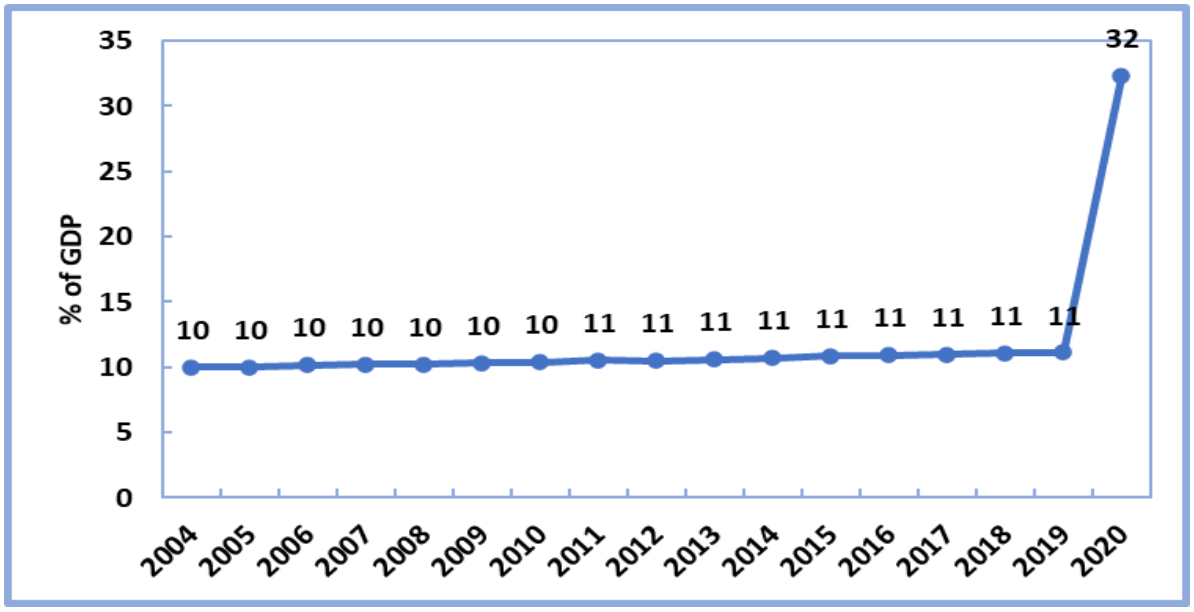
Figure 2.20 above presents the public investment to GDP ratios in Tanzania for the period 2004 to 2020. The rate of public investment in the country during the period under consideration has been moderately high compared to other HICs in the SADC region. Tanzania experienced its lowest public investment rate of 21.69% in 2004, which was followed by a considerable increase. Though significant declines were experienced, the country was quick to recover and thus maintain its average public investment rate. The country's ability to maintain it above 30% average was experienced for over a decade, and this indicated that Tanzania has over the years been able to allocate its public investment provisions and this has yielded a peak in the country's public investment rate of 42.55% in 2020, which is a 3.51% increase compared to 2019. In July 2020, Tanzania attained the status of being a lower-middle-income country, which follows decades after maintaining its economic growth. As a result, the country's investment increased compared to other years as there were

notable changes to enhance the business environment and investment climate, yielding a conducive and flexible process for economic participation and investment in the country (International Trade Administration, 2022).

2.4.3 Public Investment in Zambia

Post-independence in 1964, the preserved Zambian economy limited its public investment to the provision of basic infrastructure. Thus, it was during this period that investment in Zambia experienced several reconstruction patterns. This resulted in the provision of basic infrastructure which supplemented private investment. As such, the investment strategy was ended when the Zambian government implemented the nationalist approach through the Mulungushi (1968) and Matero (1969) reforms. These reforms yielded significant growth in public investment, mainly by combining government acquisitions of private investment and creating new state-owned enterprises (SOEs) (Makuyana & Odhiambo, 2014). Furthermore, the International Trade Administration (2022) states that Zambia has struggled to attain its utmost economic potential because of the widespread corruptive activities and economic rent-seeking, which has overall led to the country's credibility as an investment destination being tarnished. Also, reporting on the outlook the ITA reports that the country's public investment declined rapidly as there existed limitations in contracts carried out by the government, continuous lack of sufficient electricity, and high cost of operating a business due to inadequate infrastructure and limited skilled labour. Conversely, this is an old concern, where Chibuye (2013) stated that there existed numerous disadvantages that offset the country's public investment, including geographical settlements, inefficient infrastructure yielding extensive indirect costs of production, undermined competitiveness, scarcity of job creation, and constraint growth. Overall, the country's public investment is heavily dependent on external borrowing.

Figure 2.21: Public Investment in Zambia



Source: author's computation using World Bank Data

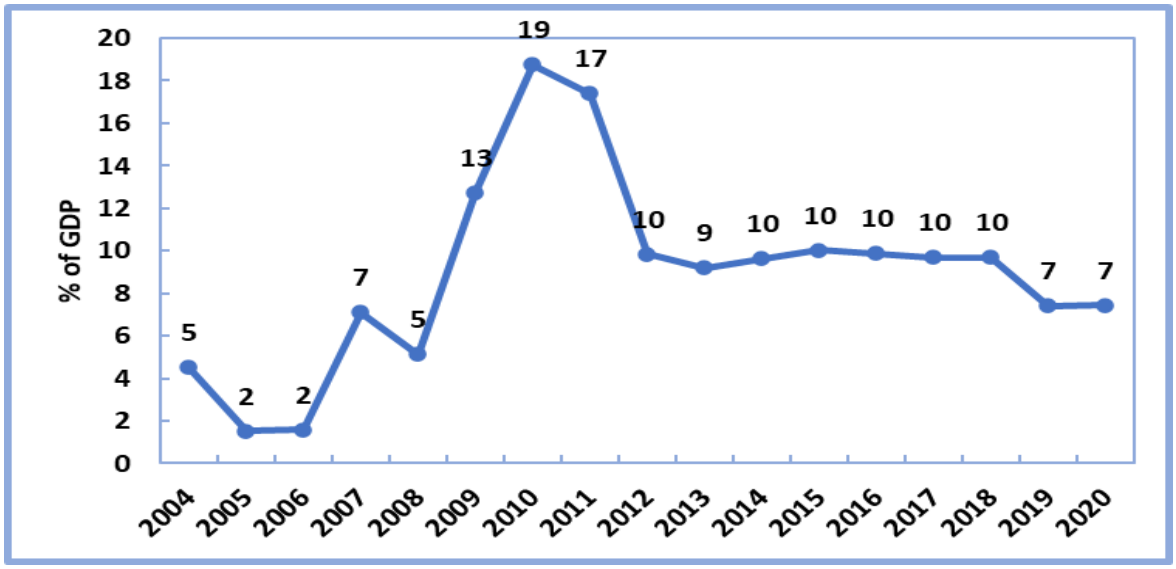
The Zambian economy as shown in Figure 2.22 above has over the years experienced a stagnant trend in its public investment to GDP levels. That is, from 2004 to 2019 an average investment ratio of 10% was experienced by the country, which surprisingly spiked significantly to 32% in 2020. Though the global pandemic COVID-19 hit the country's economy hard, Zambia's freedom of trade and investment in most sectors has enabled the country to increase capital inflows and overall investment. The country experienced significant investment improvements as it has in place different programs and initiatives which have over the years attained inclusive growth, employment, sustained macroeconomic policy, supported SMEs, and economic diversity (U.S Department of State, 2020).

2.4.4 Public Investment in Zimbabwe

Upon the realization of independency in 1980, the Zimbabwean government enhanced its market-intervention economic growth plan which was formally characterized by the colonial government, to one which aimed at addressing social and economic imbalances in the country. As such, the government focused on creating growth that promoted the support and participation of its people through rural sector development, job creation, and access to public services. In so doing, public investment became the country's main tool utilized by the government to achieve its development objectives (Makuyana & Odhiambo, 2014). According to Muyambiri, Chiwira, Chiranga, and Batau (2012), the state of the Zimbabwean economy was considered the most

disastrous in all of Africa. The government acknowledged that public investment together with private investment yielded the creation and enhancement of infrastructure which was essential to the country's conditions of economic growth and development. Although, Maune and Matanda (2022) argue that even with an abundant availability of natural resources the country has failed to attract significant capital inflows.

Figure 2.22: Public Investment in Zimbabwe



Source: author's computation using World Bank Data

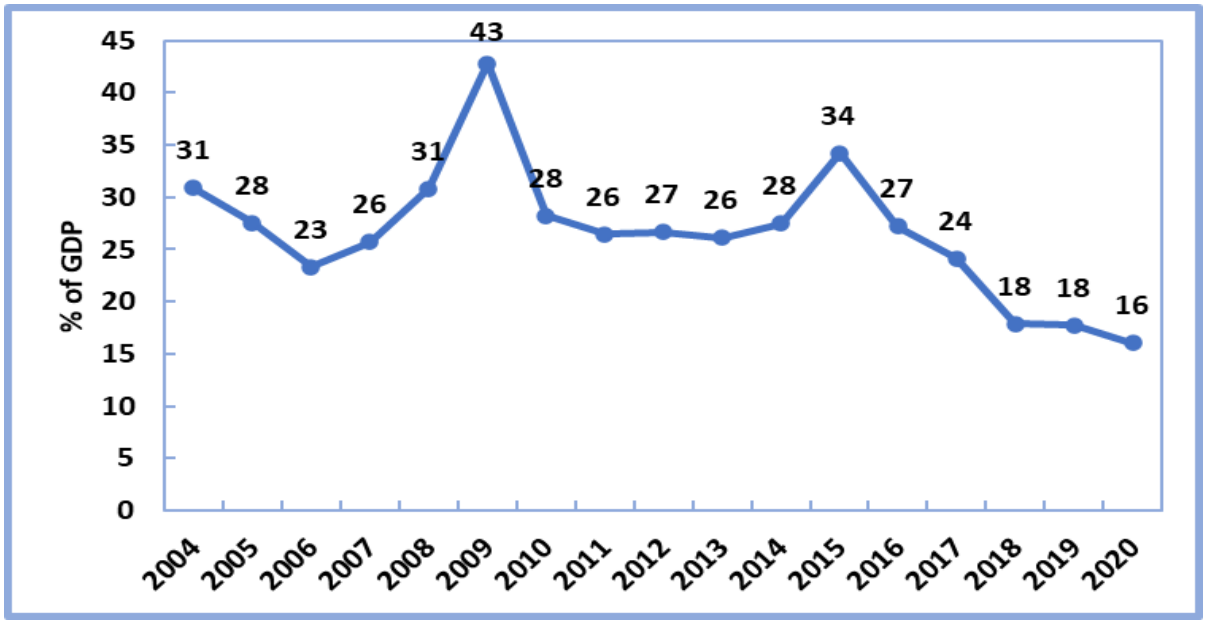
Given Zimbabwe's unstable economy, which is mainly strained by political instability and underutilized infrastructure, Zimbabwe's public investment levels as indicated by Figure 2.22 above have been substantially low though at some point a mere but not significant increase was realized. From 2004 to 2008, the country had a public investment to GDP ratio that were below 10%, with the lowest being 1.52% in 2005. These rates are the lowest recorded rates compared to other SADC countries during the period under review. Although, from 2009 an upward-sloping trend was realized which had a peak in public investment levels of 18.76% in 2010, this was the highest level of public investment to GDP the country had experienced for years, before and after 2010.

2.5 OVERVIEW OF PUBLIC INVESTMENT IN LESS INDEBTED SADC COUNTRIES

2.5.1 Public Investment in Angola

Angola's public investment remains low regardless of resource availability and a shortage of infrastructure. In past years, the government directed investment mainly towards transportation and public services mostly in rural areas which enabled improvements in Angola's failing agricultural sector. Angola has experienced shortcomings related to weak public investment, which had exaggerated targets and impractical budget assumptions. There was inadequate planning for challenges related to project feasibility, integration capacity, and even corruption risk, the country's projects' implementations dwelled mainly on transportation, which sacrificed other infrastructures, yielding pro-cyclical financing alongside rapid debt accumulation. This has overall questioned the government's ability to continue financing capital on public investment projects and also sustaining the existing infrastructure (Jensen, 2018).

Figure 2.23: Public Investment in Angola



Source: author's computation using World Bank Data

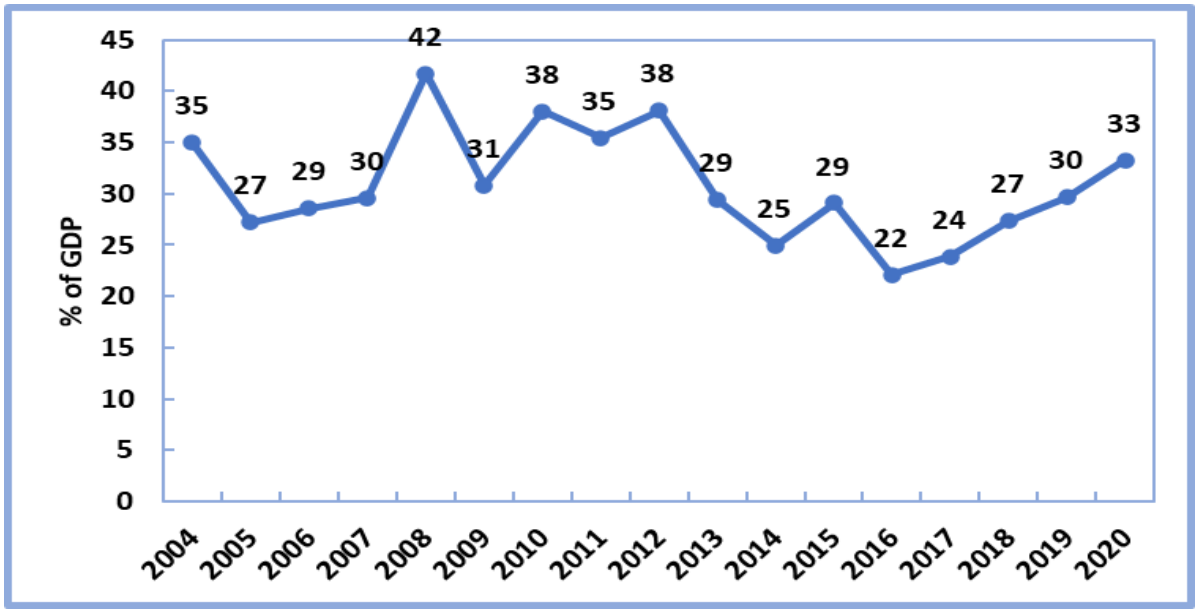
Public investment in Angola has been relatively low, given that the Angolan government has been directing its investment mainly towards the agricultural industry. The low fluctuation of public investment in Angola for the period 2004 to 2020 is shown

in Figure 2.23 above, where the country has had an unstable trend in its public investment rates. Thus, a peak of 42.82% was achieved in 2009 which was an increase of 12.01% compared to 2008, evenly a significant decline was experienced from 2015 which yielded the lowest level of 16.03% in 2020.

2.5.2 Public Investment in Botswana

According to Fisher et al., (2017), Botswana has been performing better than its peers and other emerging economies. There has been rather high spending on public investment though the quality of the infrastructure has declined. The country's indicators for infrastructural quality indicate crucial congestions, especially with electricity supply and railways. This is because at most one-third of the government's public investment does not yield the level or quality of infrastructure capable of managing resources efficiently. To fully comprehend economic growth from public investment, Botswana has to address the inefficiencies in the delivery of public infrastructure and also enhance its public investment management framework. Relatively, the country's independence on the extraction of mineral resources led to investment in social infrastructure being primarily achieved by utilizing public investment. As Botswana managed to transform from the poorest country in the world to one of the upper-middle class, the country has achieved high rates of social and economic investment over the years, which has focused on inequality and poverty eradication, though, it has to be taken into consideration that even with such improvements there remains a huge excess in infrastructure (Hungwe & Odhiambo, 2018).

Figure 2.24: Public Investment in Botswana



Source: author's computation using World Bank Data

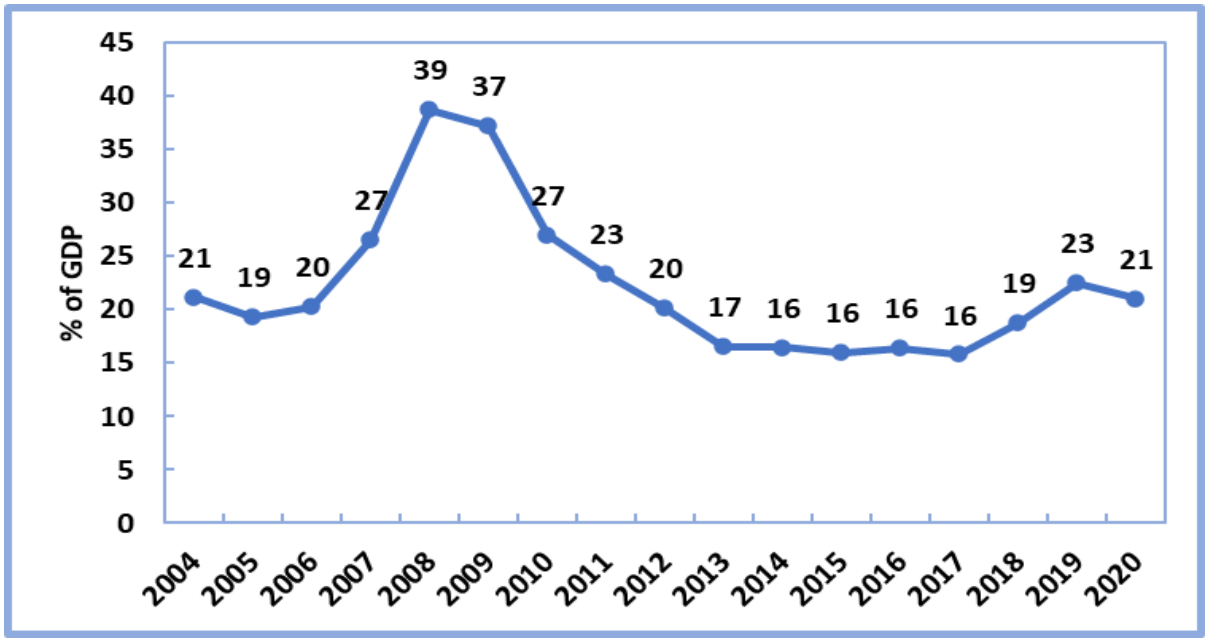
As a country that has merged from being a low-income to an upper-middle country, Botswana has been performing relatively well in its public investment to GDP levels compared to other countries. This is indicated by the public investment trend in Figure 2.24 above. With unstable fluctuations, Botswana managed to reach a peak of 41.68% in 2008 which was an increase of more than 10% compared to the previous year. Evenly, the country experienced a significant decline from 29.07% in 2015 to 22.06% in 2016, which was the lowest level experienced by the country. Though, it was followed by a reasonable upward trend of at least 3% yearly from 2017 to 2020.

2.5.3 Public Investment in Madagascar

Madagascar is notably one of the poorest countries in the SADC region, and its major systematic ineffectiveness is found in public finance management. The country's financial system is also risky, presenting vulnerability to external shocks (OECD,2008). The country's devastating challenges such as economic instability, hardships, contraction, and natural disaster have yielded little investment attraction for the country compared to other LICs. Though, in the aftermath of the coup and natural disaster, investors identified opportunities in which they can place capital, especially investment in infrastructure and commercial law, along with promising local entrepreneurs and businesses (Global Impact Investment Network, 2016). Given the country's infrastructure needs, there has been a slight increase in investment spending, as public investment has been increasing at a rather faster rate than it would have been

assumed. This presents a risk not only to growth but also to the efficiency and institutional strength of public investment which has shown improvement recently (Arora, Palomba, & Estevaoi, 2021).

Figure 2.24: Public Investment in Madagascar



Source: author's computation using World Bank Data

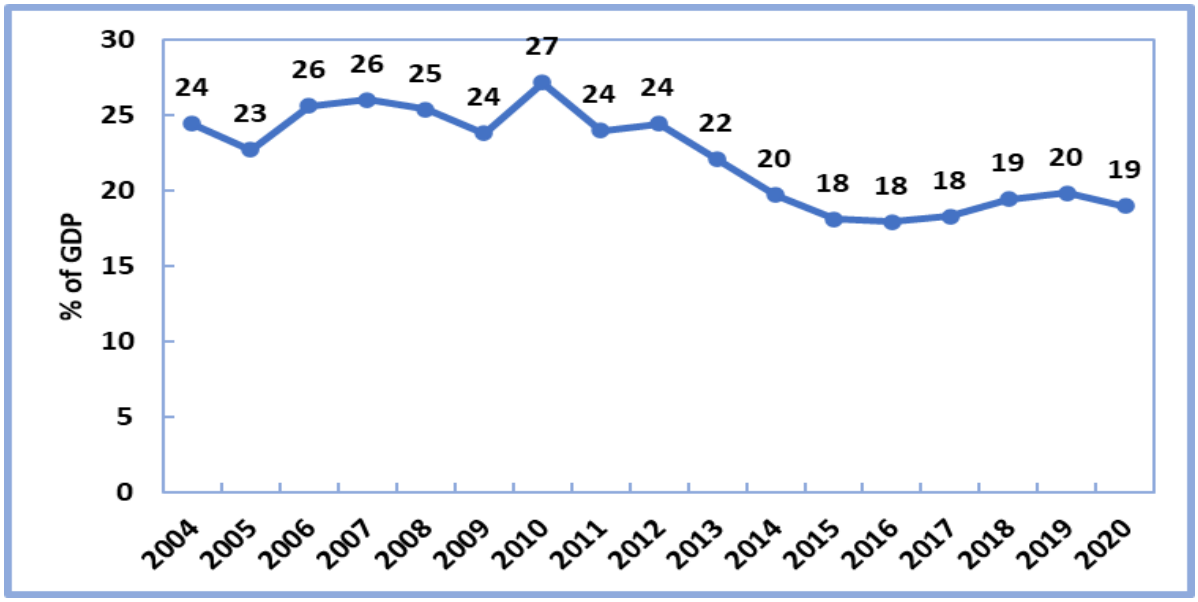
Due to its inability to effectively manage its public finances, public investment in Madagascar has been considerably low. As shown in Figure 2.24, the country has a downward sloping trend for its public investment to GDP levels. Though from 2006 to 2009 there seemed to be an upward-sloping trend, which yielded a high of 38.74% in 2008, which was the highest trend the country has experienced since 2004 and the years to follow after that. Following this, Madagascar began experiencing a significant decline from 2009, which happened at high rates, though fluctuated at a low rate from 2013 to 2017. Public investment started to improve in 2018 which according to Arora, Palomba, and Estevaoi (2021) it is when the country identified its need for infrastructure enhancement.

2.5.4 Public Investment in Mauritius

Mauritius features one of the most successful economies in Africa, and the country's government has been utilizing public investment to contribute to the development process. Public investment in Mauritius has been relatively high over the years and may indicate that the Mauritania government's decision to spend on capital projects

might have been on a need arise basis. Thus, infrastructure implementation in the country does not take into consideration the need to have a distinct focus on long-term requirements (Zaonah, 2009). Pranovich, Felix, Robert, Rial, and Sun (2022) state that, besides being focused on adaptation there must be national and sectorial approaches and planning for public investment to align with the government's climate and objectives. Given that, the majority of infrastructure projects financed through public investment are part of the budget, though their climate-related outputs and outcomes lack clear identification, monitoring and even reporting.

Figure 2.25: Public Investment in Mauritius



Source: author's computation using World Bank Data

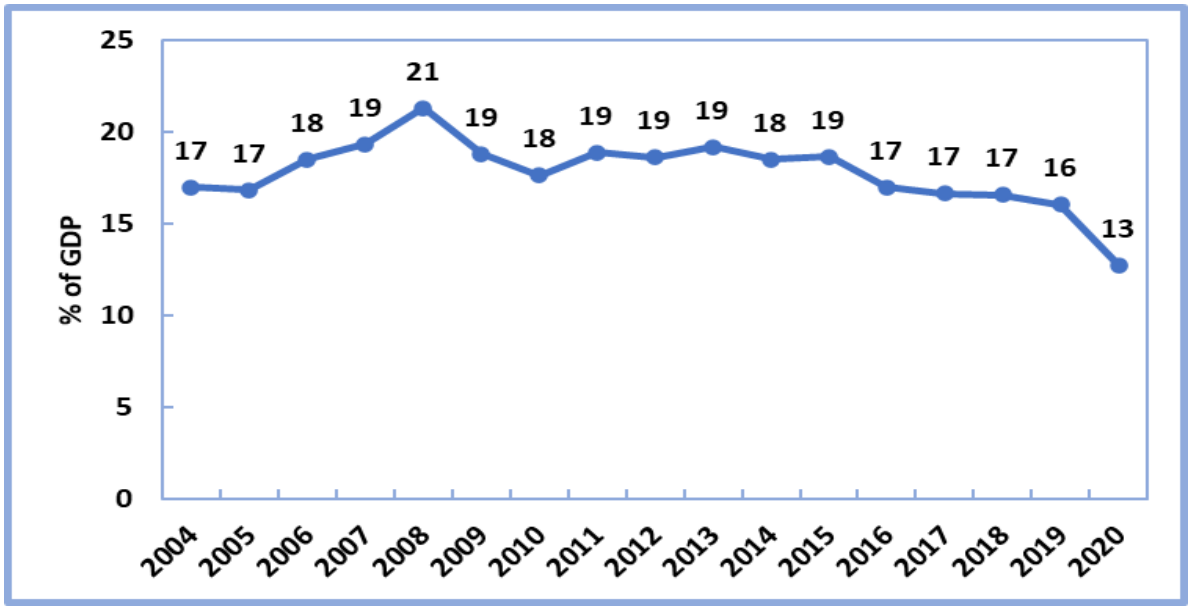
According to Zainah (2009), public investment in Mauritius is relatively low as shown in Figure 2.25 above. The country's level of public investment to GDP has been trending at a low of 17.90% in 2016, which is the lowest level experienced by the country over the years. Given its need for public investment to align with government objectives, Mauritius had a peaking trend of 27.10% in 2010, though this was followed by a significant decline of 3.15% when comparing 2010 to 2011. For years to follow, the country experienced fluctuating trends, with a declining trend from 2013 to 2016 followed by an increase in public investment from 2017 which continued to rise for the next two years. Thus, the IMF (2021) states that Mauritius has strengthened its public investment approach through orderly arrangements, processes, and practices that were the centre of a public infrastructure project. Evenly, through the Public Investment Management Assessment (PIMA) the country has been able to identify

key governance procedures and as such become more resilient in utilizing investment to influence climate change. Given this, the Mauritania government has over the years focused its investment on the adaptation of climate-related projects.

2.5.4 Public Investment in South Africa

Post the 2008/09 global financial crisis and subsequent political instability, the South African economy has reflected a scarcity of investment. Thus, the government placed an expectation on the business sector to source a fair share of the country's public investment. As such President Ramaphosa hosted an investment conference and an international investment drive aimed at attracting foreign investors. This has created optimism in policy implementations, as policymakers began analysing the accumulation of investment to be sourced not only through an increase in exports but also in imports. Given the size of the South African economy, the overall increase in openness yields enhancement in technological advancements, which has an impact on governance and most importantly influences the competitiveness of businesses on how they can improve and grow and over time attract investment (Dadam & Viegi, 2018). According to Mbanda and Chitiga-Mabugu (2017) public investment on infrastructure has been identified as the core variable to address the country's socio-economic challenges, such as excessive levels of unemployment, income inequality, and poverty. The government has for years been unable to create sufficient employment to deal with these challenges and this led to the labour-absorbing path which has the potential to enhance public investment. As it is the overall responsibility of the government to incentivize the general population in participating in the labour market, through a set of investments the population can reorientate the country's policies and activate programs capable of enhancing the economy and investment levels thereof (Ogujiuba & Mngometulu, 2022).

Figure 2.26: Public Investment in South Africa



Source: author's computation using World Bank Data

For a country of its stance, public investment levels in South Africa are relatively low compared to other less-indebted countries. As shown in Figure 2.26 above, the levels of public investment to GDP in the country were trending between 10% and 20%, though the highest level of public investment realized was 21.28% in 2008, which was then followed by a decline of 2.52% in 2009. Post-2008, the level of public investment in the country has been less than 20%, fluctuating at a low rate of 12.74% in 2020, which was the lowest level the country had experienced in over a decade. Thus, it was during this period that the country's economy was distressed, with a high level of unemployment, this was despite of the adaptation of the R500 billion fiscal package aimed at stabilizing the economy (Habiremye, Molewa, & Lekomanyane, 2022).

2.6 OVERVIEW OF ECONOMIC GROWTH IN SELECTED SADC COUNTRIES

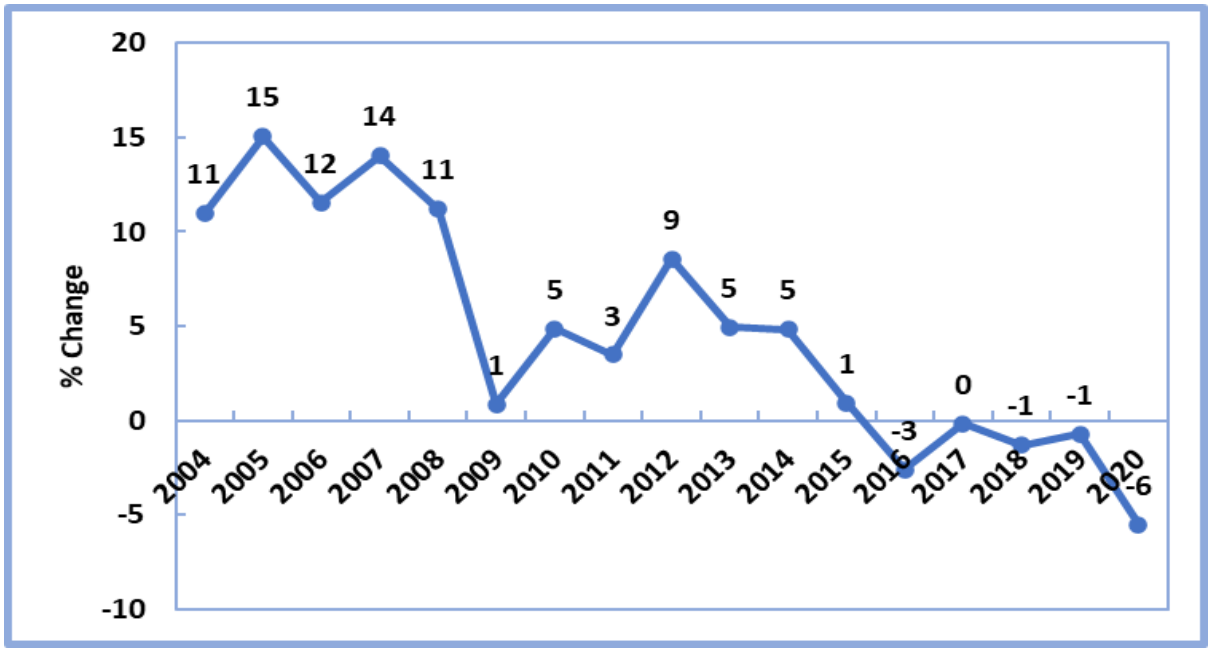
The SADC region aims at combating poverty by pursuing high and coherent levels of economic growth. Therefore, countries in the region do not only increase a certain quantity of factors of production rather they show their capabilities in combining such factors efficiently, to achieve maintained economic growth. factors affecting economic growth in the SADC region are inclusive of inflation, government expenditure, trade openness, political stability, etc. And through proper utilization and allocation of economic inputs and resources such as labour and capital economic growth is likely to be achieved thereby increasing employment and reducing poverty (Seleteng &

Sephooko, 2013). Inversely, Jan and Ji (2018) state that, even with the pursual of economic growth in the region still active, the SADC region is experiencing significant declines in investment and trade levels since the 2013 commodity slump. Evenly, there remain instabilities in trade and growth, aggravating political difficulties among member countries. Furthermore, even with the abundance of natural resources, there remains little too limited growth in the SADC region, given that, the countries lack the necessary measures and technological advancement to extract resources and further have no control over the platform which enables them to create appropriate levels of extraction necessary to achieve the desired growth rate (Nhabinde & Heshmati, 2020).

2.6.1 Economic Growth in Angola

Angola is considered one of Africa's economic giants because it produces oil, natural gas, and diamond extraction. The country dominates in the oil and gas industry as 50 percent of the country's GDP is accounted for through the oil and gas industry, making it the fifth largest country in the SSA region. Post its war era, it made a remarkable recovery by achieving growth levels which led to the country being ranked one of the economies to achieve the highest GDP in the world, and such growth was sourced through the country's oil wealth (Credit Agricole Group, 2022). Though, due to the 2014 oil crisis, as there was a collapse in the price of crude oil, the Angolan economy declined significantly, and it became essential to post the crisis that there has to be recovering to sustain high levels of growth (Konrad Adenauer Stiftung, 2021). The country depended on oil as the main source of economic growth, which over the years left the country exposed to external shocks, and this resulted in obstacles necessary to sustain and integrate growth (IMF, 2021).

Figure 2.27: Economic Growth in Angola



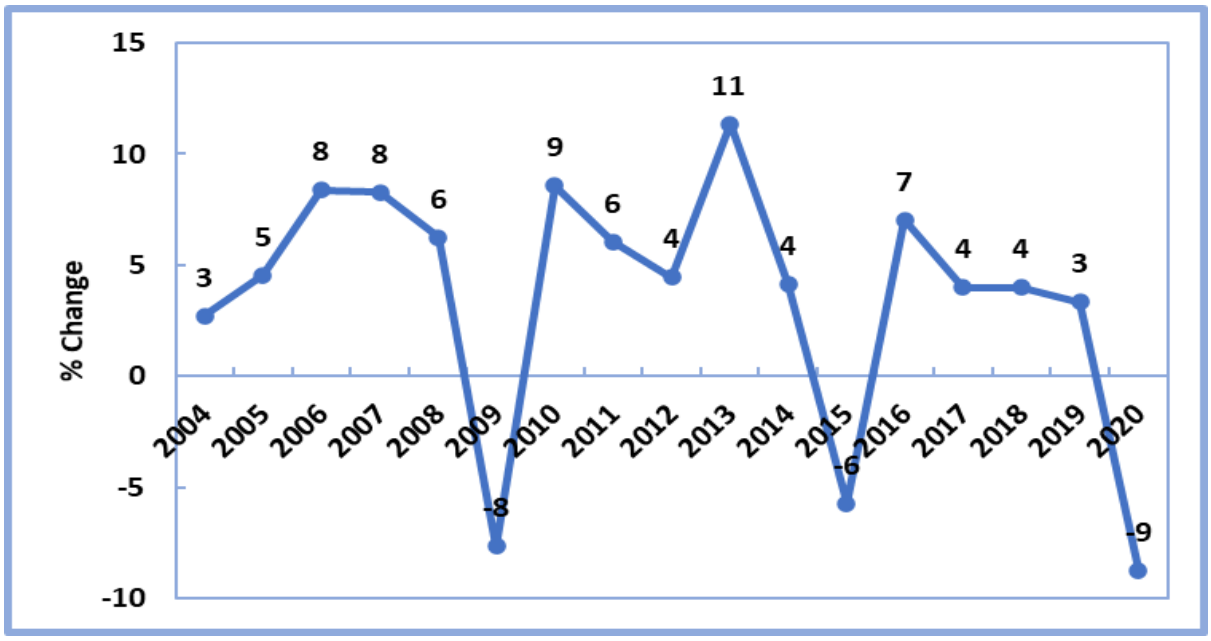
Source: Own Computation with World Bank Data

Figure 2.27 above is a representation of a year-on-year percentage change in economic growth from 2004 to 2020. The country performed well from 2004 to 2015, maintaining healthy positive growth rates. It had a 15% growth peak in 2005 and declined to a ten-year low of 1% in 2015.

2.6.2 Economic Growth in Botswana

Well-found macroeconomic policies and impeccable government governance have gambled with Botswana's diamond resources and transformed the country from being the poorest country in the world to being among Africa's fasted growing economies. Though the country experienced considerable slow growth during some years, caused by an unpredictable performance by the diamond industry, the country remained committed to achieving growth. The country's dependency on diamond mining has yielded concerns because though diamonds account for at least 40 percent of the country's exports and GDP, post the 2008 global financial crisis, the decline in mineral revenues deprived the country of the profit it sourced in the industry causing a significant decline in growth rates. Also, the absence of appropriate infrastructure development, due to inadequate project management, planning, execution, and even budget overruns, left the country with a budget deficit and little growth to declines being realized (Phiri, Karel, Sakala, Appaiah-Kubi, Pavel, Maitan, Gebeltova, & Otekhile, 2022).

Figure 2.28: Economic growth in Botswana



Source: Own Computation with World Bank Data

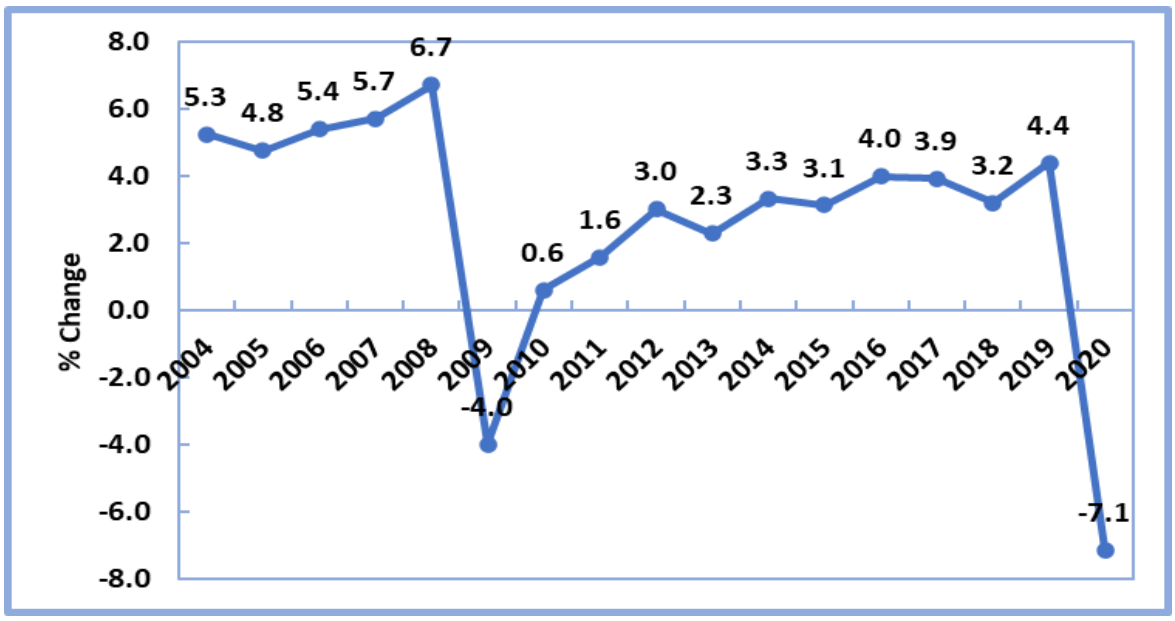
Botswana has achieved considerably high levels of growth. As shown in Figure 2.28 above, over the years the country positively averaged from 3-9 percent with the highest growth rate at 11.34% in 2013, this was an increase of 6.88% in GDP from 2012. Post the 2013 peak, the country experienced a significant decline wherein 2015 -5.71% of GDP was recorded. Considerable recovery followed thereafter as a positive and significantly high growth rate was recorded in 2016 and years to follow. Though in 2020, the country hit a slump again by experiencing a negative growth rate of -8.72% which was the lowest level of growth that the country has ever experienced. Despite Botswana's ability to sustain well advise macroeconomic policies and good governance, the occurrence of COVID-19 exposed the country's vulnerability to external shocks given that it relies on diamonds and a public sector-driven model. As such the country contracted negative growth, which further pressurized the fiscals (World Bank, 2022).

2.6.3 Economic Growth in Madagascar

Regardless of its riches in natural resources, Madagascar remains one of the poorest countries in the world. An economy characterized by political instability, inadequate institutions, and defective governance hinders the country's ability to experience economic growth. The Madagascan economy further remains vulnerable to external

shocks, fiscal imbalances, and social fragility (Market Intelligence, 2022). Even with the implementation of the National Development Plan (NDP) from 2015 to 2019, which was aimed at achieving integrated growth and sustainable development, the country's economic growth has weakened as the approach of the NDP neglected economic, societal, and individual securities. The International Monetary Fund (IMF, 2017) reports that this resulted in poverty, vulnerability, and inequalities, which led to the Madagascan economy being undermined due to how it responded to shocks and threats. Economic growth in Madagascar is mainly sourced through mining, tourism, transport, and services sector, and also the agricultural sector (World Bank, 2022). The Bank further reports that the country has deteriorated over the years as there have been multiple recessions, drought, and livestock diseases.

Figure 2.29: Economic Growth in Madagascar



Source: Own Computation with World Bank Data

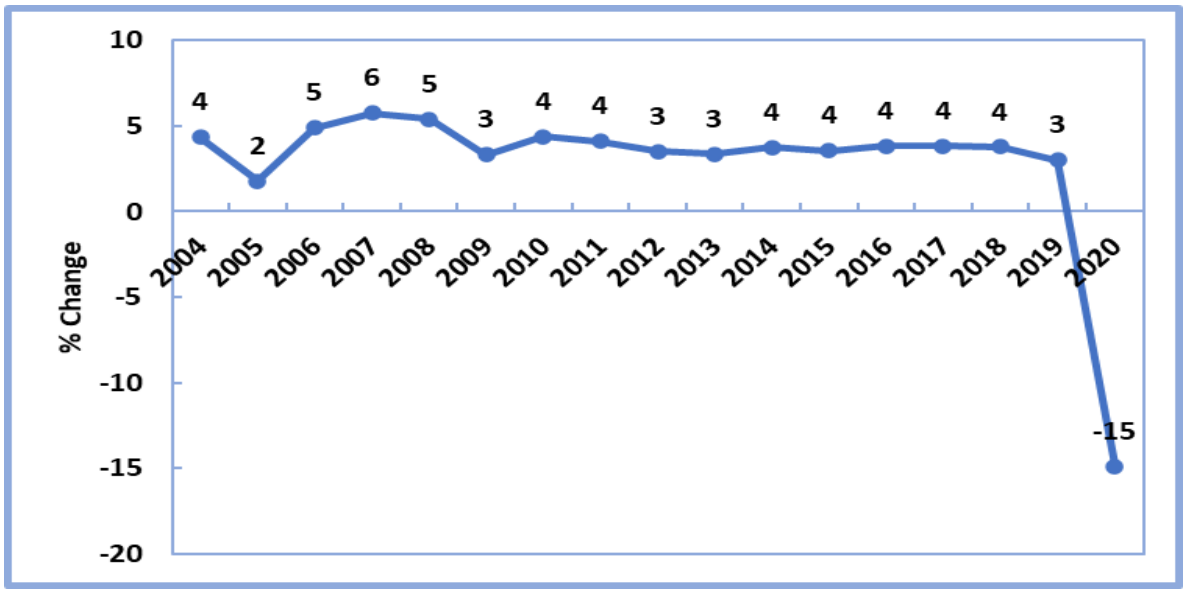
As per Figure 2.29 above, the level of economic growth in Madagascar has been significantly high for the period 2005 to 2008, where during this period the country experienced a peak of 6.71% in GDP, though it was followed by a significant decline of 10.69% in 2009, this can be because of the impact brought by the market collapse of the 2008 global financial crisis. Following the recession in 2009, Madagascar recovered going into 2010, thus a positive trend was experienced from 2010 onwards. This is an exception of 2020, because, from 4.4% in 2019, GDP fell to a startling -7.141% in 2020. According to the AfDB (2022), Madagascar suffered a decline following years of growth incline, which came to a halt in 2020 when the pandemic hurt

different sectors in the country. Thus, the mining, manufacturing, and services sectors suffered incredibly due to quarantine measures, whereas public finance felt the most pressure as revenue became limited. i.e., tax revenue declines, increased government expenditure, a standstill in tourism, and declines in FDI amongst others.

2.6.4 Economic Growth in Mauritius

Over the years, Svirydzenka and Petri (2014) argued that the Mauritian government implements policies, necessary to enhance investment and savings levels, adjust the labour market, invest in education, have educational reforms, and further improve processes utilized in production which yields limited congestion in the economy. This suggestion was necessary to improve the country's economic growth. Which has recently been classified as an upper-middle-income country, Mauritius remains challenged as it attempts to transition to a knowledge-based economy and thus adjust to the influence climate change has on the economy (World Bank, 2022).

Figure 2.30: Economic Growth in Mauritius



Source: Own Computation with World Bank Data

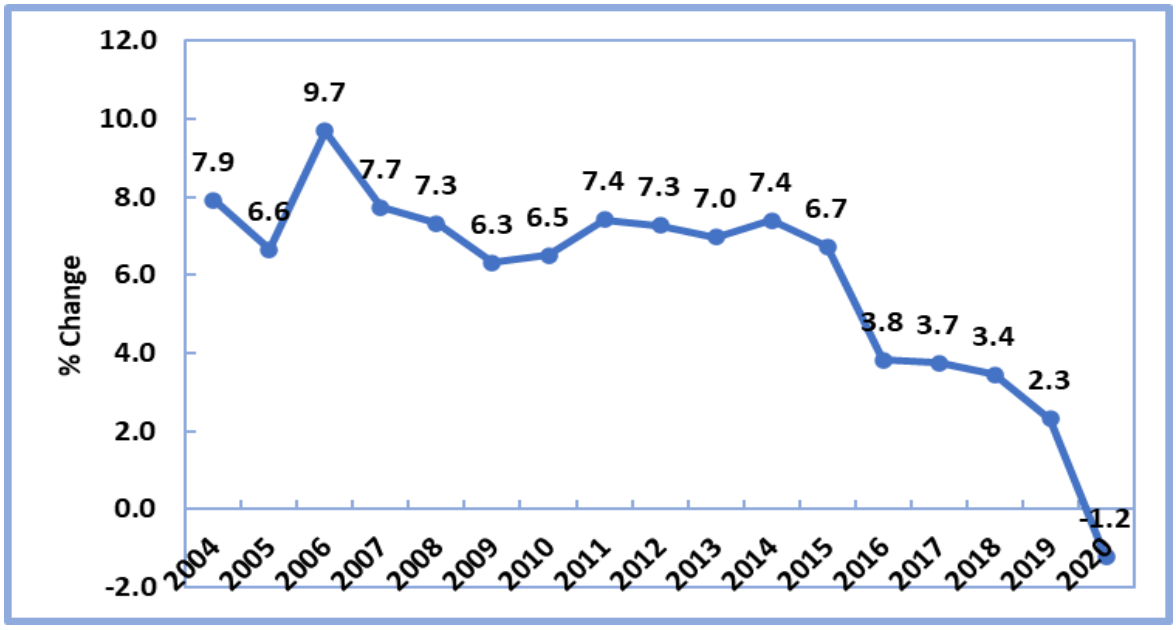
The Mauritian economy has been performing relatively well, as indicated in Figure 2.30 above, the country experienced a consistence growth rate in the covered period, averaging from 3% to 4%. Although, there had been a significant percentage change in the country's GDP declining to -15% in 2020. Based on 2019 data, in 2020 the World Bank classified Mauritius as a high-income country, that is, for a country of its size a per capita earning of above $10000 was realized pre-pandemic. The country's

dependency on tourism, goods, and capital resulted in devastation following the hit of the COVID-19 pandemic in 2020, thus the 15% shrunk in growth was because there were no activities taking place in the country's main sources of revenue sectors (Pilling, 2022).

2.6.5 Economic Growth in Mozambique

Though economic growth has been slow-paced over the years, Mozambique managed to sustain its growth rate, because the country has feasible macroeconomic policies and structural reforms, along with an advantageous external environment, donor support, and lately finding and utilizing natural resources (Ross, 2014). That is, according to Jones and Tarp (2016) the country has high levels of poverty and labour participation which is highly dominated by smallholders farming. Mozambique has been able to realize outstanding progress in advancing macroeconomic growth and stability over the past twenty years. Evenly it has performed well enough to overcome detrimental and sustained conflicts and has since maintained high rates of economic growth. Inversely, the decline in FDI, reduction of public spending, and decrease in exports resulted in restricted growth, therefore, the government has in recent years implemented a restraint budget. Evenly, the country's high economic growth rate did not enhance or sustain positive human development as Mozambique's human development index (HDI) declined significantly and thus the country is currently ranked among the poorest performing countries (Bertelsmann Transformation Index, 2018).

Figure 2.31: Economic growth in Mozambique



Source: Own Computation with World Bank Data

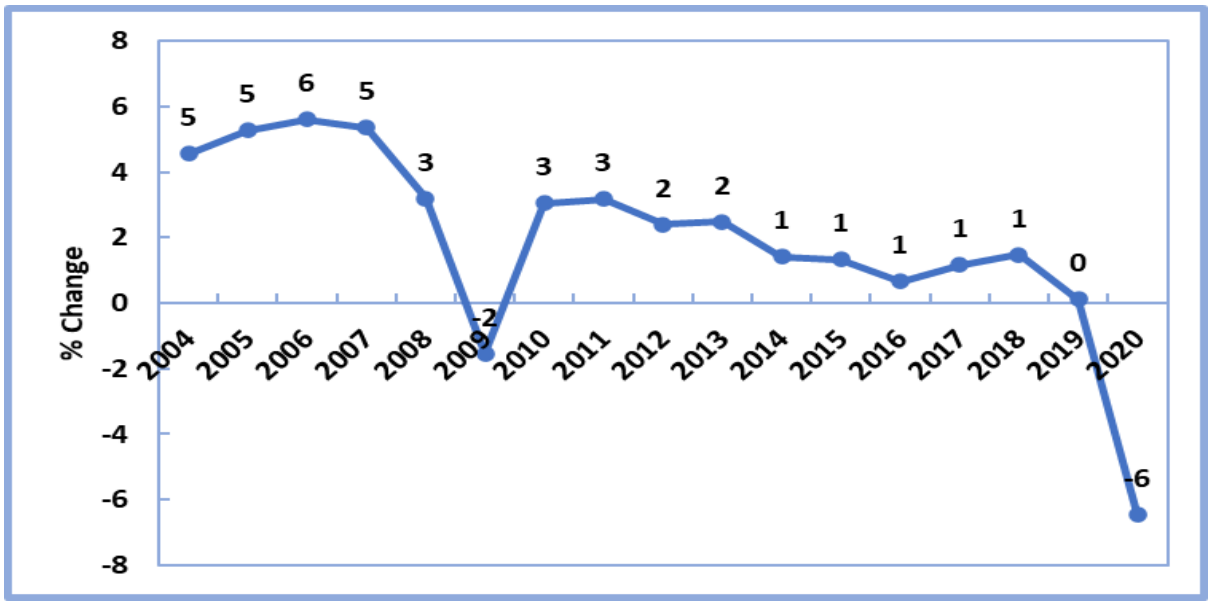
For an economy of its size and resource availability the country has been performing well during the period 2004 to 2014, with Figure 2.31 above. During the stated period, the country's growth rate has been trending along or above 7%, which is impressive as the country managed to maintain these rates for at least twelve years. Post-2015, growth fell by 2.89% and it continued the decline to -1.23% in 2020, which is the lowest growth rate experienced by the country in over a decade. This comes after the country realized declines in exports, in addition to economic conflicts over natural gas-rich, which has consequently exasperated economic declines, putting at least half a million people into poverty (Kamer, 2022).

2.6.6 Economic Growth in South Africa

Either natural or human resources, South Africa remains one country in Africa that has an abundant provision of both. Though, due to activities related to misallocation of resources, corruption, inadequate governance, and poor policing by the government, the resources have not for years been used to their fullest potential and this has resulted in a stagnant economy (Banda & Choga, 2015). Relatively, Gnade, Blaauw, and Greyling (2017) argued that amongst other things hindering the growth of South Africa's economic inequality and unemployment have been at the core, thus it can through addressing these challenges through basic and social infrastructure that the country can be able to enhance its growth levels. Thus, post-democracy the country implemented several policies aimed at service delivery which was a key factor

in growing the economy. Though, over the past years there has been limited progress in this regard, as the country become divided and spatial policies remained extensive, yielding the characterization of the South African economy as low, with overlapping poverty and inequality.

Figure 2.32: Economic Growth in South Africa



Source: Own Computation with World Bank Data

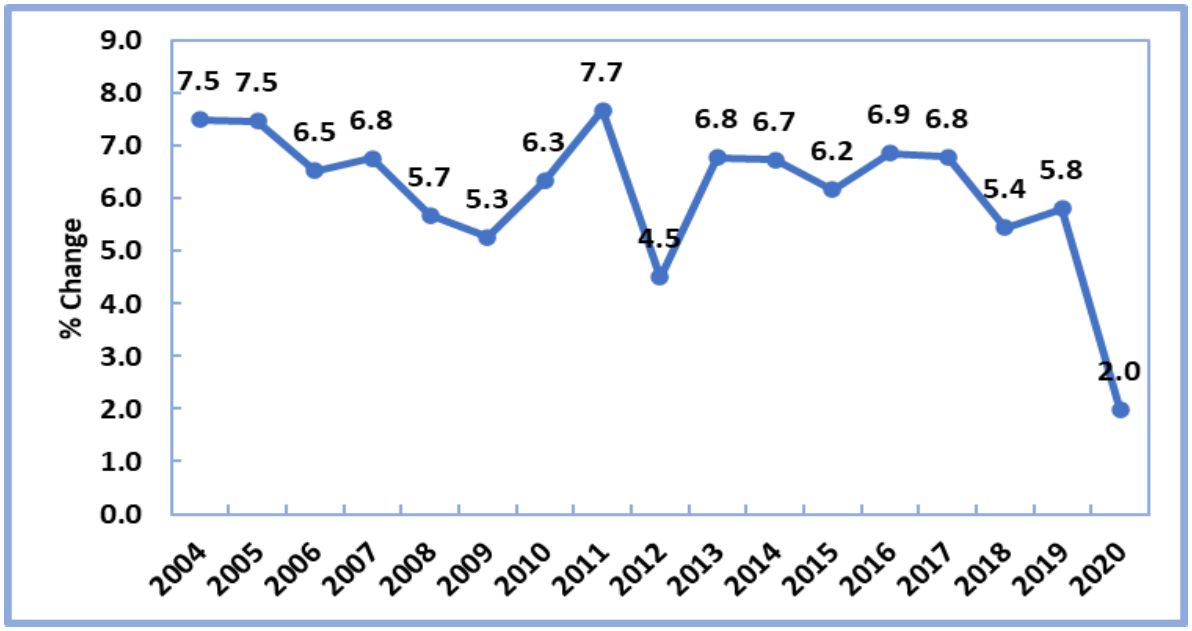
Given the reputation it holds in the SADC region, the South African economy has performed rather poorly over the past years. As shown in Figure 2.32, prior to the 2008/09 financial crisis the country's growth rate was at most 5%-6% being the highest in the country. The country experienced a decline in 2008 at 3% which was followed by a contraction of 2% in 2009, thus the country took a toll on the hit of the crisis. thereafter, the country recovered but not fully as it had a down-slopping trend of less than 3% for at least a decade. The trend became worse in 2020, as the economy was already weak, and the measure implemented to curb the spreading virus hindered the economy further as GDP contracted by 6%. This follows the downgrade South Africa received from the credit rating agencies in the previous term, thus during the pandemic government suffered a major deficit, due to major expenditures incurred in an attempt to manage the economic influence of the pandemic (AfDB, 2022).

2.6.7 Economic Growth in Tanzania

Since 2000, the Tanzanian economy has been one of the fastest growing economies in Africa with high rates of economic growth averaging at 7%, though the country still

had widespread of poverty which has been diligently below the global extreme poverty line (USAID, 2022). Even so, for a decade from 2010 to 2019, the country became the seventh-largest economy in the SSA region. This significant growth resulted in little and yet an impactful reduction in poverty levels, further causing structural changes in the economy and also attaining enhanced productivity (Narang, 2021). Relatively, the country managed to sustain a positive growth rate, in which the growth was similar to that of other developing countries with recurring characteristics such as limited access to relevant employment opportunities, socio-economic challenges, fast-growing population, unpleasant poverty circles, human rights, and market participation limitations, and even alarming vulnerability to climate changes (Kyara & Rahman, 2022). The pair further state that these characters overall present a crucial stumbling block for the country to be able to grow its economy significantly and also realised the United Nations Sustainable Development Goal 2030.

Figure 2.33: Economic growth in Tanzania



Source: Own Computation with World Bank Data

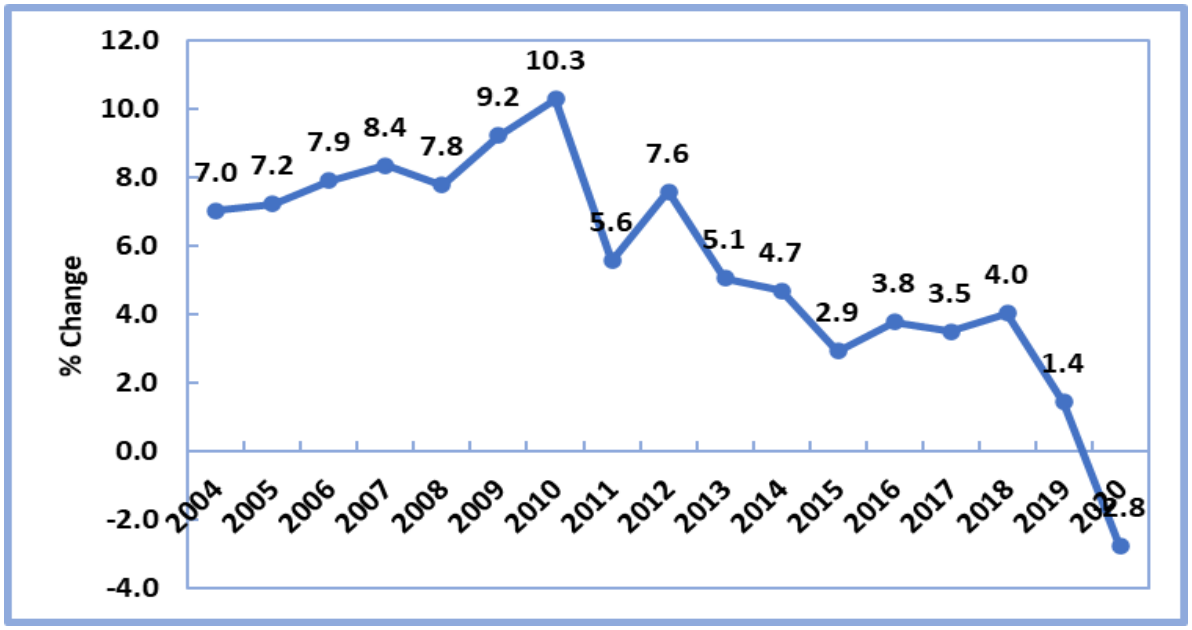
Economic Growth in Tanzania has been significantly high for over a decade. That is, as shown in Figure 2.33 above Tanzania maintained a growth level of at most 7% throughout the majority of the years, with the highest peak at 8% in 2011. Even so, the country's growth rate declined significantly in 2020 to 2% which was at most a 5% decrease compared to its usual averaging rate. Thus, according to the IMF (2020), the country has been cautious with its fiscal and monetary policies which resulted in

economic stability. Even so, it is advised that the country has to increase investment, and job creation through economic reforms to maintain its growth rates at a positive rate.

2.6.8 Economic Growth in Zambia

As it achieved great capital incentives through the mining and agricultural sector in the 1960s, the Zambian economy was classified as a dual economy. Although, such an economy was unable to reduce unemployment and thus there was an increase in the uneven distribution of wealth in the country, which created no improvements for growth in the country. Even post-independence, as the country began to rely heavily on copper mining, little growth was experienced because of the fluctuation of copper prices in the international market, opening the Zambian economy to vulnerability to external shocks (Chirwa & Odhiambo, 2016). Given the presence of absolute advantage in the copper mining industry, the Zambian economy still experiences risks associated with the industry and such resulted in the government pursuing economic diversity to enable the reduction of dependency on the mining sector and capitalize on different sectors where the country possesses an abundance of resource availability. This can be done through the development and advancement of the agricultural, tourism, gemstone mining, and hydropower generation industries. Furthermore, though Zambia had a positive GDP, it still faced crucial macroeconomic challenges such as high inflation, insignificant debt levels, increasing fiscal deficits, declining foreign reserves, and limited liquidity conditions (Wesgro, 2022).

Figure 2.34: Economic Growth in Zambia



Source: Own Computation with World Bank Data

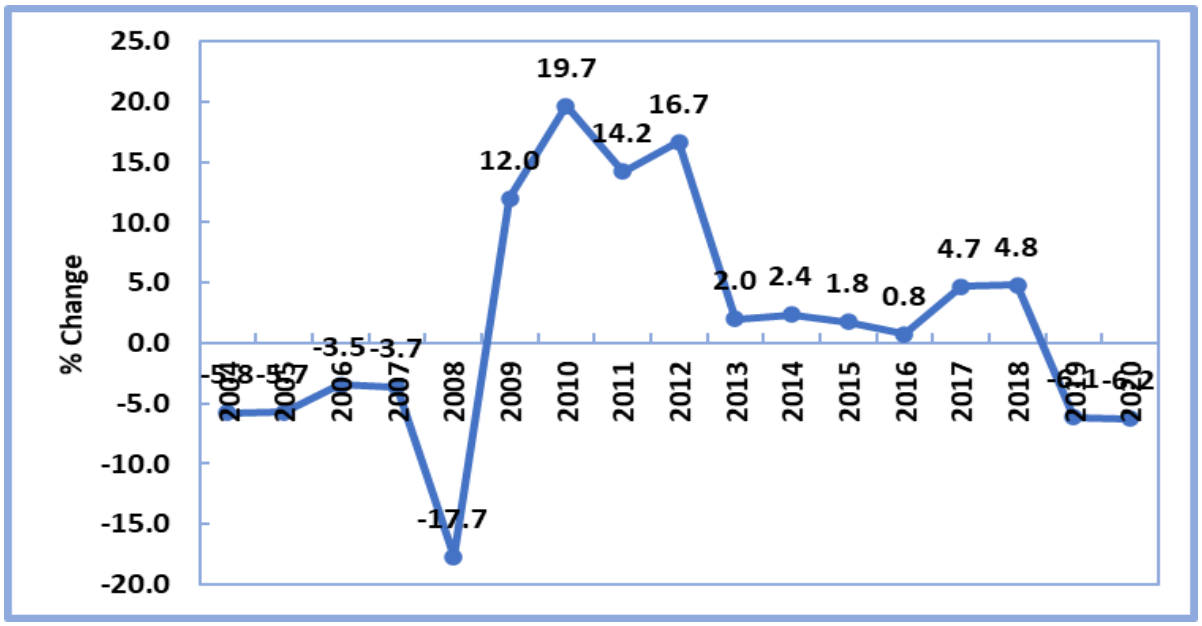
With sustainable high rates of economic growth, the Zambian economy has been performing well over the years. The country maintained a growth rate of more than 5% for over a decade, with the highest rate at 10% in 2010. Although, post-2014, the country began to average at less than 5%, with a startling decline of 4% in 2019 compared to 2014. Furthermore, the country experienced a negative growth rate of -3% in 2020. The economic growth contraction experienced by the country is a result of an uncommon decline in the country's key revenue sectors. For instance, manufacturing declined rapidly due to a halt in the process, evenly the service and tourism sectors were hindered by weak private consumption and investment, and the mining sector also crumbled as there was a decline in the global demand for copper. This was because of the measures put in place due to the COVID-19 pandemic (AfDB, 2022).

2.6.9 Economic Growth in Zimbabwe

The foundation for achieving and promoting economic growth in Zimbabwe is the necessity to enhance infrastructural services in the country. That is, through policy implementation, strategy, and programs the country can be able to develop continual and allocative economic growth (African Development Bank, 2011). Over the years, the Zimbabwean government continually outlined its adherence to implementing economic reforms, stabilizing the economy, and attracting foreign investment. Thus, the growth and development of the Zimbabwean economy needs to government

needs to refrain from prioritizing large-scale, prestigious projects because history has proved that such projects are inadequately managed, thus erecting a vast possibility for corruption, and creating critical vulnerabilities to developing environmental conditions, especially on the hydro-electronic sector. Such impacts growth negatively (Chitiyo, Dengu, Mbae, & Vandome, 2019).

Figure 2.35: Economic Growth in Zimbabwe



Source: Own Computation with World Bank Data

The Zimbabwean economy is among one of Africa's poorest economies. As shown in Figure 2.35 above, the country experienced a negative growth rate from 2004 to 2008, with an economically devastating -17.67% in 2008. Even so, the country had a fruitful era from 2009 to 2012 in which there were high and impressive growth rates. This positive rate declined significantly from 2013, reaching yet another era of negative growth rates in 2019 and 2020. According to the AfDB (2022), Zimbabwe was already in recession pre-pandemic, thus following the country's economic instability over the years and the elimination of subsidies on products such as maize meal, fuel, and electricity. Furthermore, the country had restrained foreign exchange earnings, and also unrestricted creation of money.

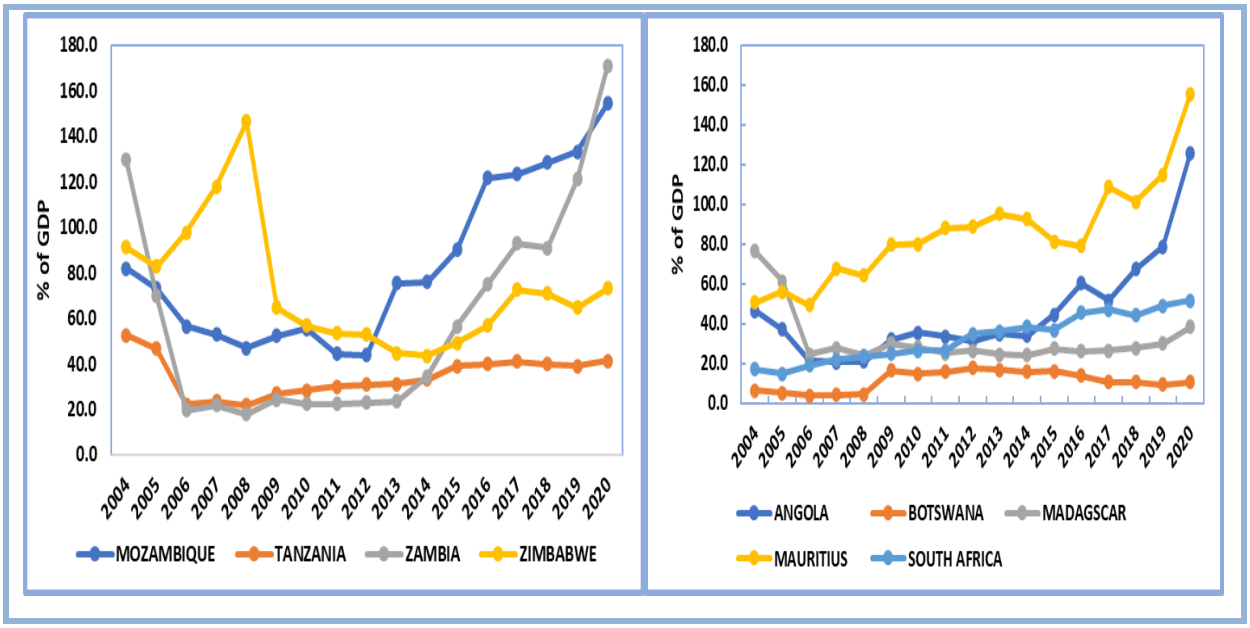
2.7 A COMPARATIVE ANALYSIS BETWEEN HIGHLY INDEBTED AND LESS INDEBTED COUNTRIES

As the study present a comparative debt analysis of HIC and LIC SADC countries. The following section presents the graphically comparison for the selected countries, comparing external debt, service cost, public investment, and economic growth.

2.7.1 External debt in highly and less indebted countries

According to Muriungi (2022) post-2012 most SADC countries began experiencing an increase in their external debt levels, the debt increased substantially and included both the dynamics and composition of sovereign debt in the region. The majority of SADC member countries have needed infrastructural development and due to financial deficit, most countries were unable to partake in the development which resulted in the need for external financing. Moreover, increased external debt in the SADC region has led to not only budget deficits but also exchange rate depreciation, hence, due to huge fiscal deficit to finance infrastructure development and expenditure SADC countries took advantage of the liquidity rates aligned with their growth rate, which was influenced by the region's enhanced macroeconomic performance and international commodity prices improving the region's creditworthiness, therefore increased their external borrowing significantly (Mupunga, Tawedwerwa, & Philton, 2019).

Figure 2.36: External debt in HICs and LICs



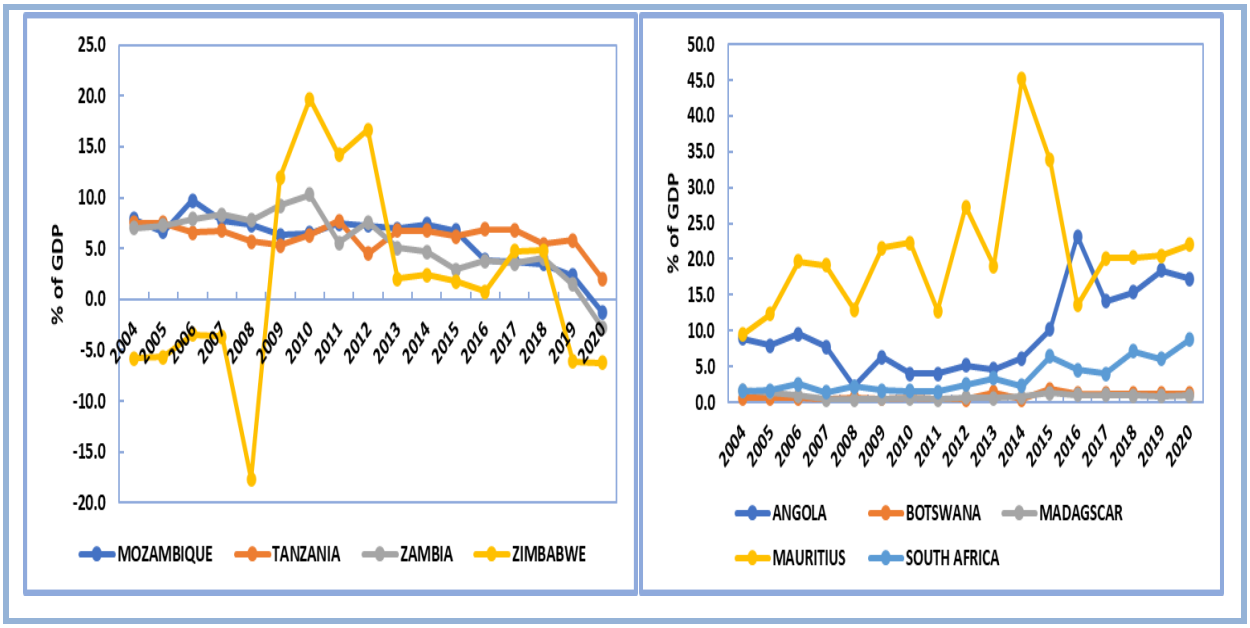
Source: Own Computation with World Bank Data

External debt in most SADC countries has been extremely high as indicated by Figure 2.36. As such countries inclusive of Mozambique, Zambia, Angola, and Mauritius have the highest external debt levels among the selected SADC countries as shown in Figure 2.36 above. The countries have an external debt rate that is significantly high as the rate is not only above 50% during almost every year, but they have exceeded 100% at some point. Whereas, Tanzania had relatively high debt levels in the 2004/05 period, and the debt rate decreased significantly thereafter. Evenly, Botswana and Zimbabwe have significantly low debt levels when compared to other countries. On the other hand, the external debt rate in South Africa began the period at a low rate and then gradually increased as the years went by. Thus Muchabaiwa (2021) states that over the years in Southern Africa external debt acquired by governments has shifted significantly from concessional borrowings accumulated through bilateral and multilateral development institutions to private borrowings which are rather more expensive. This resulted in a debt repayment burden, causing governments in the region to limit spending, and increasing revenue further pressurizing and presenting vulnerability to households and firms.

2.7.2 Debt service cost in highly indebted and less indebted countries

The occurrence of the global financial crisis emphasized the damaging impact of excessive debt increase in various countries. Whereas, not only the government but also households and firms went to an extreme as income shortages prevented them from smoothing consumption and attracting new investment, respectively. As a result, most economies were experiencing unstable output increases which led to aggravation problems related to debt repayment and thus yielding more losses for banks, over time experiencing a banking crisis (Drehmann & Juselius, 2012).

Figure 2.37: Debt service in HICs and LICs



Source: Own Computation with World Bank Data

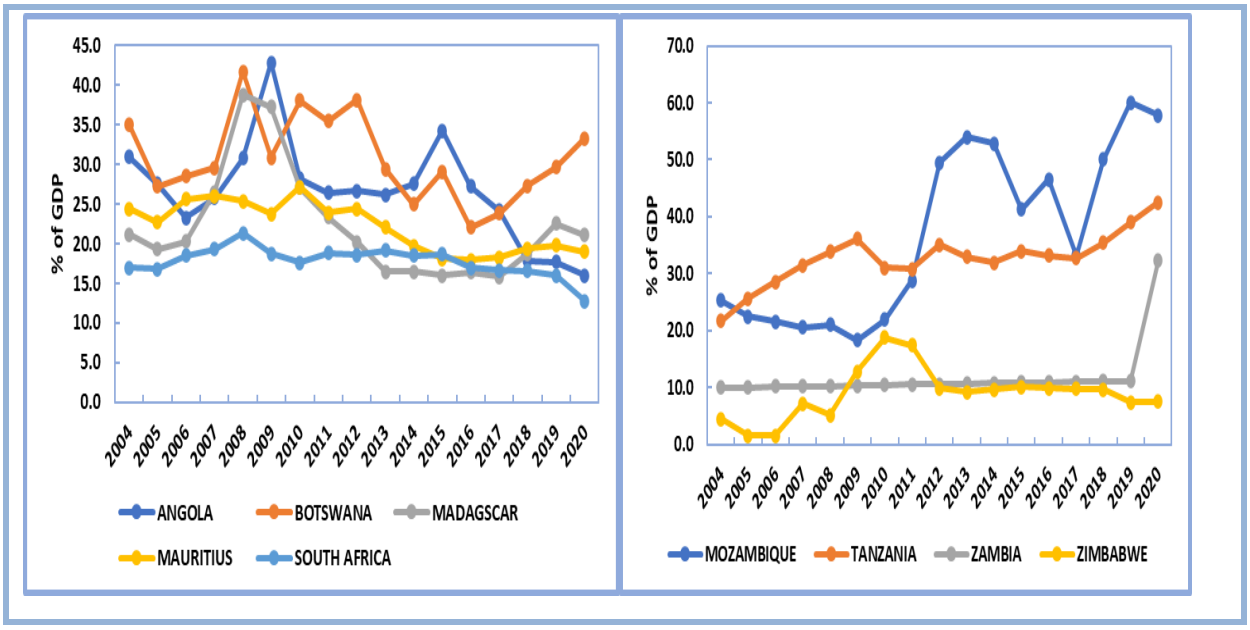
Figure 2.37 above, presents the comparability of debt service costs for highly indebted and less indebted SADC countries is given. In the Figure, highly indebted countries have high rates of the servicing cost except for Madagascar which has its servicing cost at lower than 5% and nearing 0% which is the lowest in all the SADC countries during the period 2004 to 2020. Though Botswana for certain years seems to be at the same level as Madagascar. Inversely, countries inclusive of Zimbabwe, Zambia, Angola, and Mauritius have very rates of debt servicing costs for both the highly indebted and less indebted SADC countries. Where the country's servicing cost rate neared the region's 50% target during certain years and during some years was trending above 10% which compared to other countries, is relatively high. Such an occurrence can be due to a country's inability to service their debt cost. Thus, World Bank (2022) indicates that the overall debt service in most developing economies is complemented by the countries' ability to accumulate foreign exchange through exporting goods and services, principal income, and the remittances of laborers.

2.7.3 Public Investment in highly indebted and less indebted countries

The SADC members introduced the Policy Framework for Investment (PFI) through the OECD in 2012, this policy is therefore used as a reference for developing investment policies for certain parts of the SADC region. Through the policy, the region can engage in Region Action Plans on Investment (RAPI) which establishes peer learning, national-level analytic assessment, and other practices by OECD and non-

OECD countries. Moreover, the overall aim of IPF is to enable regional coordination and further make use of the economies of scale in enhancing investment frameworks and policies across the SADC region (OECD, 2015).

Figure 2.38: Public Investment in HICs and LICs



Source: Own Computation with World Bank Data

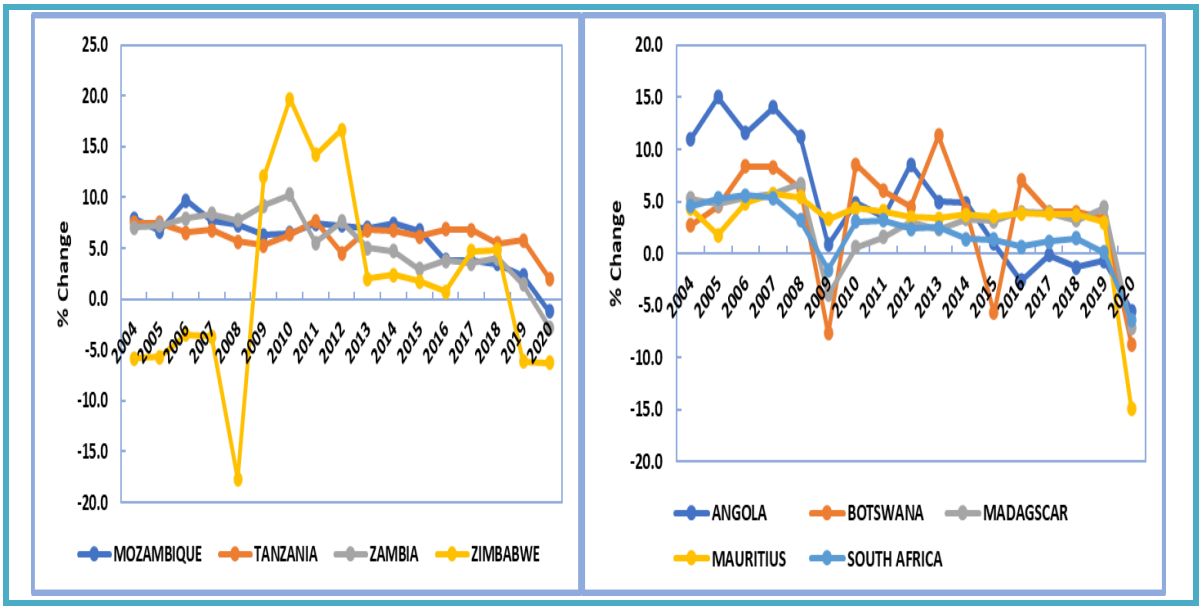
Figure 2.38 above illustrate how public investment performed in the selected SADC countries for the period 2004 to 2020. And as indicated by the figure, in LICs Angola and Botswana have performed significantly well, though there are declines the country maintained an average of above 20% for years, except the decline that Angola began to experience in 2016. Evenly, in HICs Mozambique and Tanzania also performed well, and Mozambique reached levels above 50% which is above all the selected SADC countries in both HICs and LICs, though post-2019 the country's public investment fell significantly reaching a negative percentage. Overall, for economies of their sizes and in developing markets, the selected SADC countries have performed well with regard to their public investment, although Zambia and Zimbabwe had unimpressive public investment rates compared to their peer countries.

2.7.4 Economic Growth in highly indebted and less indebted countries

Through financial development SADC countries were able to promote economic growth, this was done by fostering for development and production of a significant amount of goods and services. The introduction and participation of new banks in the market increased which boosted financial development for SADC member countries

and overall grew the economy (Moyo & Le Roux, 2020). The financial sector within countries must be developed for it brings efficiency and effectiveness to financial institutions which yields advancement in economic growth. Relatively, it's unfortunate that as the financial level increase globally it yields financial crises eventually which badly affects developing economies (Chiwira, Bakwena, Mupimpila, & Tlhalefang, 2016).

Figure 2.39: Economic growth in HICs and LICs



Source: Own Computation with World Bank Data

The fortress of economic growth in selected SADC countries is shown in Figure 2.39 above numerous countries have been performing well and others have been faced with misfortunes. Though most of the countries' growth rate is below 10%, HICs have performed better than LICs as for most years they managed to maintain a positive growth rate, except for Zimbabwe, where the country's growth rate has fluctuated mostly in the negative percentiles. Even in LICs majority of the countries reached a negative growth rate and, in both models, the negative percentile comes after 2008 which can be associated with the aftereffects of the 2008 global financial and economic crisis. Furthermore, it shows that as of 2018 the is a significant decline in economic growth for the selected countries, amid 2020 the rate has reached the negative percentile for all countries.

2.8 DEBT SOURCE AND DEBT DEFAULT REPERCUSSION

The issue of debt is relatable globally, although Africa carries a devastating debt burden both past and present. Such has yielded the experience of a debt crisis and evenly created the need for countries to safely monitor the present debt accumulation levels (Onyekwena & Ekeruche, 2019). African countries have resorted to external borrowing to fund development projects, stimulate internal resources, and support any other development agenda. And this has caused excessive debt, a high debt ratio in the short run, and a low debt-to-growth ratio in the long run (Atta-Mensah, & Ibrahim, 2020). With these factors taken into consideration, countries opted to borrow externally and some of the official lenders include Chinese development finance, which over the years has strengthened its presence and is now one of the top important sources of development finance in Africa.

China has provided over $148 billion in borrowing to African countries between 2000 and 2008 and this made it a major bilateral lender in Africa. The financing provided by China has yielded an improvement in infrastructure, development, and economic growth. The financing however has been questioned by policymakers as it has been noted that the borrowing provided by China is currently promoting enslavement, and entrapment of African countries in debt, further encouraging feasible debt levels. That is, Chinese borrowing is characterized as a speedy approach to infrastructure financing, addictive, easily accessible, and in the long term has a negative influence on a country's economic performance. As such, Africa is slowly approaching a route of becoming committed to China on debts they cannot afford thus falling for the Chinese "debt trap diplomacy", given that Africa's inability to repay the debt leaves them vulnerable to the Chinese market shocks and interest ratings (Mlambo, 2022).

Lutete (2021) argued that more popularity has risen surrounding borrowing from the IMF, although such borrowing has raised a concern in which the loans' efficacy is questioned. Thus, for most developing countries borrowing from the IMF is efficient in dealing with their revenue shortages or funding infrastructure development. Even so, the loans have an impact on economic growth which runs both directly and indirectly. Furthermore, the seems to be inflexibility attached to external debt received from the bilateral lender, such that at some point the borrowing countries can be expected to implement fiscal restraints or change their monetary policy, that is if there was an

agreement of such adjustments upon borrowing. Some of the loan conditionalities are helpful during economic crises as the IMF provides advice, this helps boost growth and reduce financial constraints.

There has been a growing concern facing the region with regards to how it has undertaken bilateral and private borrowing to fund infrastructure developments. Thus, over the years, numerous countries have been defaulting and there exists fear of many other defaulting also as there has been an incline in debt accumulation in the SADC. Most members of the SADC have benefited from debt relief programs through the HIPC Initiative, which has enabled a reduction of indebtedness in the region (Chirume, 2022). Evenly, in Africa as a whole post the colonial era, there had been resource exhaustion which is the foundation for external borrowing. Thus, countries needed capital to produce and have a positive outcome in their national income, this deviation of sources or attempt to increase income led to the majority of African countries borrowing more capital than they can repay. This has left many economies in critical and severe debt stress (Dawelbait, 2015).

2.9 SUMMARY

This chapter presented an overview of external debt, debt servicing cost, public investment, and economic growth in selected highly and less indebted countries in the SADC region. From the selected countries, Angola, Mauritius, Mozambique, and Zimbabwe were found to have exceeded the 60% set target for external debt, as they not only recorded rates above 50% but at some point, the countries were over 100%. Evenly, the majority of the countries had high levels of debt service cost although Botswana and Madagascar performed relatively well, given that they have been able to service their debt over time. Furthermore, the chapter analysed public investment as a driver for economic growth. It has been reflected that both HICs and LICs countries performed fairly well, though in Zambia and Zimbabwe, investment to GDP rates were lacking behind compared to the countries. The overall analysis from chapter 2, was that in the selected SADC countries there are numerous factors influencing growth in each country and as such, the promotion and enhancement of growth are different per country. That is, the ways in which governments decide to grow their economies are dependent on the misfortunes faced by the country. Nevertheless, to a similar extent, throughout the analysis, it is shown that the countries

have a significant decline in their economic growth rates in 2020, which is generally related to the impact the COVID-19 pandemic.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

This section reviews the theoretical and empirical literature on the debt overhang paradox and public investment in economic growth. The literature review is categorised into two parts. Firstly, the theoretical explanation and development of external debt, investment, and economic growth are brought into the prospect. And secondly, the empirical evidence on the relationship between external debt, debt service cost, public investment, and economic growth, along with the existence of causality among the variables are discussed.

3.2 THEORETICAL LITERATURE

The study focuses firstly on the neoclassical growth theory, where technology and capital are assumed as factors necessary to achieve economic growth. Secondly, debt overhang theory, where the emphasis is on external debt and its impact on economic growth. And lastly, the dual gap theory, which emphasizes the fact that investment and borrowing are imperative to supplement domestic savings and thus boost economic growth. In any case, where the debt overhang theory does not align with the hypothesis of the study as to how external debt affects economic growth, the dual gap theory will be applied as an alternative, given then its base brings into consideration the influence of not only external debt on economic growth but also that of public investment. The dual gap theory provides a broader perspective on the factors affecting growth. Whereas debt overhang theory focuses mainly on external debt and its servicing cost thereof. As such, the study provides an overview of both theories and their linkage thereafter.

3.2.1 The Neoclassical Growth Theory

The neoclassical growth theory has been essential in identifying technology as the key factor necessary for productivity and achieving growth in the long run. The literature and theory upholding the idea of growth have grown substantially post Robert Solow's

(1956) literature contribution (Le Roux, 2017). Therefore, in the last century, the theory concerning economic growth was developed to align with the variables of contemporary economic science. As evolving lessons of researchers are generated through the economic context of the era. Economic growth research has been simplified using the Solow neoclassical growth theory. This is viewed as a fundamental theory of modern research, providing a brief as to how capital and technological changes influence the economy (Popa, 2014). A government's inability to execute expected policy choices encounters a trade-off that interprets its debt level. Thus, frequently debt is examined in respect of economic growth, determined through the Gross Domestic Product (GDP) indicator (Fernando, 2009). Following the Global Financial Crisis, the majority of developing countries opted for borrowing to enable them to afford increased expenditure levels and recover the declining capital (Corporate Institute of Finance, 2021). As such, Robert Solow (1956) established the basic model of economic growth, which assumes that countries experience growth through the accumulation of capital and labour. That is, there has to be obedience to the law of diminishing marginal returns, because greater quantities of labour and capital employed, means that further quantities of labour and capital are required to advance output. The theory explains long-run growth through technological advancement's impact on labour and capital (Barro & Xavier, 1998). Furthermore, the theory is viewed as the primary definite of economic growth, as it is considered the core of ideal growth (de La Grandville, 2007).

However, according to Dalgaard and Strulik (2013), the neoclassical theory implements analysis only after the growth process has started, and this creates confusion over time on understanding the basics of comparative analysis. As such, it is said that understanding is fully comprehended when a larger analysis of the contemporary income differences is presented when the difference in timing of when the process begins is outlined. The theory mainly outlines the long-run growth rates through technological advancement, and it is considered to be an exogenous variable, given that, fluctuations of economic growth are mainly influenced by external factors. Thus, the model has foundational roots in the neoclassical school of economics by Hickis (1939) in which the principles of the model were adopted from the "demand and supply" nature of the economics of Adam Smith and David Riccardo (Gupta, 2015). Comparably, the process of growth is dependent on the impulse to save, gather

physical and human capital, and in relation to its technological advancement be able to enhance its standing through the development of new products and ways of operation (Rodrik, 2013). Contrary to neoclassical growth theory, there are endogenous growth theories with main contributions by Romer (1986) and Lucas (1988) where the overall knowledge is that economic growth improves consistently as the sufficient accumulation of knowledge does not pertain to diminishing returns and therefore enables individuals to have an understanding as to why the world economy has been growing indefinitely in per capita terms (Ulasan, 2012).

According to Zaman and Arslan (2014), the classical theory alternatively focuses on capital accumulation which is mainly broad to light by the rate of return. Thus, growth in the economy can be realized through investment and this is mainly dependent on capital availability, the neoclassical theory provides a platform of knowledge through which policy can be reformed to enable an enhancement in savings which creates additional investment output and thus improves economic growth. The pair further detailed that by utilizing the classical theory to emphasize capital accumulation has shown that there is limited access to sources of revenue in developing and underdeveloped countries, external sources have provided aid to fuel revenue, which aspires to greater investment opportunities and economic growth. This is because the availability of external sources of borrowing has been overly emphasized as a necessity in countries that are characterized to have low levels of domestic savings. The reason for this assumption can be that external sources of revenue can be utilized to improve the capacity of the economy thus generating higher output levels, overall yielding a rate of return higher than the borrowing cost realized. Notably, the utilization of the neoclassical theory is further essential in studying factors related to economic development, though a problem might arise as these factors take into consideration the impact on both the internal and external demand related to economic dynamics. Growth through internal factors is realised by utilizing the factors of production and external can be through technological transfers, human capital, knowledge, and development which overall enhances economic growth (Bykov, Tolkachev, Parkhimenka, & Shabliinskaya, 2021).

3.2.2. Debt Overhang Theory

The debt overhang theory of Krugman (1988) can be analysed as a condition where the accumulation of debt in a country introduces a significant threat to the country's ability to repay its accumulated debt, consequently scarring off potential lenders and investors. This is especially experienced when it is assumed that the level of borrowing for a country is anticipated to be greater than the availability of resources for a country to pay off the accumulated debt. With forecasted, anticipated debt service cost has the probability of presenting supplemented levels of the country's production function (Siyanga, 2018; Benedict et al, 2005). Conversely, Knoll (2013) denotes that uncontrollable external debt stock and the emanating service obligation pervert the investment choice as a country's adaptation efforts is realized because the borrowing country has an aggregate investment choice, consequently inducing an ineffective low level of future production.

Debt overhang has been analysed as a problematic factor, given that in an attempt to promote economic development, most developing countries are dependent on external borrowing to supplement insufficient domestic capital resulting from shortages in domestic savings over time creating heavy indebtedness. The presence of debt overhang generates distortions and declines in economic growth, this is because countries with debt overhang do not attract private investors, and also servicing the debt consumes an excess of the indebted country's revenue, hindering the country's remaining capacity to return to growth (Abdullahi et al, 2016). The impact of debt overhang can be promoted through a rise in the rollover risk, based on the maturity structure attached to the debt. Therefore, if borrowings are accumulated during the boom season it is usually short-term, meaning that the rollover risk will rise given that the lenders are frequently reluctant to renew overdue credit lines (Sebmen, Laeven, & Moreno, 2019).

Inversely, external borrowing is also considered to be advantageous for developing economies that have insufficient capital stock to promote productive investment, given sustained optimization of resources, expenditure management, and sustainable scarce resources allocation. Although the actions are likely to yield marginal productivity equal to the marginal cost and as such, it may over time hinder the economy as it is vulnerable, and the debt burden of developing economies increases.

This is because as the marginal cost of borrowing increases when the debt service cost increases, the impact of external debt on developing economies is no longer positive but negative as the country's ability to repay the debt has declined. And the debt overhang hypothesis states that a decline in the country's ability to repay the debt will bring about foreign lenders to anticipate taxes on their earnings and eventually a decrease in domestic and foreign investment. Simultaneously, given that the rise in the balance of the external debt is greater than the foreign debt service cost, then the debt service coverage ratio will decline (Karadan & Akin, 2021).

As the primary source of developing funds, debt is highly considered mostly by developing countries. That is, in some instances, it is shown that as debt increases so does the level of national income, creating an expectation of elevated rates of growth. Although, at most contraction is experienced given the burden yielded from external borrowing in the economy. Debt overhang theory has been noted as a debt-driven theory and has over the years presented prospects on how capital outflows yield declines in savings and investment in domestic economies. Thus, due to high amounts of external debt, most economies suffer from currency depreciation with monetary and fiscal policy crises, along with crowd-out effects on public capital and the confiscation of assets to repay the accumulated debt. As such, most developing countries have considered debt as capital necessary to achieve development and further increase production output. This created contrives for many countries, given that, due to capital outflows there has been insufficient growth in countries, having then borrow even more to sustain the economy (Kurniasih, 2021) (Otieno, Mose, & Matundura, 2022). Relatively, Makoto, Takawira, and Kagenge (2020) state that the debt overhang hypothesis in the SADC region has over the years predicted a negative influence of debt policy regulation under harmful market pressure, and restore growth given that government participates in productive spending. Thus, numerous SADC countries redirected debt following that they reach the last stages of HIPC initiatives, particularly the reduction of the external debt stock and increasing domestic debt. In most economies, government domestic debt replaced characteristics and the allocation of macroeconomic burden along with risks that debt has on the economy. This is because the presence of the emphasis on domestic debt assisted developing economies which have insufficient diversity of investors for government debt and

external debt is identified to have several advantages, thus the acquired debt has a restricted crowding out the impact on the economy.

3.2.3. Dual Gap Theory

The Dual Gap Theory of Chenery and Strout (1996) states that debt accumulation is realized through imbalances among domestic savings, the budget, and the current account balance (Siyanga, 2018). And thus Abdullahi, Bakar, and Hassan (2016) argue that there is an anticipation that most Sub-Saharan African economies depend solely on external borrowings and resources to boost the shortages of domestic capital triggered by inadequate domestic savings, therefore these economies become compelled to require facilities from outside their countries to supplement domestic savings. Hence the Dual Gap Theory is known to try and sustain factors related to economic growth in market economies. The authors further stated that factors are significantly established in most developing and underdeveloped economies in Southern Africa where; internally, insufficient savings would certainly be conveyed as investment, creating a gap known as the saving constraint. Dissolving the gap between the two will thus require Foreign Direct Investment (FDI). And externally, insufficient foreign exchange results from incompetence in exports, and vice versa; overprices importation yields a decline in foreign exchange creating a gap known as the trade gap, between the duo which can be improved between foreign aid. Therefore, the dual gap model is adapted as a technique to conduct the economy to sustain the path of growth and if necessary, restore the economy (Akande & Ola-David, 2010).

The plague surrounding underdevelopment in Southern African countries has been ascribed to the scarcity of infrastructural facilities, inadequate policy framework, malicious environment, outdated technology, lack of employment, and reliance on imports (Akande & Ola-David, 2010). As such, the foundation of dual gap analysis is specified through the characteristics of the national income accounting where the components of the income and expenditure approach are equated, and thus the following is realized (Mabula & Mutasa, 2019):

$$Income = Consumption + Savings + Imports \quad 3.1$$

$$Output = Consuption + Investment + Exports \quad 3.2$$

$$Because\ Income = Output\ then \quad 3.3$$

$$Inestment - Savings = Imports - Exports \quad 3.4$$

$$Investment = Savings - Imports = Exports \quad 3.5$$

Given that savings and investment are essential elements to maintain and promote economic growth, such growth is only possible when the level of capital attains a specific threshold point. Consequently, growth in capital and investment along with increased foreign borrowings are bound to encourage automatic economic growth yielding an increase in savings over time (Abdullahi et al, 2016). Therefore, the dual gap model is an analysis that interprets how development results from investment, and investment is significantly an outcome of domestic savings, which is frequently insufficient to finance the required development (Adedoyin, Babulola, Otekunri, & Adeoti, 2016). As such, according to Mabula and Mutasa (2019) to dissolve the gap presented by insufficient domestic savings, external sources of capital are pursued to supplement the deficit. Taking into consideration this context, governments acquire strategies of borrowing externally to fund investment into the economy, which normally covers most declines from the funds that are saved. Additionally, domestic resources are supplemented from abroad, yielding an excess of imports over exports (Adedoyin et al, 2016).

The essentiality of the theory is shown through its identification of the external resources necessary to enable accelerated economic growth. thus, the theory has been widely used to justify foreign aid. Hence the investment-saving gap and the export-import gap are to be filled for advanced growth mostly in developing countries. It is through the analysis that development is introduced as a determinant of investment and as such the dependent of investment on domestic savings creates insufficiency for development to be realized. This further provides the necessity to obtain funds externally to fill the investment gap (Nasir, 2015). The application of the theory in developing countries as in the study is undertaken to determine the level of investment necessary to achieve the desired growth rate, in which in the case of an inefficient level of investment, external borrowing is accumulated to supplement the investment. Evenly, developing countries are noted to be faced with a deficiency in their public investment and debt thereof, thus the theory is used to argue the influence of resource constraints, in that the investment-saving gap has caused revenue

difficulties, and it is complemented by borrowings. This has become an overwhelming issue in developing countries as it has raised the countries' debt profile and fear has been installed concerning the government's ability to service the accumulated debt (Kpeyol, Andohol, & Anjande, 2022). Foreign aid has always been a need for developing countries, given that, they have over the years failed to attain targeted growth rates, due to their low levels of public investment and savings. The application of the dual gap model has been against domestic borrowing as a way to finance growth and ensure the attainment of sustainable growth especially in developing and underdeveloped countries. Therefore, it is a belief that through external financing the development gap can be filled to achieve accelerated levels of economic growth (Olawale, 2017).

According to Kelikume and Otonne (2022), although external borrowing promotes capital spending and investment in infrastructure development which is critical to achieving high levels of economic growth, it becomes a problem when the incurred debt is beyond the countries' ability to service and repay it thus hindering investment objectives and the economy. For instance, the debt-led growth hypothesis can be considered as a theoretical indication given that its interpretation of how increased debt improves economic performance and advances growth. The hypothesis connects the positive relationship between debt and economic growth through how aggregate demand is influenced. The pair has emphasized how accumulated debt, its distribution is affected by aggregate expenditure, thus public investment, and government spending, through the Keynesian school emphasises that debt can improve the economy by balancing the income deficit. Relatively, through the application of the dual gap theory in African countries, the influence that external debt has on an individual's standard of living is analysed. This is crucial as in most African countries, there are overwhelming levels of external debt which accompanied by poverty incidences has burdened most countries with servicing the debt. Insufficient revenue and domestic economic participation yielded in the region's inability to feasibly generate funds. As such, countries in Africa have been characterized by a dependency on external borrowing and foreign aid to enhance and promote their economies. The debt hints at servicing cost burden together with the disposal of the region's investment in either physical infrastructure or other development factors (Kur, Chukwu, & Ogbonna, 2021).

3.3. EMPIRICAL LITERATURE

This section focuses on the empirical studies related to the current study. To remain relevant, the section is aligned with the first three objectives of this study.

3.3.1 The Effects of external debt on economic growth

The impact that debt has on economic growth can be obscure, given the debate that emerged following the contrivance of the global financial and economic crisis (Djiogap, 2016). By utilizing the model of endogenous growth, Casares (2015) analysed the non-monotonic of external debt to economic growth, and as such concluded that there can exist a non-linear relationship between external debt and growth. The implication is that given moderate amounts of indebtedness, the improving amount of debt-GDP can stimulate growth, although, at excess levels of indebtedness, an increase in the amount of debt-GDP may hinder economic growth. Relatively, through their study of the relationship between external debt and economic growth in emerging markets, Shkolney and Koilo (2018) concluded with the assumption that in emerging economies, external debt has a non-linear impact on growth. This conclusion was based on the fact that the regression results indicated that the real values have an insignificant impact on the estimation of the parameters. The pair further acknowledged that growth is likely to be hindered given excess levels of external debt paired with macroeconomic instability, yielding a negative relationship between external debt and economic growth.

Even so, Manesseh et al (2018) investigated external debt and economic growth in SSA by taking into consideration governance and external debt volatility. Thus, the paper concluded that through the utilization of the Dynamic System Generalised Methods of Moments (DSGMM) methodology and control over ordinary sources of growth, external debt negatively and significantly influenced economic growth in SSA. Also, how governance indicators, external debt, and external debt volatility relate, yields a constructive influence on GDP in SSA. Therefore, it is advised the SSA governments enhance the standard of governance by guaranteeing political stability, reducing corruption, and enforcing sustainable policies and regulations to enable and enhance GDP through an upgrade of private sectors, which the government needs to ensure that the borrowed funds are sustainably managed and allocated for the aim of

enhancing economic growth. Inversely, Kharisu and Ada (2018) found in their study that external debt has a negative and significant relationship with economic growth and better utilization and allocation of borrowings can positively impact growth. The annual budget is instigated by constant excess of external borrowing. Interestingly. Sogoni (2014) concluded that there is a negative relationship between external debt and economic growth in the sense that by being enabled to acquire funds in the international capital market most SADC countries are likely to increase their external borrowing thus exposing their economies to external shocks than promoting economic growth.

Furthermore, Ijirshar, Joseph and Godoo (2016) analysed the relationship between external debt and economic growth through both descriptive and econometric tools and found that external debt has a positive influence on economic growth. Whereas Hassan et al, (2019) concluded through the study of the external debt-economic growth nexus in HIPC that factors such as government stability, effectiveness, and legislation emanate a negative impact of external debt on economic growth. Senadza, Fiagbe and Quartey (2018), examined external debt and economic growth by utilizing the cointegration test and the error correction model and the results showed that external debt positively impacts economic growth. Also, by assuming that external debt assists developing countries achieve their development needs Kasidi and Said, (2013) found that external debt has a significant impact on economic growth. This is aligned with Shipila (2019) who utilized the ARDL cointegration test to determine the relationship between economic growth and external debt, of which it was determined that there existed a long and positive relationship between the variables. Furthermore, Epaphra and Mesiet (2021) analysed external debt burden on economic growth using the panel data methodology, and the results concluded that low levels of external debt positively impact economic growth whereas at higher levels there is a negative impact. Contrary to these findings, Zouhaier and Fatma, (2014) examined the effects of debt on economic growth in developing countries, utilizing the dynamic panel model, and the pair concluded that total external debt harms economic growth. Ayadi and Ayadi (2008) also concluded that external debt negatively affects growth by utilizing the Ordinary Least Squares (OLS) and the Generalised Least Squares (GLS) methodologies. Manasseh et al (2022), determined the impact of external debt on economic growth by adapting the Dynamic System Generalised Methods of Moments

(DSGMM) modelling technique which indicated that external debt has a negative and significant impact on economic growth, though accompanied by a reaction of economic indicators and their volatility, external debt has a positive impact on economic growth.

3.3.2. The relationship between public investment and economic growth

The relationship that public investment has with economic growth is distinct according to country, thus every country presents a different explanation concerning public investment (Rabnawaz & Jafar, 2015). Therefore, by discussing the different channels in which public investment influences economic growth Rabnawaz and Jafar (2015) concluded their work with a binary effect from public investment to economic growth, that is, investment can positively or negatively influence growth. Normally, public investment yields higher levels of production, helping the country's output level to increase together with employment and overall boost economic growth. Whereas the pair also concluded according to the Neo-classical view that the utilization of private spending is likely to cause public investment to increase given that resources are allocated more from the private sector to the public sector, negatively influencing economic growth and overall yielding a crowding-out effect for both the public sector and private sector, delaying growth. Relatively, Ahamed (2021) concluded through the utilization of the exogenous growth model that public investment is positively related to economic growth, given that the significance of factors of production is considered when determining growth. the study further states that public investment plays a fundamental role in the production function as it enables the procurement of capital for economic development. Furthermore, Fournier (2016) states through studying the positive influence public investment has on potential growth that public investment has a positive relationship with growth and labour productivity in the long run, especially given that investment is allocated sufficiently to health, research, and development. This proper allocation of human capital and physical investment rises the speed of convergence of developing countries and as such, the benefits growth experiences from the sourced investment are likely to decline given excess levels of public capital stock because of declining returns. Investment is considered essential for growth to improve. That is, the public investment being allocated for basic infrastructure and sectors such as education and health facilities is important as it may represent a

precondition enabling capital accumulation in the private sector. And investment in goods that benefit society but are inefficient with private incentives is likely to enhance human capital formation and a platform for the private sector to succeed, over time yielding high levels of growth (Epaphra & Massawe, 2016). Furthermore, Baum, Gueorguiev, Honda, and Walker, (2020) concluded that in relation to the macroeconomic theory, public investment encourages economic participation creating short-term influences on aggregate demand overall boosting growth in the economy, although, an excessive allocation of funds creates a burden on public investment which yields economic distortion and overall hindering the economy. That is, public investment harms economic growth. Inversely Hundie (2014), utilized the ARDL bounds test to determine the relationship between investment and economic growth, which was found to be positive because to attain sustainable levels of growth, it is essential to increase investment given the dual effects it presents. Khang and Hung (2021), argue differently that public investment has a negative impact on economic growth.

Conversely, Syadullah and Setyawan (2021) analysed the impact of investment on economic growth in the long run, undertaking the growth model together with a panel data analysis. The pair concluded that public investment in the form of infrastructure investment has a positive and significant impact on economic growth. Thus, investment in infrastructure development brings about adequate integration evenly across the economy, yielding fewer disparities, a decline in logistic cost, and also a decline in economic inequality among communities which further promotes community welfare with overall encouragement of economic participation which grows the economy overall. Adeosun, Olomola, Adedokun, and Ayodele (2020) used time-varying structures and nonlinearities in public investment through the ARDL test to determine public investment and growth inclusivity in Africa. The study concluded that public investment yields positive shocks which restore growth through access to opportunities for employment and also productive employment. However, Gilbert, Orfé, and Francois (2020) utilized the Cobb-Douglas production model to analyse the effects of public and private investment on economic growth in the CEMAC zone the study undertook a panel data estimation which was quantified through the Pool Mean Group and as such, it was determined that public investment has a negative and significant impact on economic growth. Although, Namoloh (2018) conducted a VECM

test that found that there is a long-run positive relationship between investment and economic growth this is deemed possible when the investment is made for a longer period.

3.3.3. The influence of debt service cost on economic growth.

According to Malik, Hayat, and Umer (2010) external debt together with its servicing cost presents an obstacle to growth levels and development progress in developing countries. Thus, over the years external debt has been analysed as the fundamental source of declining investment rates and growth outcomes in numerous countries. As such the trio suggested in their investigation of external debt and economic growth in Pakistan that external borrowing together with its servicing cost has an adverse impact on economic growth, this is because the accumulation of more borrowings will yield a rise in debt service which reduces economic opportunities. Evenly, Ijirshar, Joseph. and Godoo, (2016) concluded that external debt service cost has a negative impact on economic growth in both and short and long run, due to the factor that countries have insufficient levels of capital and thus borrowing overall creating a debt burden they cannot service, and this declines growth. This aligns with Muhammad and Abdullahi (2015) who found that debt service cost has a negative impact on economic growth.

Furthermore, Mahmud and Shahida (2012) found in their study, that they investigated debt overhang and the crowding-out effect of external public debt in Bangladesh with a focus on the external debt stock and external debt service. The study concluded that external public debt service has an insignificant causality with growth in the long run and causality is realized between external public debt stock and growth in the long run. And relatively in the short run, external debt service has an insignificant causal effect on growth whereas external debt stock has no effect at all. Conclusively, Yasar (2021) suggested that there exists an insignificant long-run unidirectional causal relationship between external debt and growth exhibiting sufficient evidence of the presence of the debt overhang hypothesis. The study also suggested that it may be because of the inefficient control and management of allocated financial resources and the insufficient governance in economic development together with a leadership recycling and uncompleted institutions in most developing and underdeveloped countries that there exists this unidirectional relationship.

3.3.4. Causality between external debt, debt service cost, public investment & economic growth

According to Saungweme and Odhiambo (2020), there is a unidirectional causality between economic growth and public debt in the short run, also, the causality is vulnerable to the complemented period. Relatively, the pair concluded that there is no causality between debt service and economic growth in the short run and long run. Therefore, advising policymakers to contemplate growth-promoting policies in the short run, as inefficient economic performance is likely to yield higher levels of external debt. Inversely, Hilton (2021) concluded in the study of developing economies, public debt levels have increased significantly and continue to increase following prominent levels of borrowing due to the influence of the COVID-19 pandemic. As such by examining the causal relationship between debt and growth utilizing the dynamic multivariate autoregressive-distributive lag (ARDL) Granger causality model, it was uncovered that there is no causal relationship between public debt and economic growth in the short run though there is a unidirectional Granger causality pacing from debt to growth in the long run. This imply that governments have to make sure that there exists an effective fiscal discipline to aid as a trailblazer for significant and sustainable utilization of the latest borrowings, such that accumulated borrowings should be utilized for essential projects, with the probability of a positive growth rate. Evenly, by undertaking the pane granger causality test to determine the causal link between health expenditure and economic growth Yusufu, Awyemi and Akmoafe (2022) found that investment and growth have a bidirectional causality, in that investment affects the health sector which affects economic growth and similarly, the effects of economic growth on the health sector influence the level of investment.

3.4. LITERATURE GAP ANALYSIS

Throughout the study, different literature has been reviewed and discussed, highlighting the effect, relationship and impact of external debt, debt service cost and public investment on economic growth. Many of the presented papers had different views and conclusions in their studies, where the effect of which external debt has on economic growth was concluded differently per case, though a similar context of the manner in which the borrowed funds are allocated within the economy was mentioned numerous times when concluding how external debt impacts economic growth.

Although, factors such as government spending, consumption, and a countries ability to import and export were not highlighted, such factors are imperative not only to how a country can be able to service their borrowing but also related to its ability to using its sourced revenue for public investment purposes. That is, a gap in literature was presented in that the studies lacked an analysis of how the variables are affected when considering, the way in which government spends, how households contribute to the economy and also role a country plays in the international market. Evenly, a linkage between debt and investment has been made to enable an effective analysis of how to manage bowing and grow the economy.

3.5. SUMMARY

This chapter provided the theoretical framework of the study which outlines theories that support the study. Theories inclusive of the neoclassical growth theory, debt overhang theory, and the dual gap theory were discussed. Given the various contribution and lack thereof that the theories bring to literature, the foundation of the study will be on all theories as they are essential to the study. Although, the study will utilize the dual gap theory more as literature has indicated that external debt, its servicing cost, and public investment if utilized allocated, and sustained effectively can ensure economic growth. Thus, when debt is accumulated, allocated, and well-serviced it attracts growth investment which presents opportunities and overall grows the economy. Although, the debt overhang theory is also of consideration given its clear outline of the impact of external borrowing on the economy and the consequences of being unable to service the accumulated debt in the economy. Furthermore, following external debt accumulation and public investment theoretical background, the chapter analysed empirical literature which presented different views by several authors about the impact external debt, debt service cost, and public investment have on economic growth, and an analysis of their relationship thereof. The empirical literature found a mixture of both positive and negative impacts of external debt on economic growth. Debt service costs influencing economic growth negatively, and public investment has both a positive and negative relationship with economic growth. Furthermore, the literature review also found the presence of a unidirectional causality between external debt and economic growth.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

Given the theoretical and empirical findings in the previous section, this section outlines the research methodology of the study. The section presents data and its sources, the model, and all the econometric modelling techniques that have been employed.

4.2 DATA DESCRIPTION

The study made use of secondary annual panel data from the period 1990 to 2020. Data for GDP, External Debt, Debt Service Cost, Public Investment, Household Consumption, National Savings, and Terms of Trade was sourced from the World Bank database. The study focused on eleven SADC countries namely: Angola, Botswana, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe. The countries were selected to enable effective comparison between highly indebted countries (HIC), and also countries with average debt rates which can manage their debt levels significantly and are less indebted (LIC).

4.3 MODEL SPECIFICATION

The study investigates the debt overhang paradox and public investment on economic growth in indebted countries. Based on modelling and adopted variables suggested by Sichula (2012), Siyanga (2018), and Knoll (2013), to analyse debt overhang, the envisaged model of this study consists of external debt stock along with the servicing cost and also the resisting fiscal decline of public investment. In addition, control variables including household consumption, government spending, and terms of trade are added to the model to improve the study's internal validity by restricting the impact of extraneous variables (Bhandari, 2021). Also, they enable the model to determine the causal impact of the analysis on the outcomes (Hunermud & Louw, 2020). Since this study undertakes a comparative analysis, the model will be represented with two

functions. The first model will be used for the analysis of the HICs and the second one for the analysis of LICs.

The functional form of the models is represented as:

$$GDP_{HIC} = \text{f}(\text{EXDBT}, \text{DSERV}, \text{PINV}, \text{FCE}, \text{GFCE}, \text{TOT}) \quad (4.1)$$

$$GDP_{LIC} = \text{f}(\text{EXDBT}, \text{DSERV}, \text{PINV}, \text{FCE}, \text{GFCE}, \text{TOT}) \quad (4.2)$$

Additionally, the variables inserted into the model will be converted into logarithms. The introduction of a logarithm is imperative as enables variables to behave moderately and also controls the influence of outliers (Wooldridge, 2007) and thus the linear models are presented as follows:

$$LGDP_{itHIC} = LEXDBT_{it} + LDSERV_{it} + LPINV_{it} + LFCE_{it} + LGFCE_{it} + LTOT_{it} \quad (4.3)$$

$$LGDP_{itLIC} = LEXDBT_{it} + LDSERV_{it} + LPINV_{it} + LFCE_{it} + LGFCE_{it} + LTOT_{it} \quad (4.4)$$

Where $LGDP_{itHIC}$ measures the rate of economic growth in highly indebted countries, $LGDP_{itLIC}$ measures the rate of economic growth in less indebted countries, LEXDBT presents external debt, LDSERV denotes debt service, and LPINV denotes public investment. In addition, LFCE represents household consumption, LGFCE denotes government spending, and LTOT represents the terms of trade.

4.4 ESTIMATION TECHNIQUES

The estimated tests consist of the unit root test, followed by the panel cointegration test, and the Panel Vector Error Correction Model (PVECM). Unlike standard regression, panel data regression follows specific estimation techniques. A panel data model is considerably direct as it is a combination of time series and cross-section data. Thus, the model does not investigate time and individual dimensions, rather the model supposed that the behaviour of collective data is similar during numerous periods (Rika, 2011). Econometric modelling undertakes the panel analysis because it represents a more capable technique to run dependencies of unobserved independent variables related to the dependent variable, often yielding biased estimators in the linear regression models (Brugger, 2021).

Furthermore, the observations contain cross-sectional dimensions denoted by i, and time-series dimensions denoted by t. Panel data is chosen because it has numerous advantages over the cross-sectional and time-series techniques, such as the fact that it contains more accurate inferences of the model parameters, as it usually has more degrees of freedom and more sample variability than cross-sectional and time-series data where the panel of T and N is equal 1. Also, a panel has the advantage of capturing more complex human behaviour such as testing more robust behavioural hypotheses than single time-series or cross-section data. Evenly, when an econometric model is assessed utilizing panel data, it is most likely to control the influence of omitted variables as it has information regarding both the intertemporal dynamics and also the specification of the variable enabling the control of the influence of missing and unobserved variables. Lately, panel data enables the researcher to uncover dynamic relationships among variables because it represents inter-individual differences that yield the reduction of collinearity between collected and lagged variables to forecast unlimited time-adjustment patterns (Hsiao, 2007).

Adaptation of PVECM to run the cointegration test enables the model to estimate the Granger causality test, this allows determination for both the long-run and short-run causality. Analysing cointegration among variables and the existence of cointegration thereof indicates that at least there is a causal direction in the variables (Khandaker & Khairul, 2019).

4.4.1 Descriptive Statistics

Descriptive statistics is an econometric modelling technique that is used in a PARDL, it summarises data in an arranged order through the description of the relationship between variables in a sample. This technique is a crucial first step when conducting research and it must be performed before forming any other inferential statistics comparison (Kaur, Stoltzfus, & Yellapu, 2018). Descriptive statistics focuses on describing the midpoint of scattered results, given its normal reference as the measure of central tendency, and the scarred results are identified as variances. Various categories of descriptive statistics are used to describe variables in a sample through the level of measurement that is used, such includes the nominal level of measurement which is used to capture variables into broad categories, such as measuring variances based on their significance. The measure categorizes the central

tendency of the most frequent number of counts and categorizes them as the mode of the data set. Also, the ordinal level of measurement is where variables involved in the research process are sorted into categories of numerical hierarchy. Ordinal data is determined into a specified hierarchy, where all variables are arranged from lowest to highest score, with the value at the middle of the rank-ordered distribution identified as the median (Murray, Fisher, Andrea, & Marshall, 2009). Thus, descriptive statistics is a tool used mainly where large data sets need to be interpreted, this is done by arranging and summarising the data (Zealure, 2017).

4.4.2 Panel Unit root test

Unit root testing has become a frequent practice in empirical studies. Though the utilization of unit root in panels is rather recent, it incorporates significant developments in non-stationary panel models. Panel data technique has been adapted from micro panels including large N (the sum of cross-section data) and small T (the sum of time series data) to macro panels with large N and large T (Barreira & Rodrigues, 2005). Through the panel unit root test framework, two generations of the test have emerged. The first-generation consists of the Levin-Lin-Chu (LLC) test (2002), Im-Pesaran-Shim (IPS) test (2003), and the Fisher-type test (2001); whose fundamental limit is the assumption of the cross-sectional independence hypothesis. Therefore, deciding if ever economic data are stationary or integrated, it is necessary to test for the null hypothesis of stationarity along with that of a unit root. Moreover, testing for stationarity in panel data alternates to single time series, which yields similar advantages induced for panel unit root test, whereas N grows the ability of the test increases and the test statistic distributions become asymptotically normal (Barbieri, 2005).

Throughout the last decade, substantial model testing was conducted for panel unit root testing. Where numerous panel unit root tests were formulated to test the null hypothesis of a unit root for individually collected series in panel data. The conceptualization relating to the alternating hypothesis is ideally a disputed proceeding that adversely depends on which assumptions are fundamental concerning the classification of homogeneity or heterogeneity of the panel (Pesaran, 2011). Testing for stationarity in a panel model is essentially filled with curiosity and can be instantly persuaded. It appears reasonably advantageous that, within the general class of

models where heterogeneity is limited to individual fixed effects, time series functions of an individual variable are expected to be well estimated either as an autoregressive process including a near-unit root and insignificant fixed effects. Both alternatives can be considered a single model where the test of the former against the latter incorporates the panel data unit root test (Hall & Mairesse, 2002).

Panel unit root is the first step undertaken to enable the test of panel cointegration, this is because the variables must be integrated in the same order. Given the different unit root tests that are presented in panel data, the null hypothesis of all these panel unit root tests has at most considered the non-stationarity of the data set in its null hypothesis. Thus, the IPS represents a combination of information from the time series dimension with that obtained from the cross-section dimension, as such less time observations are thus required for the test to have power (Pradhan, 2016). The test presents a null hypothesis that there is a unit root whereas the alternative hypothesis states that there is no unit root. That is, LLC (2002) assumes that there is a similar unit root process and the IPS and ADF assume that there is an individual unit root process. The model, therefore, tests unit root assuming that there exists an individual process in which the null hypothesis cannot be rejected at 1%, 5%, and 10% levels of significance (Kim, 2019).

4.4.2.1 Levin, Lin, and Chu (LLC, 2002) test

According to Mugowo (2017), the LLC is a unit root test that enables the possibility of correlation and heteroscedasticity, while maintaining independence across the model cross-sections. The test determines unit root assuming that each individual unit in the panel model shares the same AR (1) coefficient, simultaneously allowing for individual effects, time effects and even time trends when possible. Evenly, the dependent variable is also included to enable for serial correlation in any omission (Birnhorst & Baum, 2001). LLC test follows the hypothesis where the null hypothesis states that each time series contains a unit root and the alternative is that each time series is stationary (Babu, Kiprop, Kalio, & Gisore, 2014).

The LLC model presents restricted coefficients to be homogenous across all units of the panel model. The model is presented as follows (Reza & Zahra, 2008):

$$(b_i = b \qquad \forall_i) \tag{4.5}$$

$$\Delta x_{i,t} = bx_{i,t-1} + \sum_{z-1}^{L_t} \beta_z \Delta x_{i,t-z} + \varepsilon_{i,t} \quad (4.6)$$

Given that N and T go to infinity with $\frac{\sqrt{N}}{T}$ moving toward zero, the test is determined with the test for the null hypothesis $H_0: b = 0$ against the alternative $b < 0$ where all $i = 1 \ldots N$. Homogeneity is an assumption that is distinctly restrictive and is subject to possible biasness of fixed effects estimators (Reza & Zahra, 2008).

4.4.2.2 Im, Pesaran, and Shin (IPS, 2003) test

The IPS test is preferred among the other test given that besides being the most cited unit root test in literature, the test utilizes a balanced data panel instead of only different time series for different samples. The test is mainly based on the heterogeneity parameters, which is possible in either the error variance or the serial correlation structure presenting the errors (Rizvi & Nishat, 2009). Test determined using this model are mainly those of cross-sectional dependence. It enables heterogeneity in coefficient presenting lagged dependent variables across all the panel unit. Thus, the model is presented as follows, it includes individual effect and no time trend (Mugowo, 2017):

$$\Delta Y_{i,t} = \alpha_i + \rho_i Y_{i,t-1} + \sum_{z=1}^{\rho} \beta_{i,z} \Delta Y_{i,t-z} + \varepsilon_{i,t} \quad (4.7)$$

The model presents the null hypothesis described as $H_0: \rho_i = 0 \; for \; i = 1, \ldots N$ and the alternative hypothesis as $H_1: \rho_i < 0 \; for \; i = 1, \ldots N \; and \; \rho_i = 0 \; for \; i = N_1 + 1, \ldots N \; with \; 0 < N_1 \leq N$. As such, the alternative hypothesis gives room to some individual series to have unit roots. Therefore, instead of presenting pooled data IPS utilises different unit root test for the N cross section units. The test is founded in the ADF (1980) statistical mean across the selected groups (Mugowo, 2017).

4.4.2.3 Fisher Type Test

This test converges on the basis of p-vales having a long history in meta-analysis. That is, when undertaking a panel unit root test, the fisher type test is then introduced as utilised by Choi (2001) and Maddala (1999) (Hurlin & Mignon, 2007). The test is based solely on the proposal of combining p-values of the test statistic from the individual unit root tests. It is non-parametric and similar to the IPS it enables the presence of different first-order autoregressive coefficients and a similar null and

alternative hypothesis when undertaking the estimation of the model. Comparably, the test presents an ideally accurate size and more effective power compared to LLC, it brings about flexibility when selecting the different leg lengths in each series of the ADF regression. Therefore, the test may be considered more useful as it may reduce the bias caused by the lag selection (Ling, Liew, & Syed Khalid Wafa, 2010).

4.4.3 Lag Order Selection Criteria

Lag length criteria are econometric modelling that is considered difficult to determine, especially in an autoregressive process utilizing the Autoregressive Integrated Moving Average (ARIMA) modelling. The technique has several criterions to select from namely, the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan-Quinn Information Criterion (HQ), Final Product Error (FPE), and the corrected version of AIC (Zahid & Irum, 2007). The study employs the criterions as their fundamental function is to determine the probability of selecting the true lag length for an autoregressive model being estimated. Noting that probability takes the overall value between zero and one, as such, having the probability zero can indicate that the criterion failed to select the true lag length, and thus a poor criterion is presented.

Whereas, having the probability of one can be an indication of selecting a true lag length and thus presenting a significant criterion (Venus, 2004). Accordingly, the technique is applied as the first step to determining cointegration in the model. Where the decision criteria are mainly based on the number of observations, and it is noted that the different lag length selection criteria yield different conclusions about the optimal lag order that has to be used, given that, the selected lag length can significantly influence the cointegration results (Emerson, 2007). Therefore, the criteria are established to have inconsistencies and also the likelihood to miscalculate the autoregressive lag length (Venus, 2004). According to Han, Peter, and Phillips (2013), model results, consistency and reliable estimations likely rely on correct lag length selection. As the presence of insignificant parameters such as fixed effects and insignificant trends interrupt the procedure utilized when selecting a lag length in the model, which can yield inconsistency in the estimation order.

4.4.4 Correlation Matrix

A correlation matrix refers to a situation in which data in the model is presented to indicate if ever there is a high or low correlation coefficient among variables. The test is undertaken to illustrate summarized data, which informs an advanced analysis, and also a diagnostic for the advanced analysis (Bock, 2022). As a way to assess the relationship among independent variables which are inclusive of multivariable, the intercorrelation relationship is realized, which is also known as multicollinearity. Multicollinearity is utilized as an econometric testing tool to measure, detect, and explain the effects realized on results with multiple linear regression analyses (Kim, 2019). When testing correlation matrix, multicollinearity is realized when a high correlation exists among the independent variables in a linear regression model, and this has an impact on the interpretation of the model results. Evenly, its presences subdue the ability to analyse the interpretation of the independent variables on the dependent variable individually. The probability of the probability value and the coefficient are greatly affected by the outcomes of multicollinearity, though the predictions and goodness-of-fit tests are not affected (Pulagam, 2020).

According to Han and Liu (2017), the function of correlation matrix plays a fundamental rule in mainly multivariate methods such as graphical model estimation and factor analysis. The pair further stated that lately, the test has been focusing on Pearson's sample correlation, although the method is ineffective when dealing with heavy-tailed distributions. The utilization of this concept in multivariate statistics has enabled the interference of structure dependence among the random variables, this takes place when the population mean and covariance are unknown (Zhigang, Jiang, Xiaocong, & Xiaozhuo, 2022). When analyzing statistically, the application of correlation matrix is undertaken first, this shows the real asymmetric positive semidefinite matrix involving unit diagonal from empirical and experimental data. Given that, during certain analyses, there might be missing observations and indefinite approximations to the sample that is when correlation matrix arises. Undertaking the correlation matrix in most studies has yielded outliers in the data which has overall introduced the development of robust estimators (Higham & Strabic, 2016).

4.4.5 Panel Cointegration For a panel dataset, cointegration in the panel between two or more variables is considered as the hypothesis test that is directly the degree of

evidence, or its absence thereof (Neal, 2014). That is, the following section will be discussing the different types of cointegration used when checking for the presence of cointegration between variables.

4.4.5.1. Pedroni Cointegration

Pradhan (2016) and Pedroni (1997, 1999) presented the panel cointegration test enabling the estimation of cointegration among the variables. By doing the test, numerous cross-sectional interdependences are allowed together with different other individual effects that bring about the estimation of cointegration. The utilization of cointegration techniques to determine the presence of a long-run relationship between integrated variables has grown exceedingly when studying empirical literature and econometric modelling (Pedroni, 1997). The utilized panel data sets are logically large in both cross-sectional (N) and time series (T) dimensions. Such that, Pedroni (1999 & 2004) brought about numerous test statistics, testing the null hypothesis of no cointegration in non-stationary panels. The tests thus enable heterogeneity in panels, for both short-run dynamics and long-run slopes together with intercepts coefficient.

Contrary. to standard time series analysis, this technique is inconsiderate of normalization or the required amount of cointegrating relationships. The panel cointegration tests have two main approaches, the residual-based and the maximum-likelihood-based approach. Where the residual-based approach of Pedroni (1999) is mainly utilized to test for the presence of a unit root in the residual of an invalid regression, as the presence of a unit root in the residual entails that there is no cointegration between the integrant of the model (Orsal), the residual-based approach consists of the Kao (1999) test which suggests testing for a homogeneous cointegrating relationship in a panel regression where individual fixed effects are allowed, and also the Pedroni (1999) test which enables several heterogeneities in a cointegrating relationship, the test suggests estimating the first-stage regression separately for each panel member to derive an estimate of the independent variable.

The Pedroni cointegration test is undertaken using the Fisher (Johansen Combined) cointegration test. The test is presented to determine the null hypothesis that a cointegrating relationship does not exist against the alternative hypothesis of an existing cointegrating relationship. As such, the test averages the test of statistics indicating that the null hypothesis of no cointegration can be rejected as 1%, 5%, and

10% level of significance for all the estimated variables (Pradhan, 2016). According to (Kim, 2019) the panel cointegration test at most consists of seven statistical tests which are meant to determine the null hypothesis that cointegration does not exist in heterogeneous panels. The classification of the tests can be either within-dimension (panel test) or between-dimension (group tests), where the within-dimension approach tests the null hypothesis of no cointegration with the alternative that there is cointegration. Evenly, the between-dimension undertakes a less restrictive approach that does not require stating the probability value under the alternative hypothesis.

4.4.5.2. Fisher Combined Johansen Cointegration Test

The Fisher test is a cointegration test in which Johansen presented a combination of two different approaches to determine cointegration among variables. It is through this approach that non-stationarity in a cointegrating vector is determined using the likelihood ratio trace statistics test and the maximum eigen- value statistics test. Thus, the mentioned statistic approaches are derived by the fitting equations below (Kurtovic, Siljkovic & Milanovic, 2015):

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} In(1-\hat{\lambda}_i) \quad (4.8)$$

$$\lambda_{max}(r, r+1) = -TIn(1-\hat{\lambda}_{i+1}) \quad (4.9)$$

Where:

T : $Sample\ size$

n : $Total\ Number\ of\ variables$

$\hat{\lambda}_i$: $the\ largest\ cononical\ correlation\ between\ residua; ls\ from\ the\ processed\ dimensions$

The null hypothesis for the cointegration is derived that $H_0: \lambda = 1$ against the alternative hypothesis that $H_1: \lambda < 1$ (Kurtovic et al, 2015). That is, for there to be a cointegrating relationship between variables in a series the trace statistic and the maximum-eigen value statistic values have to be greater than the 5% level of significance. This yields the acceptance or rejection of the presented results, the Fisher Combined Johanssen cointegration test is mainly utilised in determining whether there is more than one cointegrating relationship among variables in the model (Prakash & Savitha, 2017).

4.4.5.3. *Kao Cointegration Test*

The Kao (1999) cointegration test presents a different narrative of cointegration from the Pedroni and Fisher cointegration test given that it has a different null hypothesis to determine the presence of cointegrating variables. Through a panel data analysis, the Kao test utilises the DF and ADF test (Yardimcioglu, Gurdal, Altundemir, & Egitim, 2014). The test's model is presented as follows (Dogan & Deger, 2016):

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it} \quad (4.10)$$

Where:

Y: dependent Variable

α_i: Stationary Effect

it: Model trend

The model assumes that independent variables and dependent variable are stationary, at first level. Which expresses the hypothesis as follows,

H_0: No cointegration for all variables.

H_1: There is cointegration for all variables.

According to Lucero Ortix, Rodriguez, and Gomez (2020), the Kao test determines cointegration in case the series is proven to be stationary at first difference, that is the long-run relationship is then determined between the integrated variables. The results are rejected at a 1% level of significance, indicating the presence of a long-run relationship between the variables.

4.4.6 Panel Vector Error Correction Model

This econometric modelling has been applied by Engle and Granger (1987), and it suggests a two-way procedure to enable the examination of the short-run and long-run dynamic relationship between variables presented in the model (Pradhan, 2016). The VECM is regarded as the co. According to Asari, Baharuddin, Jusoh, Mohamad, Shamsudin and Jusoff (2011) when cointegration is detected amongst variables, it is an indication that a long-run relationship exists in the model and therefore this brings about the application of VECM which is used to examine the short-run properties of

the cointegrating variables. Given that, VECM modelling provides an overall long-run relationship between dependent variables, it also gives the short-run dynamics for the very dependent variables. It is therefore through the model that achieving a long-run relationship is indicated, along with the rate of change in the short-run relationship to realize equilibrium. This is because, in the long run, variables are meant to converge to an equilibrium where their cointegrated relationship exists (Jaupllari & Zoto, 2013). That is, a regression equation form for VECM is introduced as the following (Asari et al, 2011; Winarno et al, 2021):

$$\Delta Y_t = \alpha_1 + y_1 x_1 + \sum_{i=0}^{n} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} \delta \Delta X_{t-i} + \sum_{i=0}^{n} \gamma_i Z_{t-i} + \varepsilon_t \quad (4.11)$$

$$\Delta GDP_{t,hic} = \alpha_1 + y_1 x_1 + \sum_{i=0}^{n} \beta_i \Delta EXDBT_{t-i} + \sum_{i=0}^{n} \delta \Delta DSERV_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta PINV_{t-i} + \sum_{i=0}^{n} \theta_i \Delta FCE_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta GFCE_{t-i} + \sum_{i=0}^{n} \mu_i \Delta TOT_{t-i} + \varepsilon_t \quad (4.12)$$

$$\Delta GDP_{t,lic} = \alpha_1 + y_1 x_1 + \sum_{i=0}^{n} \beta_i \Delta EXDBT_{t-i} + \sum_{i=0}^{n} \delta \Delta DSERV_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta PINV_{t-i} + \sum_{i=0}^{n} \theta_i \Delta FCE_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta GFCE_{t-i} + \sum_{i=0}^{n} \mu_i \Delta TOT_{t-i} + \varepsilon_t \quad (4.13)$$

$$\Delta X_t = \alpha_2 + y_2 x_{i-1} + \sum_{i=0}^{n} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} \delta \Delta X_{t-i} + \sum_{i=0}^{n} \gamma_i Z_{t-i} + \varepsilon_t \quad (4.14)$$

Where:

Δ : $Difference, where\ \Delta y_t = y_t - y_{t-1}$

y_{t-i} : Vector variable dependent with the 1st lag

ε_t : Vector residual

γ_i : Matrix with order k*k of coefficient dependent on the i-th variable

α : Vector adjustment, matrix with order k*r

β : Vector cointegration (long run parameters)

Given that VECM enables the cointegration ranks to be presented in a way that the cointegrating vectors are shown. The utilization of the VECM model such as the one presented above can be used to present the cointegrating vectors for instance, where a rank of two shows that the two linear independent combinations of the non-stationary variables can possibly be stationary. Thus, a negative and significant coefficient of the Error Correction Model (ECM) shows that in any short-run shift between the

independent variables and the dependent variable, there will be a realization of a stable long-run relationship between the variables given that the model is bound to converge to equilibrium in this state (Asari et al, 2011). Evenly, Basuki and Karima (2017) argue that VECM modelling limits the long-run dependent variables' relationship to enable it to remain convergent in the cointegrating relationship, simultaneously still considering the short-run relationship to exist.

Therefore, the variables' short run dynamics are provided as they can be impacted by the deviations from equilibrium. Hence, equations (4.12 & 4.13) can be transformed to determine the ECM which is the error correction term equation as follows:

$$\Delta GDP_{t,hic} = \emptyset_i\big(GDP_{i,t-1} - \beta_t' EXDBT_{it} - \delta_t' DSERV_{it} - \gamma_t' PINV_{it} - \theta_t' FCE_{it} - \varphi_t' GFCE_{it} - \mu_t' TOT_{it}\big) + \sum_{h=1}^{n-1} \tau_i' GDP_{i,t-h} + \sum_{h=1}^{x-1} \beta_i' EXDBT_{i,t-h} + \sum_{h=1}^{r-1} \delta_i' DSERV_{i,t-h} + \sum_{h=1}^{k-1} \gamma_i' PINV_{i,t-h} + \sum_{h=1}^{u-1} \theta_i' FCE_{i,t-h} + \sum_{h=1}^{c-1} \varphi_i' GFCE_{i,t-h} + \sum_{h=1}^{n-1} \mu_i' TOT_{i,t-h} + \varepsilon_t \quad (4.15)$$

$$\Delta GDP_{t,lic} = \emptyset_i\big(GDP_{i,t-1} - \beta_t' EXDBT_{it} - \delta_t' DSERV_{it} - \gamma_t' PINV_{it} - \theta_t' FCE_{it} - \varphi_t' GFCE_{it} - \mu_t' TOT_{it}\big) + \sum_{h=1}^{n-1} \tau_i' GDP_{i,t-h} + \sum_{h=1}^{x-1} \beta_i' EXDBT_{i,t-h} + \sum_{h=1}^{r-1} \delta_i' DSERV_{i,t-h} + \sum_{h=1}^{k-1} \gamma_i' PINV_{i,t-h} + \sum_{h=1}^{u-1} \theta_i' FCE_{i,t-h} + \sum_{h=1}^{c-1} \varphi_i' GFCE_{i,t-h} + \sum_{h=1}^{n-1} \mu_i' TOT_{i,t-h} + \varepsilon_t \quad (4.16)$$

As per the above model 4.15, the parameters of the error term, thus the speed of adjustment is presented by $\emptyset_i$. The parameters must be non-zero given their representation of the speed of adjustment. When the parameters are estimated to equal to zero, the long run relationship between the variables will be non-existent as the model will be unable to converge to equilibrium. Therefore, the parameters of the error term are presented in this manner as the error term has to be statistically significant and negative.

4.5 PANEL GRANGER CAUSALITY

Granger Causality was developed to examine the flow of data between panel data, identifying the directionality, directness, and dynamics of influences between sources based on the idea that a cause happens before its effects and knowledge of the cause enhances forecasts of its effects (Stokes & Purdon, 2017). Furthermore, the Granger Causality test determines whether a predictable event occurs before another, which helps to predict the event. As variables are considered to Granger-cause each other provided that previous estimates of a predictable variable assist when predicting the

latest level of an additional variable presented with relevant information (Masoga, 2017). The panel Granger Causality test utilizes different techniques, where the assumption of the utilized data formation in the model is what the test depends on. The panel causality relationship is determined through the bivariate regression being estimated, and it is considerate of both the cross-sectional dependency and heterogeneity to allow the formulation of panel data. Thus, the presence of causality in the model is indicated by the test results with significant probabilities (Ncanywa & Letsoalo, 2021).

4.6 DIAGNOSTIC TEST.

Harvey (2001) urges that testing for stability is essential in model estimation because, amongst other things, the test provides the validity of both the dependent and independent variables over time. Therefore, the test's importance is realized when the results indicate if every non-stationary series is progressing in a manner that their differencing is stationary. Whereas the model estimated has to undergo numerous tests which are utilized to estimate diagnostic guidelines. The diagnostic test is undertaken to decide whether the model is dependable or at least adheres to the properties of a good model (Ncanywa & Letsoalo, 2021).

4.6.1 Normality Test

The test is used to study for the normal distribution of the estimated model, in which Masoga (2017) states that residuals can best emulate normal distribution in which the mean is zero and the variance is constant, by taking into consideration OLS estimates. Given the regression coefficient, OLS estimates are the Best Linear Unbiased Estimators (BLUE). The test is conducted using the Jarque-Berra statistics, in which the probability value and the relative Jarque-Berra value are imperative aspects to check.

4.7 STABILITY TEST

The inverse root of autoregressive is a stability test that holds the general principle that when all roots are within the unit circle then the estimated model will be considered stable, and it has to be viewed as appropriate for statistical purposes (Ncanywa & Letsoalo, 2021). Also, taking into consideration the inverse of roots AR characteristics

of polynomial, stability is achieved when the model (q) includes all the variables within the unit circle, that is, the roots of characteristics are not outside the unit circle (Nwafor, Odok, Atsu, & Esuabana, 2016).

4.8. SUMMARY

This chapter outlined the detailed theoretical framework for the research methodologies that will be utilised in the study. Firstly, the data collection methods where highlighted, followed by the outline of the model specification, and then the different estimation techniques. The techniques utilised in the study are inclusive of the descriptive statistics, unit root utilising the LLC, IPS, and Fisher type tests. The techniques further explained the lag selection criteria, along with the correlation matrix and then the cointegration test. The panel VECM was also explained, followed by the granger causality test. The chapter concluded the methodologies with the diagnostic and stability test.

CHAPTER 5

DISCUSSION, PRESENTATION, AND INTERPRETATION OF FINDINGS

5.1 INTRODUCTION

This chapter presents empirical results and discussions of findings. This includes the descriptive test results, unit root analysis, lag length criteria and the correlation matrix. Panel cointegration test is also presented where the focus is on the Fisher Combined Johansen test. Furthermore, the long and short-run results from the panel VECM are presented as well as the Granger causality analysis outcomes. The last part of the section presents the findings from the Impulse response function, variance decomposition as well as the stability and diagnostic tests.

5.2 EMPIRICAL RESULTS

5.2.1 Descriptive statistics test results

Tables 5.1 and 5.2 present a summary of the descriptive statistics of variables utilized in the modelling terms of the mean, standard deviation, minimum and maximum values in selected highly and less indebted SADC countries.

Table 5.1: Descriptive statistics test results: highly indebted countries

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
GDP	4.678179	4.356542	-9.900000	11.9000	68
EXDBT	3.968741	0.586182	2.884505	5.139903	68
DSERV	3.601620	3.609038	0.265944	23.06473	68
PINV	2.869345	0.796599	0.422110	4.095316	68
FCE	4.238312	0.618755	2.338662	4.799585	68
GFCE	2.625691	0.472708	0.716435	3.276038	68
TOT	4.166283	0.338950	3.387918	4.845793	68

Source: Author computation using World Bank data

Table 5.1 presents the descriptive statistic in highly indebted countries, where the bloc's mean GDP rate is 4.67 percent, and the standard deviation is 4.33. The total number of observations is 68, covering the period 2004 to 2020. The minimum growth rate experienced was -9.90 percent whereas the maximum was 11.90 percent. The HICs realized a mean rate for external debt of 3.96 percent during the estimated period. This had the lowest external debt accumulated of US$2.88 million and the highest of US$5.13 million. The rate of servicing the external debt was a mean rate of 3.60 percent, along with a standard deviation of 3.61 percent. The countries recorded a minimum debt servicing cost of US$0.26 million and a maximum of US$23.06 million. Evenly, during the same period, the mean value of the acquired public investment amounted to US$ 2.86 million, with the lowest investment valued at US$ 0.46 million and the highest value of US$4.09 million. Lastly, the region's selected HICs had relatively high rates of spending on household consumption, government spending, and terms of trade from 2004 to 2020.

Table 5.2: Descriptive statistics test results: less indebted countries

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
GDP	1.308513	0.780145	-2.179892	2.710048	72
EXDBT	3.449569	0.794699	1.359695	5.047699	72
DSERV	7.126428	8.906801	0.370263	45.11784	72
PINV	3.138751	0.267513	2.545183	3.757025	72
FCE	4.318585	0.186378	3.792984	4.535931	72
GFCE	2.828305	0.250084	2.104029	3.574113	72
TOT	4.348424	0.310911	3.820863	4.844682	72

Source: Author computation using World Bank data

Comparably, Table 5.2 presents the descriptive statistics outcomes for less indebted countries, which shows the selected regions' mean GDP rate of 1.30 percent and a standard deviation of 0.78 percent out of 72 observations from five countries for the period 2004 to 2020. The minimum growth rate experienced was -2.17 percent, with a maximum growth rate of 2.71 percent. Evenly, the group's accumulated external debt recorded a mean average of 3.44 percent, along with a standard deviation of 0.79 percent. The minimum external debt was valued at US$ 1.35 million with a maximum

of US$ 5.04 million. Relatively, a mean average of 7.12 percent and a standard deviation of 8.90 percent of debt service cost was recorded. The minimum servicing cost was recorded at US$ 1.35 million and a maximum of US$ 45.11 million. Furthermore, the countries' public investment mean rate was recorded at 3.13 percent and a standard deviation of 0.26 percent. This translates into a minimum of US$ 2.54 million and a maximum of US$ 3.75 million. Household consumption, government spending, and terms of trade recorded the growth mean averaging at 4 percent, with a standard deviation of less than one. The minimum and maximum spending costs were high for household consumption and terms of trade; thus, the government incurred less spending costs.

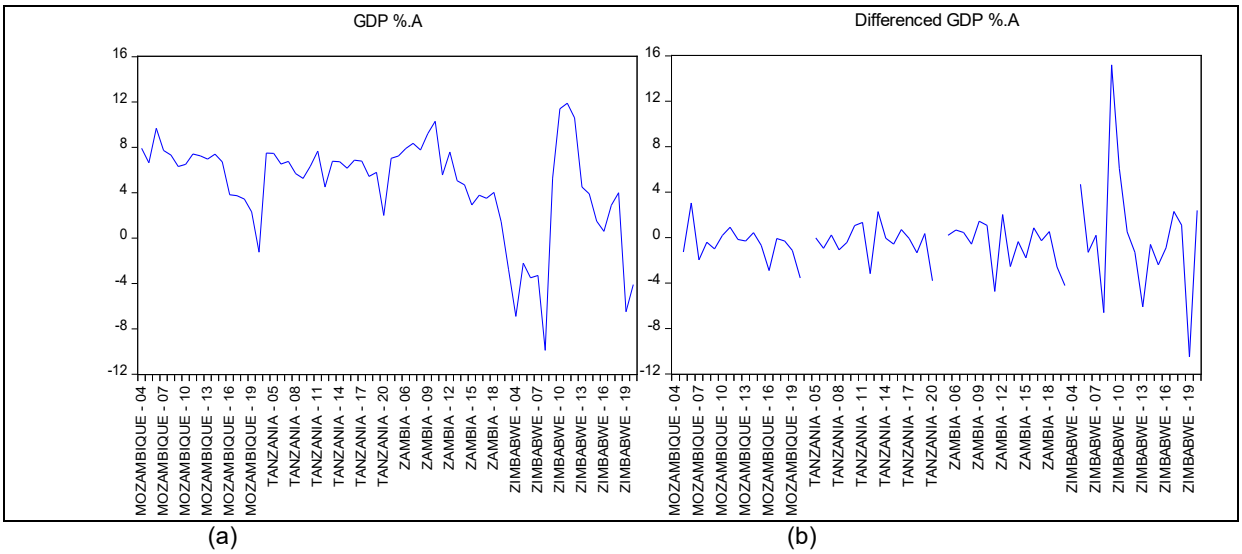
5.2.2 Informal unit root test

This section presents the graphical panel unit root test from figure 5.1 to 5.14, which indicates whether each variable in the study is stationary or non-stationary. This graphical unit root test further indicates whether the variables are trending the mean over time or not. The visual inspections of panel unit root are not conclusive because they only give a visual picture of the variables.

5.2.2.1 Highly Indebted Countries

The outcomes of the informal unit root analysis of the HIC countries variables are summarised as follows,

Figure 5.1: Gross domestic product (at level and first difference)

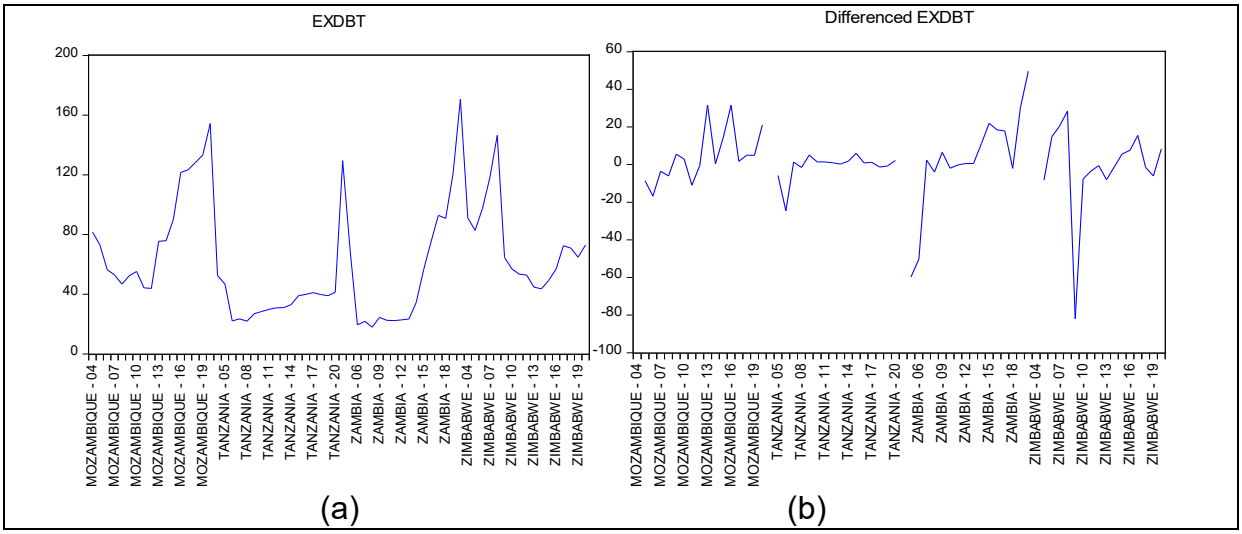


(a) (b)

Source: Author computation with World Bank data

Based on Figure 5.1 (a) GDP seems to be non-stationary which means it contains a unit root at level because it is not moving along the mean of zero overtime. It becomes stationary at first difference as it is trending along the mean.

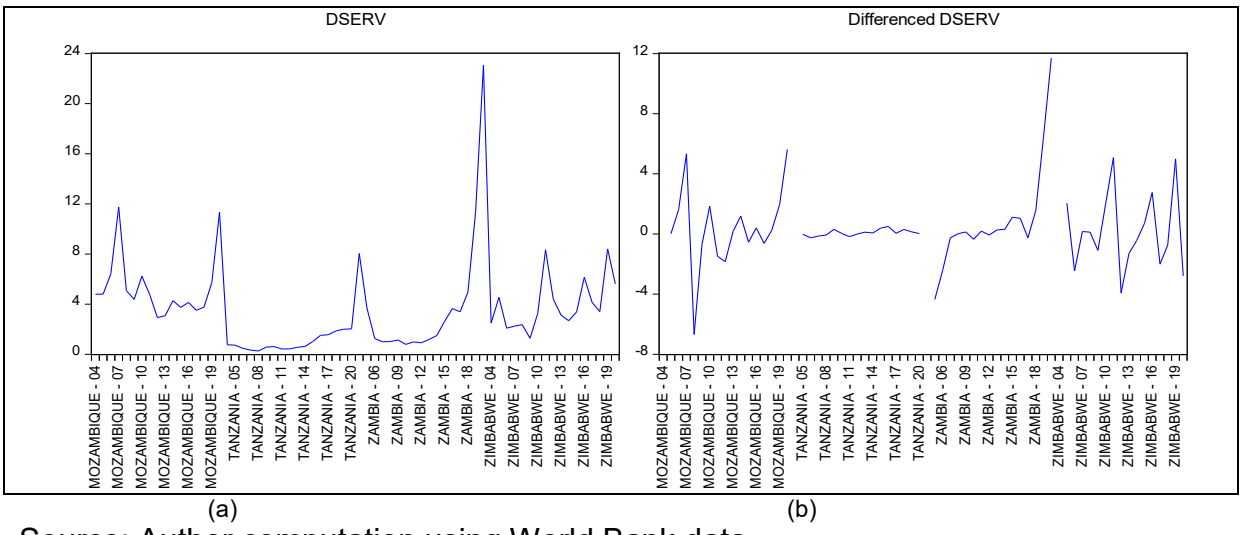
Figure 5.2: External debt (at level and first difference)



Source: Author computation using World Bank data

Based on Figure 5.2 (b) external debt seems to be non-stationary which means that external debt has unit root at level because it is not moving along the mean of zero overtime. The graphical presentation of Figure 5.2 (b) however shows that at first difference external debt appears to be stationary which means it does not contain a unit root. This impression is because the variance seems to be non-time-invariant, as they are moving along a mean of zero overtime.

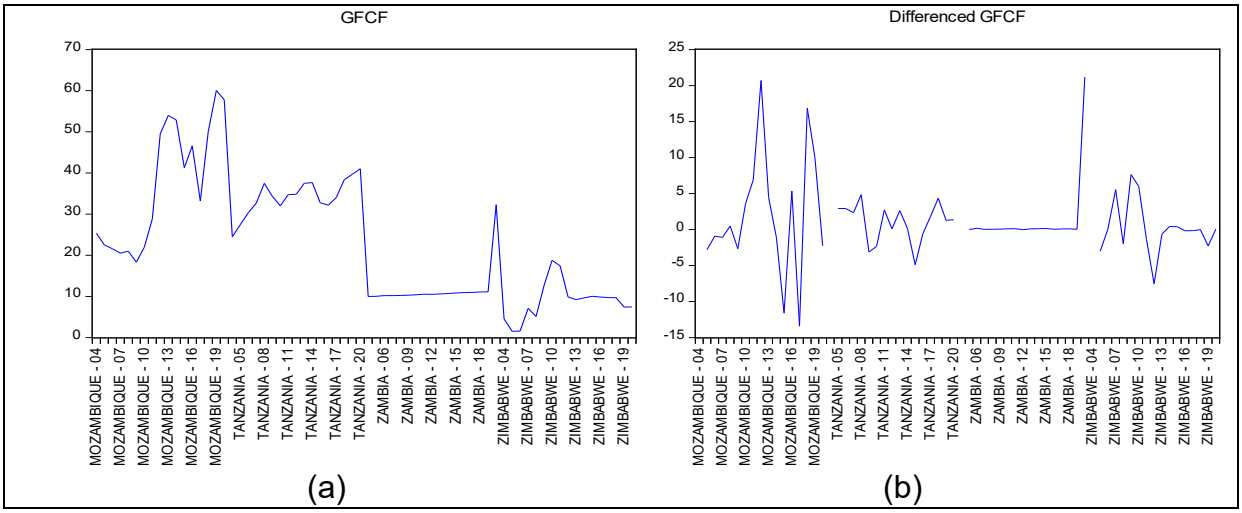
Figure 5.3: Debt service cost (at level and first difference)



Source: Author computation using World Bank data

The graphical inspection of Figure 5.3 indicates that debt service cost seems to be stationary at level (a), thus it contains a unit root at level, though after differencing (b) it, it does not contain unit root. The impression is that debt service cost is not influenced by the time at level, as the variance is trending around the mean of zero.

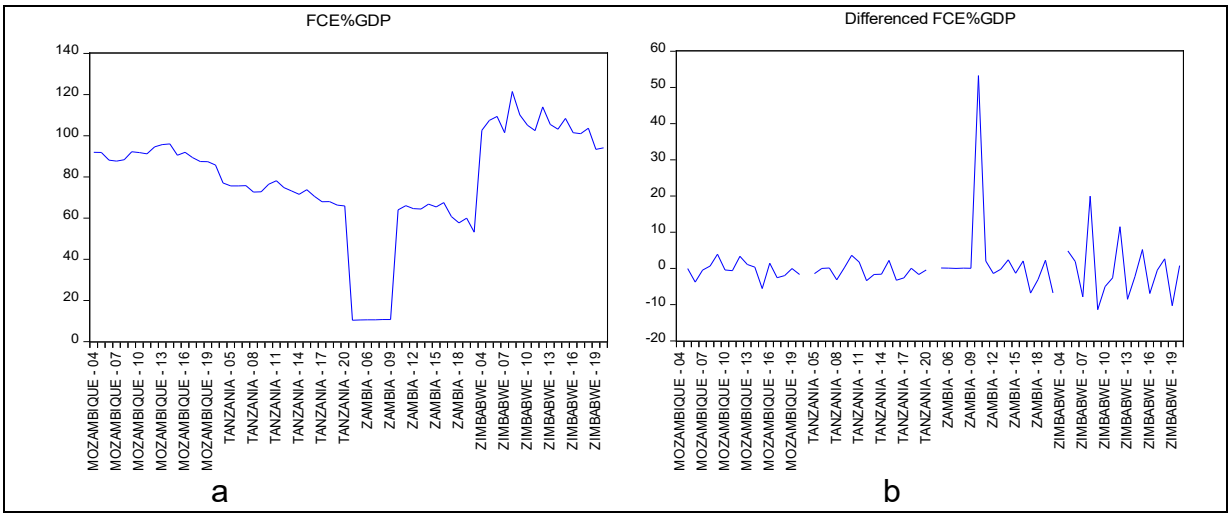
Figure 5.4: Public investment (at level and first difference)



Source: Author computation using World Bank data

Figure 5.4 indicates that public investment at level (a) appears to be non-stationary meaning it appears to contain unit root at level. This is because it appears not to trend around a mean of zero overtime. At first difference (b) public investment seems to become stationary due to the variance hovering around the mean.

Figure 5.5: Household consumption (at level and first difference)

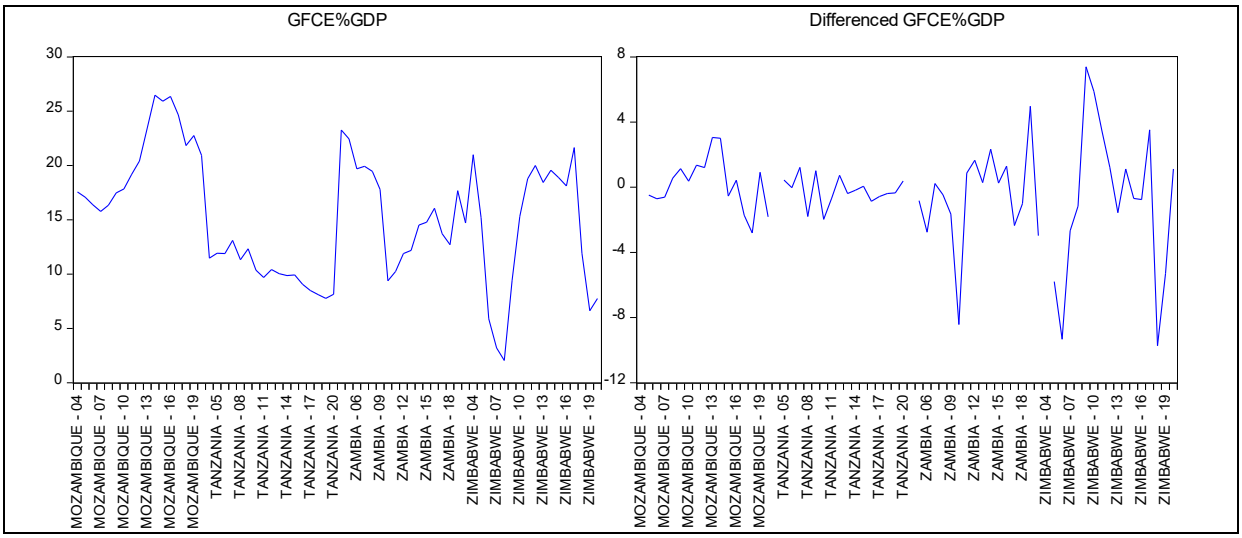


Source: Author computation using World Bank data

The variance of Figure 5.5 (a) above seems to show that household final consumption expenditure has unit root at level as they are not trending around the mean of zero.

At first difference, they are trending around the mean indicating that it does not contain unit root.

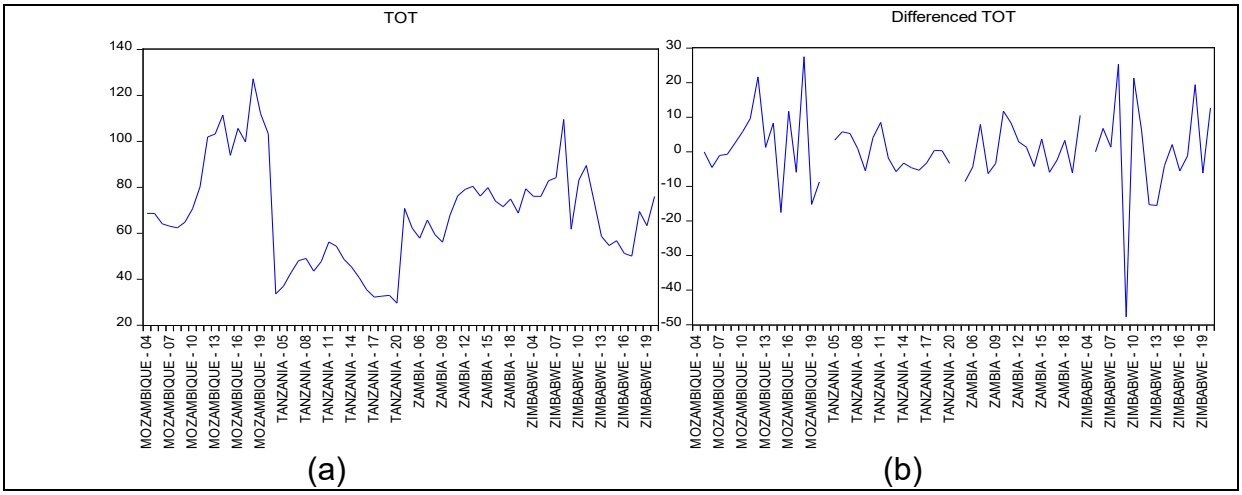
Figure 5.6: Government expenditure (at level and first difference)



Source: Author computation using World Bank data

Government final consumption expenditure indicated by Figure 5.6 (a) and (b), shows that it has unit root at level which implies that it is non-stationary, but it becomes stationary at first difference as the variances are trending around the mean of zero.

Figure 5.7: Terms of trade (at level and first difference)



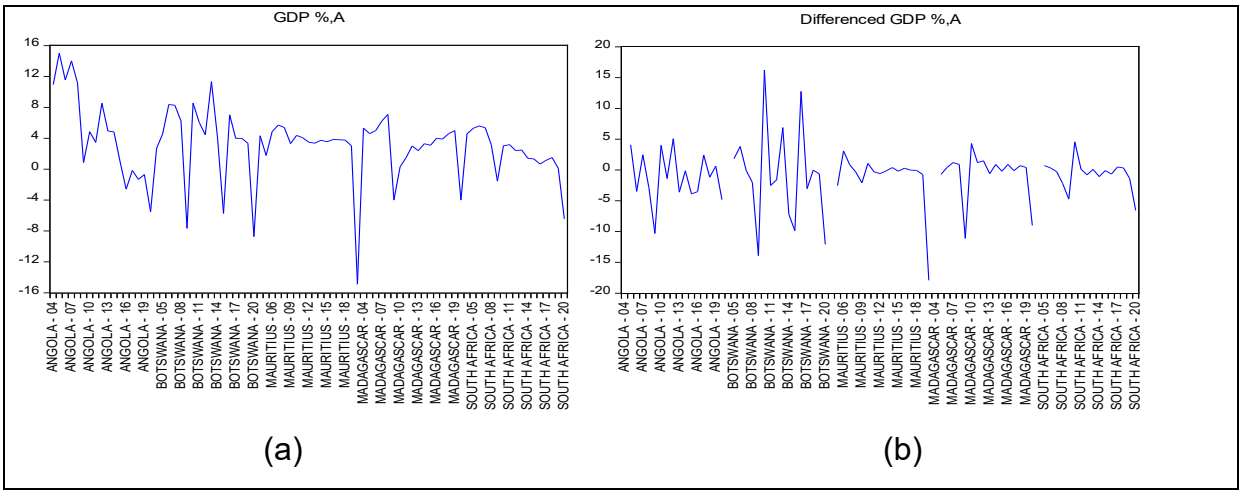
Source: Author computation using World Bank data

Similarly, Figure 5.7 seems to show that terms of trade contain unit root at level implying that it is non-stationary, but it becomes stationary at first difference as the variance are trending around the mean of zero.

5.2.2.2 Less Indebted Countries

The outcomes of the informal unit root analysis of the LIC countries variables are summarised as follows,

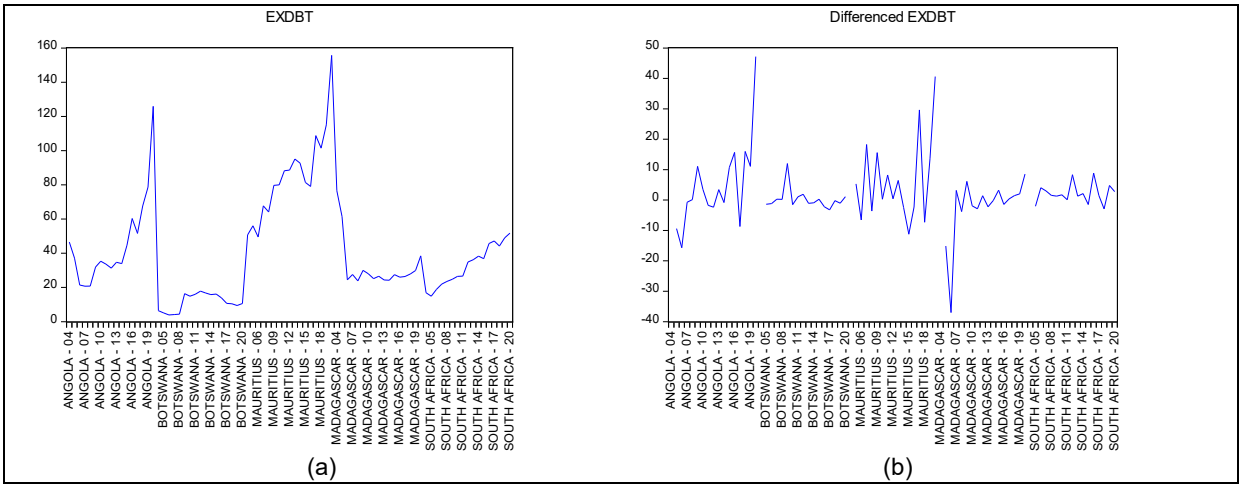
Figure 5.8: Gross domestic product (at level and first difference)



Source: Author computation using World Bank data

Based on Figure 5.8 (a) gross domestic product seems to be non-stationary which means that it contains a unit root at level because it is not moving along the mean of zero overtime. It becomes stationary at first difference as it is trending along the mean.

Figure 5.9: External debt (at level and first difference)

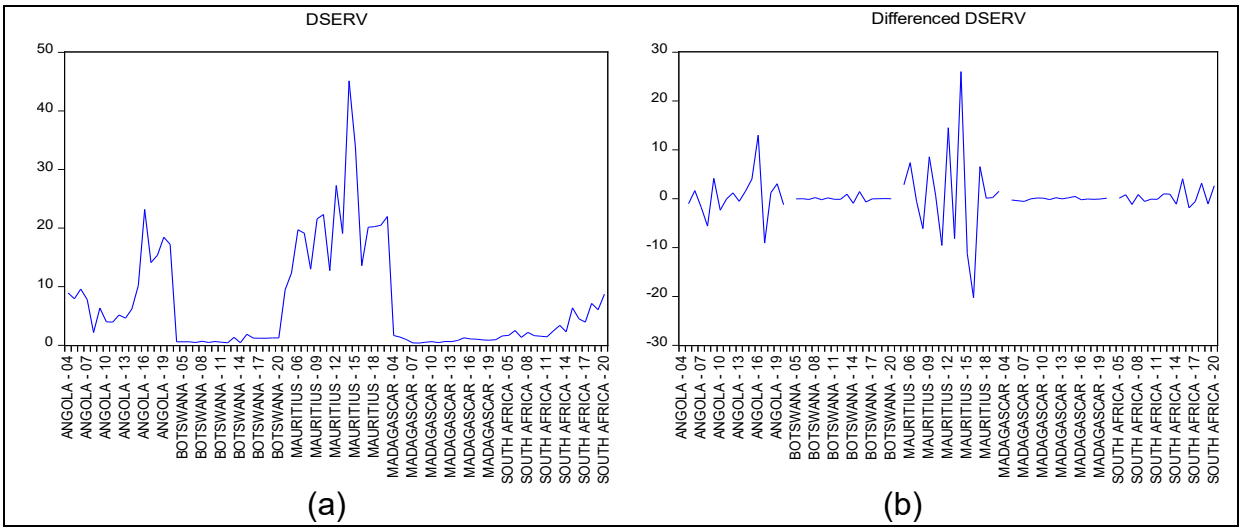


Source: Author computation using World Bank data

Based on Figure 5.9 (b) external debt seems to be non-stationary which implies that external debt has unit root at level because it is not moving along the mean of zero overtime. The graphical presentation of Figure 5.9 (b) however shows that at first difference external debt appears to be stationary which implies that it does not contain

a unit root. This impression is given by the variance which seems to be non-time-invariant, as they are moving along a mean of zero overtime.

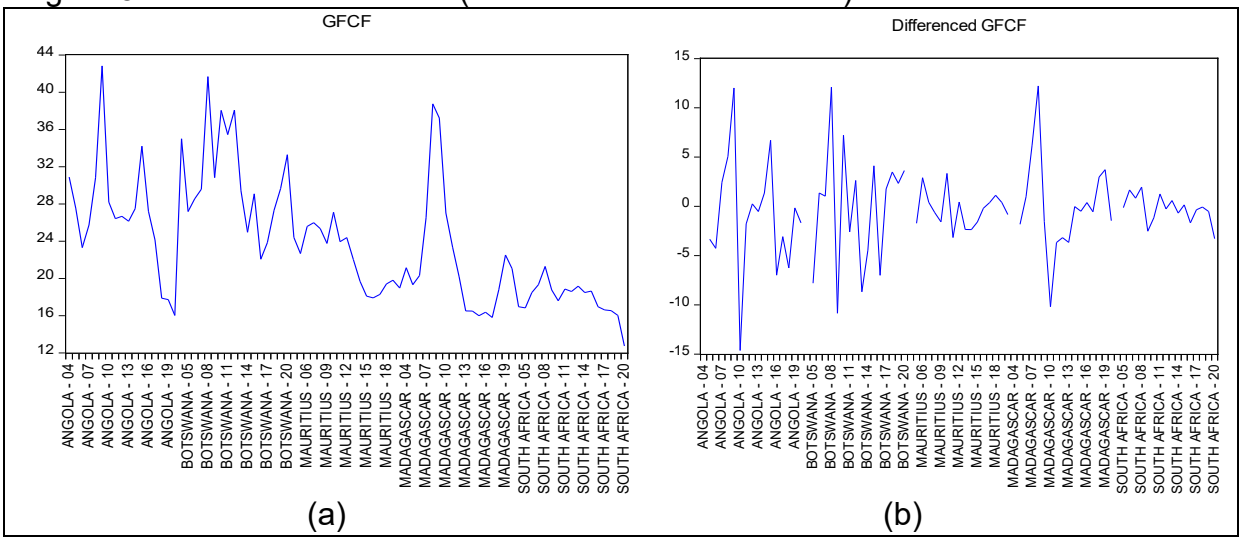
Figure 5.10: Debt service cost (at level and first difference)



Source: Author computation using World Bank data

The graphical inspection in Figure 5.10 above indicates that Debt service cost seems to be non-stationary which means that it contains unit root at level but after differencing it, it does not contain unit root. The impression is that debt service cost is influenced by time at first difference as the variance are trending around the mean of zero.

Figure 5.11: Public investment (at level and first difference)

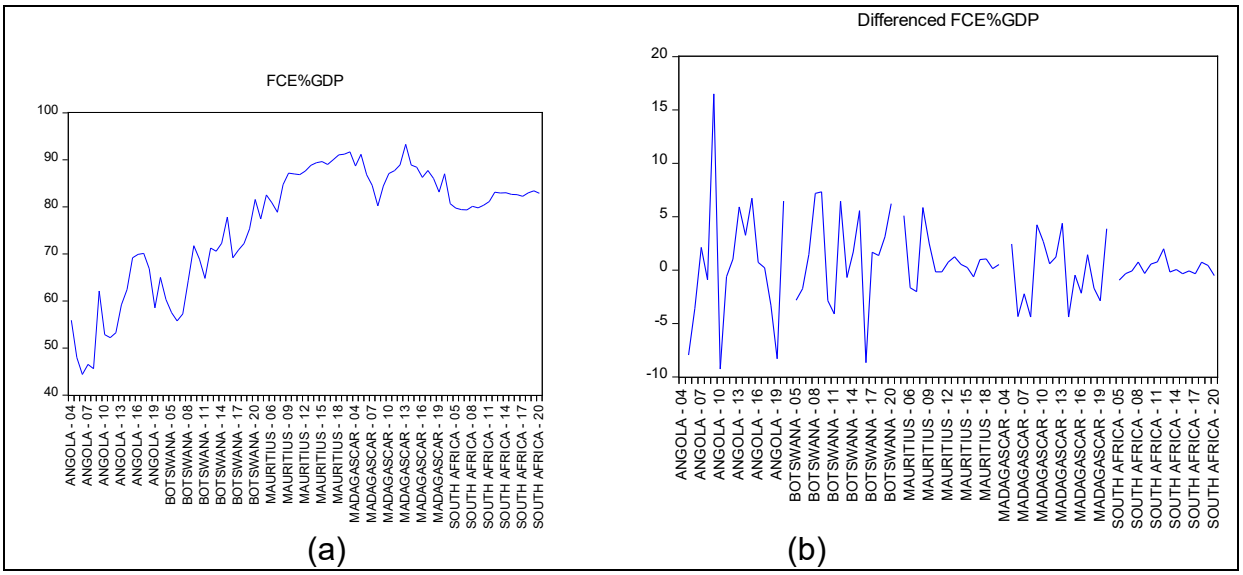


Source: Author computation using World Bank data

Figure 5.11 indicates that public investment at level (a) appears to be non-stationary which implies that it appears to contain unit root at level. This is because it appears

not to trend around a mean of zero overtime. At first difference (b) public investment seems to become stationary due to the variance hovering around the mean.

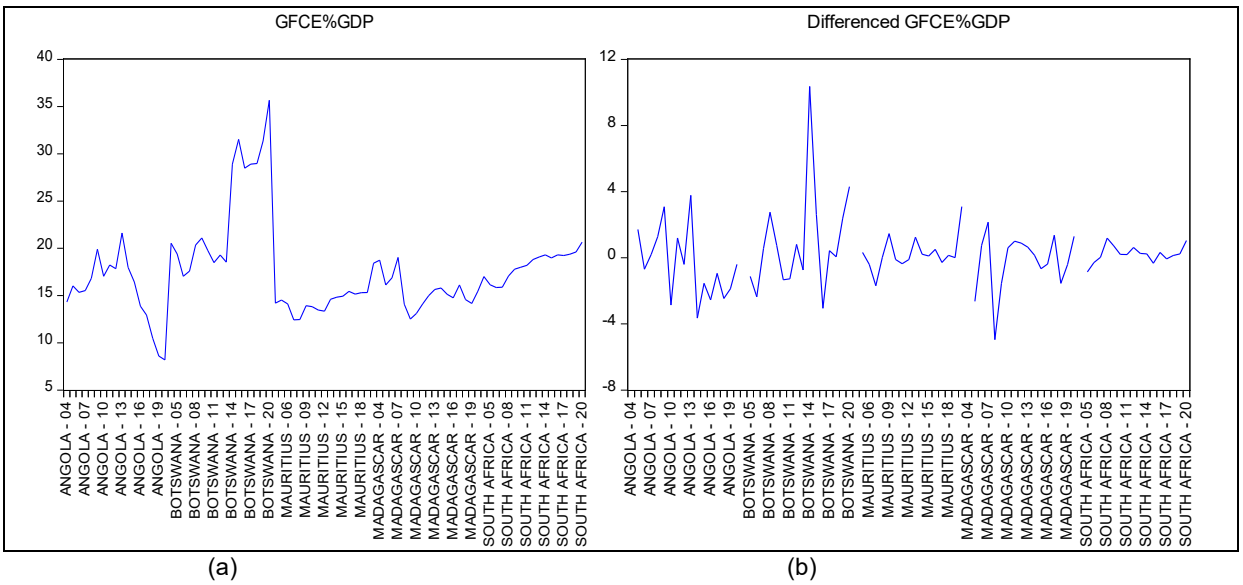
Figure 5.12: Household consumption expenditure (at level and first difference)



Source: Author computation using World Bank data

The variance of Figure 5.12 (a) above seems to show that household final consumption expenditure has unit root at level as they are not trending around the mean of zero. At first difference, they are trending around the mean providing an indication that it does not contain unit root.

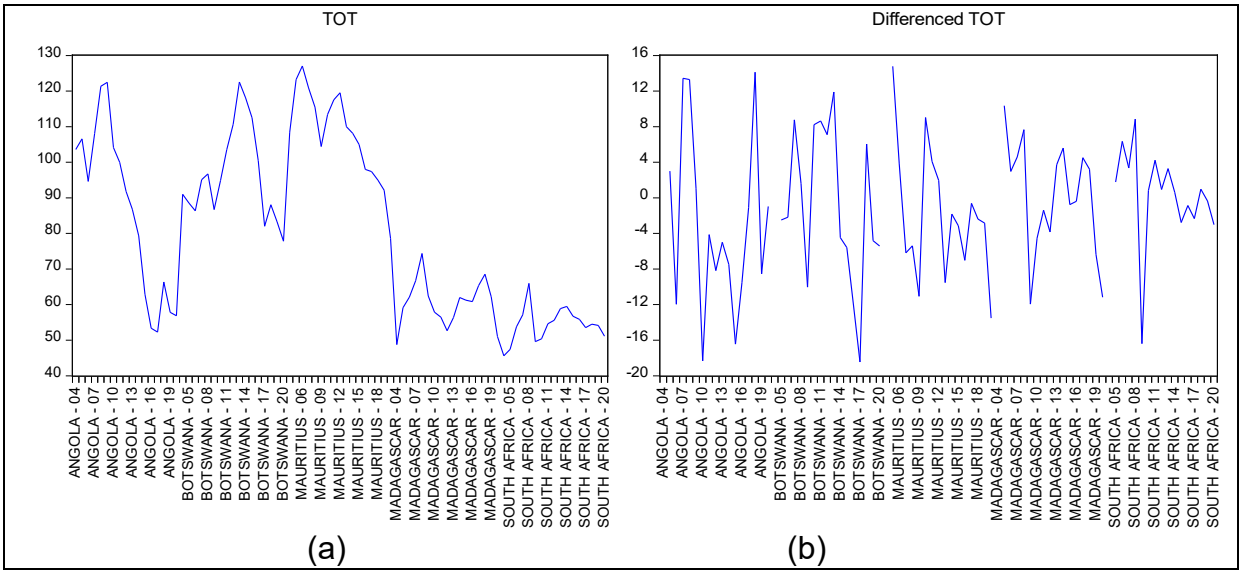
Figure 5.13: Government consumption expenditure (at level and first difference)



Source: Author computation using World Bank data

Government final consumption expenditure indicated by Figure 5.13 (a) and (b), shows that it has unit root at level which implies that it is non-stationary, but it becomes stationary at first difference as the variance are trending around the mean of zero.

Figure 5.14: Terms of trade (at level and first difference)



Source: Author computation using World Bank data

Similarly, Figure 5.14 above seems to show that terms of trade above contain unit root at level which implies that it is non-stationary, but it becomes stationary at first difference as the variance are trending around the mean of zero.

5.2.3 Formal presentation of unit root test results

This section presents formal panel unit root tests, which is important for determining the order of integration of the variables. Table 5.3 presents the summary of the panel unit root test based on IPS test (2003), Fisher-ADF test (2001), Fisher-PP test (2001), LLC test (2002), Handri test and Breitung test.

5.2.3.1 Highly & less indebted countries unit root test results

Table 5.3: Unit root test results: highly indebted

Variables	Model	LLC	Im, Pesaran & Shim	Fisher ADF	Fisher PP	Conclusion
Unit Root Test Results at Level Form						
LGDP	Individual Intercept	4.16972 (1.0000)	2.58061 (0.9951)	2.84320 (0.9438)	5.31021 (0.7240)	Non-Stationary
	Individual Intercept and trend	2.19652 (0.9860)	1.70751 (0.9561)	1.61942 (0.9905)	4.06855 (0.8509)	Non-Stationary
	None	-2.17422	-	13.8941 (0.0846) *	15.3201 (0.0532) *	Stationary *I* (0)

		(0.0148) **				
LEXDBT	Individual Intercept	0.74789 (0.7727)	0.051270 (0.6959)	5.72848 (0.6780)	6.12238 (0.6335)	Non-Stationary
	Individual Intercept and trend	-7.89147 (0.0000) ***	-5.46375 (0.0000) ***	35.9717 (0.0000) ***	20.4809 (0.0087)	Stationary *I* (0)
	None	0.43995 (0.6700)	-	2.85689 (0.9430)	3.73402 (0.8803)	Non-Stationary
LDSERV	Individual Intercept	4.92665 (1.0000)	2.58661 (0.9952)	6.19503 (0.6254)	7.83132 (0.4501)	Non-Stationary
	Individual Intercept and trend	2.34047 (0.9904)	2.27363 (0.9885)	8.45309 (0.3905)	11.0679 (0.1979)	Non-Stationary
	None	2.30860 (0.9895)	-	2.52464 (0.9606)	2.66220 (0.9537)	Non-Stationary
LPINV	Individual Intercept	-0.28460 (0.3880)	0.81045 (0.7912)	9.19910 (0.3258)	6.31324 (0.6122)	Non-Stationary
	Individual Intercept and trend	0.63699 (0.7379)	0.69425 (0.7592)	6.83732 (0.5543)	5.19642 (0.7364)	Non-Stationary
	None	1.23500 (0.89160	-	1.35710 (0.9948)	1.64403 (0.9901)	Non-Stationary
LFCE	Individual Intercept	0.13794 (0.5549)	0.91374 (0.8196)	3.16717 (0.9234)	6.52439 (0.5887)	Non-Stationary
	Individual Intercept and trend	-0.15836 (0.4371)	0.72231 (0.7649)	4.82991 (0.7756)	8.74204 (0.3645)	Non-stationary
	None	-1.39839 (0.0810) *	-	6.99005 (0.53770	14.4646 (0.0704) *	Stationary I (0)
LGFCE	Individual Intercept	-0.41797 (0.3380)	-0.08167 (0.4675)	8.40652 (0.39480	5.97779 (0.6497)	Non-Stationary
	Individual Intercept and trend	0.29415 (0.6157)	0.02208 (0.5088)	7.69721 (0.4636)	8.88273 (0.35230	Non-Stationary
	None	-1.05685 (0.14530	-	9.67428 (0.2886)	7.94374 (0.43900	Non-Stationary
LTOT	Individual Intercept	0.25752 (0.6016)	0.65309 (0.7432)	3.60520 (0.8909)	5.43193 (0.7106)	Non-Stationary
	Individual Intercept and trend	-0.44914 (0.3267)	0.37191 (0.6450)	4.73328 (0.7857)	8.50479 (0.3858)	Non-Stationary
	None	0.43293 (0.6675)	-	3.24590 (0.9180)	2.79553 (0.9465)	Non-Stationary
Unit Root Test Results at 1st difference						
∆LGDP	Individual Intercept	0.62525 (0.7341)	-2.02004 (0.0217) **	16.7838 (0.0324) **	42.3739 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	0.82556 (0.7955)	-1.33103 (0.0916) *	12.8542 (0.1170)	40.6738 (0.0000) ***	Stationary *I* (1)
	None	-4.42982 (0.0000) ***	-	28.0642 (0.0005) ***	61.4273 (0.0000) ***	Stationary I (1)
∆LEXDBT	Individual Intercept	-8.75354 (0.0000) ***	-6.11782 (0.0000) ***	44.8724 (0.0000) ***	24.6448 (0.0018) ***	Stationary I (1)

	Individual Intercept and trend	-3.97349 (0.0000) ***	-3.83535 (0.0001) ***	28.7057 (0.0004) ***	21.3625 (0.0062) ***	Stationary I (1)
	None	-8.89517 (0.0000) ***	-	56.1374 (0.0000) ***	45.0773 (0.0000) ***	Stationary I (1)
Δ**LDSERV**	Individual Intercept	-0.19235 (0.4237)	-1.65274 (0.0492) **	21.0047 (0.0071) ***	36.3320 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	0.09662 (0.5385)	-1.34508 (0.0893) *	14.6014 (0.0674) *	31.5504 (0.001) ***	Stationary I (1)
	None	-3.16196 (0.0008) ***	-	34.7468 (0.0000) ***	46.8691 (0.0000) ***	Stationary I (1)
Δ**LPINV**	Individual Intercept	0.34689 (0.6357)	-1.53465 (0.0624) *	15.7222 (0.0465) **	25.9953 (0.0011) ***	Stationary I (1)
	Individual Intercept and trend	0.47622 (0.6830)	-0.89961 (0.1842)	14.0315 (0.0809) *	18.3588 (0.0187) **	Stationary I (1)
	None	-4.72312 (0.0000) ***	-	27.2950 (0.0006) ***	40.4132 (0.0000) ***	Stationary *I* (1)
Δ**LFCE**	Individual Intercept	-5.32398 (0.0000) ***	-3.82945 (0.0001) ***	29.4032 (0.0003) ***	53.1051 (0.0000) ***	Stationary *I* (1)
	Individual Intercept and trend	-5.07794 (0.0000) ***	-3.14058 (0.0008) ***	24.2738 (0.0021) ***	45.1998 (0.0000) ***	Stationary *I* (1)
	None	-6.31919 (0.0000) ***	-	46.2390 (0.0000) ***	65.2878 (0.0000) ***	Stationary *I* (1)
Δ**LGFCE**	Individual Intercept	-2.00436 (0.0225) **	-1.98271 (0.0237) **	16.9035 (0.0311) **	32.7782 (0.0001) ***	Stationary *I* (1)
	Individual Intercept and trend	-2.08539 (0.0185) **	-0.71405 (0.2376)	9.97888 (0.2665)	24.3517 (0.0020) ***	Stationary *I* (1)
	None					Stationary *I* (1)
Δ**LTOT**	Individual Intercept	-3.52259 (0.0002) ***	-2.64329 (0.0041) ***	21.3936 (0.0062) ***	37.6535 (0.0000) ***	Stationary *I* (1)
	Individual Intercept and trend	-3.50808 (0.0002) ***	-1.74227 (0.0407) **	17.0781 (0.0293) **	28.2871 (0.0004) ***	Stationary *I* (1)
	None	-5.43708 (0.0000) ***	-	39.0658 (0.0000) ***	59.6032 (0.0000) ***	Stationary *I* (1)

Note: asterisk *,**,*** denote statistical significance at the 10%,5% and 1% respectively.
Δ denotes first difference.
Source: Author computation using World Bank data

Table 5.3 illustrates the results for IPS (2003), Fisher-ADF (2001), Fisher-PP (2001), and LLC (2002) unit root testing. As in the table, at level form, LGDP is stationary at the 10% significance level at none whereas LEXBDT is stationary at the 1%

significance level at individual intercept and trend, and LFCE is stationary at the 10% significance level at none, thus indicating that the null hypothesis can be rejected. The null hypothesis of non-stationary cannot be rejected at level form for LGDP at individual intercept, individual intercept and trend, LDSERV, LPINV, LTOT, and LGFCE at individual intercept, individual intercept and trend, and none. The variables are thus subjected to first difference as they contain no unit root when presented at level form. In Table 5.3, after first differencing, the table confirms that stationarity for all variables is realised after all the variables are subjected to first differencing. Therefore, a non-stationary null hypothesis cannot be rejected, given that the probability values are less than the different levels of significance (0.01, 0.05, & 0.1). This satisfies the requirements for stationarity using I'm, Persaran and Shin, Fisher-ADF, Fisher-PP, and Levin, Lin and Chu unit root tests at individual intercept, individual intercept and trend, and none.

Table 5.4: Unit root test results: less indebted

Variables	Model	LLC	Im, Pesaran & Shim	Fisher ADF	Fisher PP	Conclusion
Unit Root Test Results at Level Form						
LGDP	Individual Intercept	-1.33432 (0.0910)	-0.68590 (0.2464)	16.6410 (0.0827) *	28.9103 (0.0013) **	Stationary *I* (0)
	Individual Intercept and trend	-5.10915 (0.0000) ***	-1.74341 (0.0460) **	24.6661 (0.0060) **	28.3995 (0.0016) ***	Stationary *I* (0)
	None	-0.08749 (0.4651)	-	8.21146 (0.6082)	10.2957 (0.4149)	Non-Stationary
LEXDBT	Individual Intercept	-2.42315 (0.0077) ***	-1.43382 (0.0758) *	24.6784 (0.0060) ***	10.9944 (0.3580)	Stationary *I* (0)
	Individual Intercept and trend	-3.31618 (0.0005) ***	-1.93246 (0.0267) **	22.4153 (0.0131)	11.5946 (0.3131)	Stationary *I* (0)
	None	3.74041 (0.9999)	-	2.59407 (0.9894)	3.43709 (0.9692)	Non-Stationary
LDSERV	Individual Intercept	-0.12570 (0.4500)	0.41536 (0.6611)	10.5336 (0.3950)	17.7554 (0.0592) *	Stationary *I* (0)
	Individual Intercept and trend	-2.25906 (0.0119) *	-0.35414 (0.3616)	10.7935 (0.37380)	24.4631 (0.0065) ***	Stationary *I* (0)
	None	0.26296 (0.6037)	-	5.03933 (0.8885)	7.71497 (0.6567)	Non-Stationary
LPINV	Individual Intercept	1.02721 (0.8478)	0.91692 (0.8204)	5.97402 (0.8174)	7.22321 (0.7042)	Non-Stationary
	Individual Intercept and trend	-0.67882 (0.2486)	0.06076 (0.5242)	9.38951 (0.4956)	4.85186 (0.9009)	Non-Stationary

	None	-1.08942 (0.1380)	-	7.43235 (0.6841)	9.04224 (0.5281)	Non-Stationary
LFCE	Individual Intercept	-0.74322 (0.2287)	0.17489 (0.5694)	7.21970 (0.7046)	10.5783 (0.3913)	Non-Stationary
	Individual Intercept and trend	-0.06637 (0.4735)	-0.46794 (0.3199)	10.1870 (0.4242)	14.1600 (0.1658)	Non-stationary
	None	1.48251 (0.9309)	-	2.04099 (0.9960)	1.83453 (0.9975)	Non-Stationary
LGFCE	Individual Intercept	0.72003 (0.7642)	1.69905 (0.9553)	4.94474 (0.8948)	6.20698 (0.7976)	Non-Stationary
	Individual Intercept and trend	-1.24572 (0.1064)	0.06463 (0.5258)	10.9418 (0.3621)	6.86725 (0.7379)	Non-Stationary
	None	2.03580 (0.9791)	-	4.55342 (0.9189)	4.99227 (0.8917)	Non-Stationary
LTOT	Individual Intercept	0.75987 (0.7763)	-0.06075 (0.4758)	13.4087 (0.2017)	13.3160 (0.2065)	Non-Stationary
	Individual Intercept and trend	0.53022 (0.7020)	0.36632 (0.6429)	8.03128 (0.6258)	7.82824 (0.6456)	Non-Stationary
	None	-1.86068 (0.0314)	-	11.7218 (0.3041)	8.70953 (0.5599)	Non-Stationary
Unit Root Test Results at 1st difference						
∆LGDP	Individual Intercept	0.34876 (0.6364)	-2.35245 (0.0093) ***	26.0796 (0.0036) ***	62.7591 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	1.30137 (0.9034)	-0.81298 (0.2081)	15.6866 (0.1090) *	50.0523 (0.0000) ***	Stationary *I* (1)
	None	-6.23657 (0.0000) ***	-	43.4599 (0.0000) ***	72.9393 (0.0000) ***	Stationary I (1)
∆LEXDBT	Individual Intercept	-4.47177 (0.0000) ***	-4.37840 (0.0000) ***	37.4409 (0.0000) ***	52.5302 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	-2.71588 (0.0033) ***	-3.19089 (0.0007) ***	28.2572 (0.0016) ***	48.4424 (0.0000) ***	Stationary I (1)
	None	-7.64683 (0.0000) ***	-	47.5902 (0.0000) ***	62.5529 (0.0000) ***	Stationary I (1)
∆LDSERV	Individual Intercept	-4.29083 (0.0000) ***	-4.83629 (0.0000) ***	41.2457 (0.0000) ***	92.3809 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	-3.85177 (0.0001) ***	-4.17108 (0.0000) ***	35.2068 (0.0001) ***	83.4214 (0.0000) ***	Stationary I (1)
	None	-7.35212 (0.0000) ***	-	64.2670 (0.0000) ***	102.418 (0.0000) ***	Stationary I (1)
∆LPINV	Individual Intercept	-0.33360 (0.3693)	-2.12592 (0.0168) **	19.9847 (0.0294) **	41.8722 (0.0000) ***	Stationary I (1)
	Individual Intercept and trend	0.80111 (0.7885)	-1.20625 (0.1139)	14.5715 (0.1485)	38.6557 (0.0000) ***	Stationary I (1)
	None	-5.69629	-	40.9862	68.1686	Stationary *I* (1)

		(0.0000) ***		(0.0000) ***	(0.0000) ***	
Δ**LFCE**	Individual Intercept	-3.73834 (0.0001) ***	-4.36728 (0.0000) ***	37.3317 (0.0000) ***	71.4995 (0.0000) ***	Stationary *I* (1)
	Individual Intercept and trend	-3.78227 (0.0001) ***	-3.17094 (0.0008) ***	28.2581 (0.0016) ***	52.6789 (0.0000) ***	Stationary *I* (1)
	None	-6.67617 (0.0000) ***	-	49.7979 (0.0000) ***	76.4226 (0.0000) ***	Stationary *I* (1)
Δ**LGFCE**	Individual Intercept	-2.31845 (0.0102) **	-3.06850 (0.0011) ***	27.7199 (0.0020) ***	37.6553 (0.0000) ***	Stationary *I* (1)
	Individual Intercept and trend	-2.83643 (0.0023) ***	-2.5799 (0.0049) ***	23.5345 (0.0089) ***	38.9564 (0.0000) ***	Stationary *I* (1)
	None	-5.47989 (0.0000) ***	-	42.6517 (0.0000) ***	57.8300 (0.0000) ***	Stationary *I* (1)
Δ**LTOT**	Individual Intercept	-2.65668 (0.0039) ***	-2.15927 (0.0154) **	20.1251 (0.0281) *	32.9568 (0.0003) ***	Stationary *I* (1)
	Individual Intercept and trend	-2.15188 (0.0157) **	-1.14528 (0.1260)	14.1516 (0.1662)	28.8787 (0.0013) ***	Stationary *I* (1)
	None	-5.51974 (0.0000) ***	-	39.1047 (0.0000) ***	57.1161 (0.0000) ***	Stationary *I* (1)

Note: asterisk *,**,*** denote statistical significance at the 10%,5% and 1% respectively

Δ denotes first difference.

Source: Author computation using World Bank data

Same as Table 5.3, Table 5.4 illustrates the results for IPS (2003), Fisher-ADF (2001), Fisher-PP (2001), and LLC (2002) unit root testing. As reported in the table, in level form, a non-stationary null hypothesis can be rejected for LGDP, LEXDBT and LDSERV at individual intercept and, individual intercept and trend. Though for LGDP, LEXDBT, and LDSERV accept the null hypothesis at none. LPINV, LFCE, LTOT, and LGFCE also reject the null hypothesis at individual intercept, individual intercept and trend, and also none. Therefore, the variables are subjected to first difference ng the IPS, Fisher-ADF, Fisher-PP, and LLC unit root tests, to enable them to become stationary.

In Table 5.4 when subjected to first differencing ΔLGDP is stationary at the 1% significance level when there is an individual intercept, individual intercept trend and none. Thus, the null hypothesis in this case can be rejected. Also, ΔLEXDBT has become stationary at the 1% and 5% significance levels, as such the null hypothesis

is rejected. Relatively, ΔLDSERV, ΔLPINV, and ΔLFCE are stationary at the 1% significance level, meaning that we cannot accept a non-stationary null hypothesis. Evenly, ΔLTOT and ΔLGFCE are significant at all levels (1%, 5%, & 10%), therefore we reject the null hypothesis. As such, undertaking the first difference for the variables has confirmed stationarity of all variables. As a result, a non-stationary null hypothesis cannot be rejected, because the probability values are less than the different levels of significance (0.01, 0.05, & 0.1). This satisfies the requirements for stationarity using the IPS (2003), Fisher-ADF (2001), Fisher-PP (2001), and LLC (2002) unit root tests at individual intercept, and individual intercept and trend.

Elder & Kennedy, (2001) note that including intercept or intercept with trend in a model are necessary to enable the model to present the alternative hypothesis challenging the unit root null hypothesis. Nonetheless, Masoga (2017) highlights that a situation where there is neither an intercept nor intercept with the inclusion of trend is overlooked, suggesting that such a situation has minimal or no significant effect on conclusion of unit root. In Table 5.4 the none results for all variables are stationary at level form, and after first differencing. Since stationarity for all variables is realised after being subject to first difference, we can conclude that all variables are integrated at first order.

5.2.4 Lag selection criteria test results

Table 5.5: Lag order selection criteria test results: highly indebted

Lag	LogL	LR	FPE	AIP	SC	HQ
0	-391.6545	NA	16.10333	14.13052	14.27519	14.18661
1	-249.7331	258.4997	0.179734*	9.633326*	10.35667*	9.913763*
2	-238.0851	19.55208	0.211927	9.788752	11.09076	10.29354
3	-220.0714	27.66391*	0.201858	9.716834	11.59752	10.44597

Note: Lag selected order selected by the criterion indicated by *

LR: Sequential Modified LR Test Statistic (each as 5% level)

FPE: Final Prediction Error

AIP: Akaike Information Criterion

SC: Schwarz Information Criterion

HQ: Hannan-Quinn Information Criterion

Source: Author's Computation

Listed above are the different lag selection criteria. The study undertakes the Sequential Modified LR Test Statistics which recommends lag 3 as shown in Table 5.5 Even though FPE, AIP, HQ and SC recommend lag 1, the study will apply lag three which follows LR. The reserve for such is based on a conclusion by Masoga (2017) where it states that, the HQC cannot be followed as it is only advantageous and reliable in recommending a true lag length better than other criterion when it is applied in a study with a sample presenting more than 120 observations. The study has a total of 68 observations which is below 120, making HQC unfit to give a true lag length. Hence, the study cannot apply lag 1 which is recommended by HQC. Relatively, the remaining criterions support HQC by recommending lag length 1, as HQC has failed to support the recommendation of lag 1 it is relatively concluded the same for SC.

Table 5.6: Lag order selection criteria test results: less indebted

Lag	**LogL**	**LR**	**FPE**	**AIP**	**SC**	**HQ**
0	-505.5461	NA	24.70385	14.55846	14.68694	14.60950
1	-341.8805	303.9504	0.363822*	10.33944	10.98187*	10.59462*
2	-325.7838	28.05421*	0.364546	10.33668*	11.49305	10.79600
3	-313.3233	20.29288	0.408094	10.43781	12.10812	11.10128

Note: Lag selected order selected by the criterion indicated by *

LR: Sequential Modified LR Test Statistic (each as 5% level)

FPE: Final Prediction Error

AIP: Akaike Information Criterion

SC: Schwarz Information Criterion

HQ: Hannan-Quinn Information Criterion

Source: Author's Computation

Similar to Table 5.5, listed above are the different lag selection criteria. As such, the study follows the Sequential Modified LR Test Statistic and Akaike Information Criterion where lag 2 is recommended as shown in table 5.6. Although other specified lag criterions such as the FPE, SC, and HQ recommend lag 1, the study still applies lag two which follows the LR and AIC selection criterions. Hence the aforementioned explanation by Masoga (2017), HQ cannot be recommended as the study has a total of 68 observations which is less than 120 observations acceptable for HQ. Therefore, the study cannot apply lag 1.

5.2.5 Correlation matrix test results

Below is Table 5.7 and Table 5.8**,** presenting the correlation matrix results for the main variables used in the model analysis in highly indebted and less indebted SADC countries. The vector error correction (VEC) residual correlation matrix was determined using EViews, in which the matrix indicates the main expectation of the relationship between the variables. Mugowo (2017) states that the purpose of the correlation matrix analysis is to enable the identification of possible sources of multicollinearity in the estimated model.

Table 5.7: VEC residual correlation matrix test results: highly indebted

	LGDP	**LEXDBT**	**LDSERV**	**LPINV**	**LFCE**	**LGFCE**	**LTOT**
LGDP	1						
LEXDBT	-0.3226	1					
LDSERV	-0.2179	0.4071	1				
LPINV	0.01334	-0.1272	-0.0084	1			
LFCE	0.0890	0.0350	0.0165	-0.0086	1		
LGFCE	-0.1795	0.2088	0.3192	0.0473	0.5141	1	
LTOT	0.2911	-0.0508	-0.1001	0.5544	0.3192	-0.1453	1

Source: Author's Computation

As shown in Table 5.7 above, there is a negative and moderate correlation between external debt, and economic growth. Also, there is negative and weak correlation between debt service cost and economic growth as well as a positive and weak correlation between public investment and economic growth. To avoid the issue of multicollinearity in the model, the correlation between the independent variables has to be smaller. Indeed, there exist a weak correlation among all the predictors. External debt and debt service cost reflect a moderate correlation at 0.4071, whereas external debt and public investment reflect a negative and weak correlation at -0.1272. Additionally, debt service cost and public investment had a negative and relatively weak correlation at -0.0084. Furthermore, other explanatory variables including household expenditure, government spending, and terms of trade presented a weak correlation.

Table 5.8: VEC residual correlation matrix test results: less indebted

	LGDP	**LEXDBT**	**LDSERV**	**LPINV**	**LFCE**	**LGFCE**	**LTOT**
LGDP	1						
LEXDBT	-0.4919	1					
LDSERV	-0.1862	0.0998	1				
LPINV	-0.1588	0.1226	0.1638	1			

LFCE	-0.6177	0.4739	0.1766	0.3745	1		
LGFCE	-0.3903	0.3110	-0.0614	-0.1700	0.4552	1	
LTOT	0.1421	0.0142	0.0216	0.0891	0.0038	0.039	1

Source: Author's Computation

Similar to Table 5.7, Table 5.8 above present correlation matrix results for less indebted SADC countries. The results indicate that each variable correlates perfectly with itself. Meanwhile, a moderate and negative correlation was established between external debt and economic growth at -0.4919, while debt service cost and public investment reflected a weak and negative correlation with economic growth at -0.1862 and -0.1588, respectively. In an attempt to avoid multicollinearity, the correlation between the independent variables has to be small. The study finds that a weak and positive correlation is presented among all the predictors. Similarly, the control variables also reflect a positive and weak correlation.

5.2.6 Panel cointegration test results

Before estimating the short and long-run estimates, a cointegration relationship between the variables needs to be confirmed. To check if the long-run relationship exists the Pedroni cointegration test and combined Johansen cointegration test were used. Table 5.9 and 5.10 presents the Pedroni cointegration test results. Table 5.11 presents the Fisher Johansen cointegration test results in estimating the existence of a long-run relationship between variables in the model. This test estimates cointegration based on the trace and maximum eigenvalue tests. This is followed by the Kao cointegration test in table 5.12, which is different from the first two as it utilises ADF to determine the existence of cointegration among variables.

Table 5.9: Pedroni cointegration test results: highly indebted

	Statistic	**Prob**	**Weighted statistic**	**Prob**	**Conclusion**
Panel v-Statistic	-0.859625	0.8050	-0.140587	0.5559	No Cointegration
Panel rho-Statistic	0.742134	0.7710	0.511865	0.6956	No Cointegration
Panel PP-Statistic	-3.046190	0.0012***	-3.028617	0.0012***	Cointegration
Panel ADF-Statistic	-3.299430	0.0005***	-3.779712	0.0001***	Cointegration
Group rho-Statistic	1.161594	-	-	0.8773	No Cointegration
Group PP-Statistic	-2.879611	-	-	0.0020***	Cointegration
Group ADF-Statistic	-3.441768	-	-	0.0003***	Cointegration
Null hypothesis: No Cointegration					

Note: *** denote significance at 5%

Source: Author's Computation

Table 5.9 provides a presentation of the Predroni cointegration test for HIC in the SADC region. The results show that with the Panel PP-Statistic, Panel ADF-Statistic, Group PP-Statistic, and Group ADF-Statistic the null hypothesis that there is no cointegration is rejected. In contrast, the null hypothesis is accepted with Panel v-Statistic, Panel rho-Statistics, and Group rho-Statistic. These results indicate that cointegration does not exist. From the results, the alternative hypothesis is accepted by four tests and the no cointegration null hypothesis is accepted by three tests. The results indicate a strong presence of cointegration among the variables in the model as the probability values of the four tests provides evidence of being less than the 0.05 level of significance.

Table 5.10: Pedroni Cointegration test results: less indebted

	Statistic	**Prob**	**Weighted statistic**	**Prob**	**Conclusion**
Panel v-Statistic	0.613481	0.2698	-0.460432	0.6774	No Cointegration
Panel rho-Statistic	0.481590	0.6850	0.853262	0.8032	No Cointegration
Panel PP-Statistic	-2.721183	0.0033***	-1.048352	0.1472	Cointegration
Panel ADF-Statistic	-2.897738	0.0019***	-1.326332	0.0924	Cointegration
Group rho-Statistic	1.355912	-	-	0.9124	No Cointegration
Group PP-Statistic	-1.823822	-	-	0.0341***	Cointegration
Group ADF-Statistic	-1.725746	-	-	0.0422***	Cointegration
Null hypothesis: No Cointegration					

Note: *** denote significance at 5%

Source: Author's Computation

Similar to Table 5.9, Table 5.10 also illustrates the Pedroni cointegration results for LIC in the SADC region. From the above results the presence of cointegration is detected with Panel PP-Statistic, Panel ADF-Statistic, Group PP-statistic, and Group ADF-Statistic. Thus, the model is cointegrating as the probability values of the test are significant at the 0.05 level of significance, thus rejecting the null hypothesis of no cointegration. Inversely, with Panel v-Statistic, Panel rho-Statistic, and Group rho-Statistic the results indicate that the null hypothesis is accepted, as the probability values are more than the 0.05 level of significance. Therefore, this implies that there is no cointegration.

Table 5.11: Fisher (Combined Johansen) cointegration test results

HIC					
CE(s) Number	**Trace Fisher Stat**	**P-value**	**Max Fisher Stat**	**P-value**	**Conclusion**
None	106.4	0.0000	83.05	0.0000	**Cointegration**
At most 1	37.20	0.0000***	23.94	0.0023	**Cointegration**
At most 2	21.37	0.0062	15.16	0.0560	**Cointegration**
At most 3	21.68	0.0055	21.68	0.0055	**Cointegration**
LIC					
CE(s) Number	**Trace Fisher Stat**	**P-value**	**Max Fisher Stat**	**P-value**	**Conclusion**
None	66.76	0.0000	62.09	0.0000	**Cointegration**
At most 1	49.39	0.0000	48.96	0.0000	**Cointegration**
At most 2	14.86	0.0214	11.44	0.0757	**Cointegration**
At most 3	14.56	0.0239	14.56	0.0239	**Cointegration**
Null Hypothesis: No Cointegration					

Notes: ***denote significance at 5%
Source: Author's Computation

Table 5.11 shows that from the results obtained with both trace and maximum eigenvalues, four cointegrating equations exist for both highly and less indebted countries. The probability values for both countries are significant at the 1% level in the "None" category and for both trace and maximum stats in the "At Most 2" category. Furthermore, the probability value for highly indebted countries with trace is significant at the 1% level while for less indebted countries is significant at the 5% level. Maximum fisher probability in the "At most 2" category for both countries show cointegration at the 10% level of significance. Lastly, in the "At most 3" category, both trace and maximum stats indicate cointegration for highly indebted countries at the 1% level of significance while, LICs are significant at the 5% level.

The cointegration test provided above indicates that the variables in the model have a relationship in the long run for both LICs and HICs. This provides an important indication to the model as it shows that the study will not only be providing the short run estimates but also the long- run estimates as the variables have an association in the long term.

Table 5.12: Kao cointegration test results

HIC			
Selection criteria	**ADF (t-statistic)**	**Probability value**	**Conclusion**
Akaike info criterion	-2.822077	0.0024***	**Cointegration**
Schwarz Info Criterion	-3.140642	0.0008***	**Cointegration**
Residual variance	8.286816	-	**-**
HAC variance	7.979253	-	**-**
LIC			
Selection criteria	**ADF (t-statistic)**	**Probability value**	**Conclusion**
Akaike info criterion	-2.726329	0.0032***	**Cointegration**
Schwarz Info Criterion	-2.162224	0.0153***	**Cointegration**
Residual variance		**-**	**-**
HAC variance		**-**	**-**

Notes: ***denote significance at 5%
Source: Author's Computation

Presented in Table 12 above is the Kao cointegration test results for both the HIC and LIC, in which there exist cointegration at the 5% level of significance using the Akaike Information Criterion and Schwarz Information Criterion. That is, in the HIC the probability value of 0.0024 for AIC and 0.0008 for SIC was realised. Given that the p-value is less than 5%, this indicates that there is cointegration. Evenly, in the LIC probability values of 0.0032 and 0.0153 for AIC and SIC were determined and thus leading to the conclusion that there is cointegration among the variables. Therefore, the null hypothesis of no cointegration in the model is rejected.

5.2.7 Panel vector error correction model test results

Presented in Table 5.13 and 5.14 are the long run VECM results for HICs and LICs. Following the confirmation of cointegration between the variables, the results below show the long run and short run estimates. This is to estimate if the variables have a relationship in the long run and are able to converge to equilibrium in the short run. The results are computed using two models, that is, model A incorporates control variables while Model B does not incorporate control variables. This technique was employed to examine how the variables react when control variables are added and when they are excluded. According to Bhandari (2022), control variables are held constant in a study and their involvement does not interest the objective of the study,

although they have the power to influence the study outcomes through their ability to prevent biasness in research which mainly comes through variables omissions and errors thus affecting the results. As such, the study has two model to analyse the behaviour of variables with and without the control variables, considering the characteristics that they hold.

Table 5.13: Panel VECM test results: high indebted

Model A: LGDP-LEXDBT-LDSERV-LPINV-LFCE-LGFCE-LTOT				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-value**
Long run				
LEXDBT	0.014186	(0.00947)	[1.49844]	0.1353
LDSERV	-0.306280	(0.13755)	[-2.22670]	0.0269
LPINV	-6.064871	(0.01383)	[-4.69046]	0.0000
LFCE	0.027807	(0.01323)	[2.10158]	0.0366
LGFCE	-0.028731	(0.0182)	[-2.65523]	0.0084
Short run				
D(EXDBT)	-0.289929	(1.62670)	[-0.17823]	0.8587
D(LDSERV)	-0.20105	(0.23341)	[-0.86203]	0.3895
D(LPINV)	2.005166	(1.42785)	[1.40432]	0.1615
D(FCE)	1.114315	(2.04234)	[0.54561]	0.5858
D(GFCE)	-1.226531	(2.95907)	[-0.41450]	0.6789
ECT	-0.385755	(0.141929)	[-2.717938]	0.0070
Model B: LGDP-LEXBDT-LDSERV-LGFCF				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-value**
Long-run				
LEXDBT	0.015371	(0.00811)	[1.899464]	0.0597
LDSERV	-0.159516	(0.11372)	[-1.40270]	0.1624
LPINV	-0.060432	(0.01166)	[-5.18442	0.0000
Short run				
D(LEXDBT)	-0.909347	(1.57847)	[-0.57609]	0.5653
D(LDSERV)	-0.004040	(0.23924)	[-0.01689]	0.9865
D(LPINV)	3.674007	(1.31086)	[2.80275]	0.0056
ECT	-0.411598	(0.12651)	[-3.25350]	0.0014

Source: Author's Computation

Table 5.13 above presents the estimated vector error correction model results showing both the long and short relationship between the independent variable and the dependent variables in HICs. In both models, it is indicated that in the long run, there is a positive relationship between external debt and GDP. The relationship is found to be insignificant in both models at the 0.05 level of significance. This implies that a 1 percent increase in external debt will result in 1.4 percent and 1.5 percent respective increase in economic growth in the SADC region for highly indebted countries.

The results are in line with Ijirshar, Joseph, and Godoo (2016), Hassan et al, (2019), Senadza, Fiagbe & Quartey (2018), Shkolnyk & Koilo, (2018) and Kasidi & Said,

(2013) who found a statistically significant and positive relationship between external and economic growth. The results are in contrary with the results by Zouhaier, & Fatma, (2014), and Ayadi & Ayadi (2008) who found an inverse relationship between external debt on economic growth in Nigeria and South Africa using neoclassical growth model. They found a negative impact of debt (and its servicing requirements) on growth in the two countries while external debt contributes positively to growth to the extent that its contribution becomes negative in Nigeria.

The results in Table 5.13 above also indicate that there is a negative relationship between debt service cost and economic growth in the long run. The negative relationship between the two variables is found to be significant in model A but insignificant in Model B at the 0.05 level of significance, respectively. The results are in line with Ijirshar et al (2016), Muhammad and Abdullahi, (2020), Utomi (2014), and Anyamu (2013) who found that debt service costs have a negative effect on economic growth in the long run, at least in Nigeria.

The long run relationship between public investment and economic growth is found to be negative and statistically significant in both model A and Model B, with the inclusion of control variables and exclusion, respectively. The results indicates that a 1 percent increase in public debt will lead to 6 percent decline in economic growth in the SADC region for HICs. The coefficients of public investment obeyed the priori expectation, and they are statistically significant at the 0.05 level of significance. Thus, in the SADC region, HICs present a negative relationship between public investment and economic growth. The finding is in line with Miyamoto, Baum, Gueorguiev, Honda, and Walker, (2020) who state that a negative relationship between public investment and economic growth can be experienced when allocated public capital exceeds a specified threshold which presents a burden to the financing of public infrastructure, thus, if not efficiently allocated, the infrastructure provided through allocated public investment may yield poor output production adversely impacting economic growth. Relatively, when public investment is financed through increased taxes, economic distortions are exacerbated, further increasing the cost of inputs which negatively affects the expected economic growth. The results are however, contradicting the findings by Hundie (2014), that investment and economic growth relate positively in Ethiopia.

The control variables indicate that there is a positive relationship between household consumption and economic growth, and a negative relationship between government expenditure and economic growth. The relationship between household consumption and government expenditure are significantly related to economic growth which meets the priori expectation in line with studies by Acikgoz, and Cinar (2017), Meyer, Manete, and Muzindutsi, (2017), Handriyani, Sahyar, and Si (2018), and Laboure, and Taugourdeau, (2018).

The short run results are also presented in Table 5.13 above, in which the error correction term, which is denoted by ECT, is negative in both model A and B. This means that the models are bound to converge to equilibrium. Thus, the correction of the long run disequilibrium would undertake the adjustment in the short run, a 38.57% and 41.51% speed of adjustment, respectively, returning the model back to equilibrium in the short run. That is, the models' elasticities are statistically significant and likely to converge in highly indebted countries in the SADC region. The short run results above indicate that all the variables in both model A and model B negatively impact economic growth in the short run with the exception of public investment. The relationship between all the variables and economic growth are insignificant in the short run in both models.

Table 5.14: Panel VECM test results: less indebted

Model A: LGDP-LEXDBT-LDSERV-LPINV-LFCE-LGFCE				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-value**
Long run				
LEXDBT	0.007352	(0.00173)	[4.25134]	0.0000
LDSERV	-1.101701	(0.05781)	[-1.75923]	0.0793
LPINV	0.000827	(0.00156)	[0.52922]	0.5970
LFCE	0.001850	(0.00060)	[3.08847]	0.0022
LGFCE	0.000145	(0.00116)	[0.12551]	0.9002
LTOT	0.002105	(0.00109)	[1.92334]	0.0552
Short run				
D(LEXDBT)	-1.906383	(2.58193)	[-0.73836]	0.4608
D(LDSERV)	0.104407	(0.10808)	[0.96600]	0.3347
D(LPINV)	-10.36812	(4.63034)	[-2.23917]	0.0257
D(LFCE)	-19.94078	(12.8435)	[-1.55260]	0.1214
D(LGFCE)	4.049481	(6.14638)	[0.65884]	0.5104
D(LTOT)	-3.218633	(6.48282)	[-0.49649]	0.6198
ECT	-0.096822	(0.04802)	[-2.01642]	0.0445
Model B: LGDP-LEXBDT-LDSERV-LGFCF				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-value**
Long-run				
LEXDBT	0.007060	(0.00586)	[1.20406]	0.2298

LDSERV	-0.352610	(0.15657)	[-2.25210]	0.0252
LPINV	0.013354	(0.00425)	[3.14326]	0.0019
Short run				
D(LEXDBT)	-3.164277	(2.60253)	[-1.21585]	0.2252
D(LDSERV)	0.027232	(0.10437)	[0.26093]	0.7944
D(LPINV)	-10.53802	(3.86272)	[-2.72813]	0.0068
ECT	-0.163197	(0.13817)	[-1.18116]	0.2387

Source: Author's Computation

Contrary to Table 5.13, Table 5.14 above indicates the estimated vector error correction model results for LIC. The table displays both the long run and short run relationship between the independent variables and dependent variable. The results are determined using two models, model A which is inclusive of control variables and model B which excludes control variables. The results indicate a positive long run relationship between external debt and economic growth in both model A and B. The relationship is significant in model A but insignificant in model B at the 0.05 level of significance. Thus, it is implied as per the results that in model A, a 1 percent increase in external debt yields a 0.73 percent (Model A) and 0.70 percent (Model B) increase in economic growth in less indebted countries in the SADC region. The respective results are aligned with Shipila (2019), Epaphra and Mesiet (2021), and Manasseh et al (2022), who concluded that external debt positively influences economic growth.

Also, Table 5.14 indicates that there is a negative long run relationship between debt service cost and economic growth. The relationship is found to be insignificant in model A but significant in model B at the 0.05 level of significance, respectively. As such, the results indicate that a 1 percent increase in debt service cost yields a 11.01 percent (Model A) and 3.52 percent (Model B) decline in economic growth in LICs in the SADC countries. The results are aligned with literature by Malik, Hayat, and Umer (2010) who found that the service cost has a negative relationship on economic growth. Furthermore, in model A and B public investment is indicated to have a positive long run relationship with economic growth. That is, a 1 percent increase in public investment yields a 0.08 percent and 1.33 percent increase in economic growth in less indebted countries in the SADC region. Evenly, public investment coefficient in model B meets the prior expectation, as it is statistically significant at the 0.05 level of significance but insignificant in model A. The results are aligned with literature by Fournier (2016), Epaphra and Massawe (2016), and Han (2017) who found that public investment is positively related to economic growth.

Model A in Table 5.14 is inclusive of control variables, and their impact on economic growth has been analysed such that, household consumption and terms of trade have a negative and insignificant relationship with economic growth. In contrast, government expenditure has a positive though insignificant impact on economic growth. These results align with studies by Acikgoz, and Cinar (2017), Meyer, Manete, and Muzindutsi, (2017), Handriyani, Sahyar, and Si (2018), and Laboure, and Taugourdeau, (2018). The results however contradict the findings by Jawaid, Waheed, and Siddiqui, (2020).

Table 5.14 also computed the short run results, in which the error correction term, which is denoted by ECT, is negative in both model A and B. This means that the model is bound to converge to equilibrium. Thus, the correction of the long run disequilibrium would undertake the adjustment in the short run, by 9.68 percent, and 16.31 percent speed of adjustment, respectively, returning the model back to equilibrium in the short run. That is, the models' elasticities are statistically significant and likely to converge in less indebted countries in the SADC region. The results further indicate a negative relationship between external debt, public investment, and economic growth. According to Khang and Hung (2021), public investment has a negative impact on economic growth where acquired investment funds are misallocated by government to enhance different economic sectors, thus less improvement is seen in the economy.

Inversely, a positive relationship between debt service cost, government expenditure, and economic growth was realised. Mitchell (2005) suggested that government spending provides essential and valuable public goods and services that are inclusive of education, health, and infrastructure among others. Also, additional government spending has the potential of enhancing economic growth, through the allocation of money into people's pockets, of which the funds are eventually spent on economic activities, improving the growth rate.

5.2.8 Granger causality test results

The Granger causality test which estimates if there is a causal relationship between variables is presented by Table 5.15 below. The causal relationship among the variables can either be bi-directional or unidirectional.

Table 5.15: Granger causality test results: high indebted

Null Hypothesis	Obs	F-statistic	P-value	Decision
LEXBDT does not Granger Cause LGDP	60	1.45748	0.2417	Accept Null Hypothesis
LGDP does not Granger Cause LEXBDT	60	0.64441	0.5289	Accept Null Hypothesis
LDSERV does not Granger Cause LGDP	60	0.80924	0.4504	Accept Null Hypothesis
LGDP does not Granger Cause LDSERV	60	1.19055	0.3118	Accept Null Hypothesis
LGFCF does not Granger Cause LGDP	60	0.81333	0.4486	Accept Null Hypothesis
LGDP does not Granger Cause LPINV	60	3.91626	0.0257	Reject Null Hypothesis
LFCE does not Granger Cause LGDP	60	0.88359	0.4191	Accept Null Hypothesis
LGDP does not Granger Cause LFCE	60	0.14690	0.8637	Accept Null Hypothesis
LGFCE does not Granger Cause LGDP	60	9.08755	0.0004	Reject Null Hypothesis
LGDP does not Granger Cause LGFCE	60	8.52163	0.0006	Reject Null Hypothesis
LTOT does not Granger Cause LGDP	60	0.31910	0.7281	Accept Null Hypothesis
LGDP does not Granger Cause LTOT	60	3.18186	0.0492	Reject Null Hypothesis

Source: Author's Computation

Table 5.15 presents the Granger Causality test results for HIC. The results indicate that there are four variables that Granger cause each other. Also, eight variables do not Granger cause each other, that is the null hypothesis is accepted as the probability values are more than the 5% level of significance. Inversely, the null hypothesis of Gross Domestic Product does not Granger cause Public Investment is rejected as the probability value is less than the 5% level of significance. The rejection of the null hypothesis indicates that gross domestic product does Granger cause public investment. Thus, there is a unidirectional causality from gross domestic product to public investment. This informs us that past GDP data carries information that has an influence on public investment. Similarly, Gross Domestic Product seem to also Granger cause government spending and terms of trade as the null hypothesis is rejected.

Table 5.16: Granger causality test results: less indebted

Null Hypothesis	Obs	F-statistic	P-value	Decision
LEXBDT does not Granger Cause LGDP	75	0.30462	0.7384	Accept Null Hypothesis
LGDP does not Granger Cause LEXBDT	75	0.04055	0.9603	Accept Null Hypothesis
LDSERV does not Granger Cause LGDP	75	0.16771	0.8459	Accept Null Hypothesis
LGDP does not Granger Cause LDSERV	75	0.33326	0.7177	Accept Null Hypothesis
LGFCF does not Granger Cause LGDP	75	2.71620	0.0731	Accept Null Hypothesis
LGDP does not Granger Cause LPINV	75	7.63495	0.0010	Reject Null Hypothesis
LFCE does not Granger Cause LGDP	75	0.78869	0.4584	Accept Null Hypothesis
LGDP does not Granger Cause LFCE	75	2.72442	0.0725	Accept Null Hypothesis

LGFCE does not Granger Cause LGDP	75	0.03955	0.9612	Reject Null Hypothesis
LGDP does not Granger Cause LGFCE	75	4.07730	0.0211	Reject Null Hypothesis
LTOT does not Granger Cause LGDP	75	0.68464	0.5076	Accept Null Hypothesis
LGDP does not Granger Cause LTOT	75	0.67104	0.5144	Accept Null Hypothesis

Source: Author's Computation

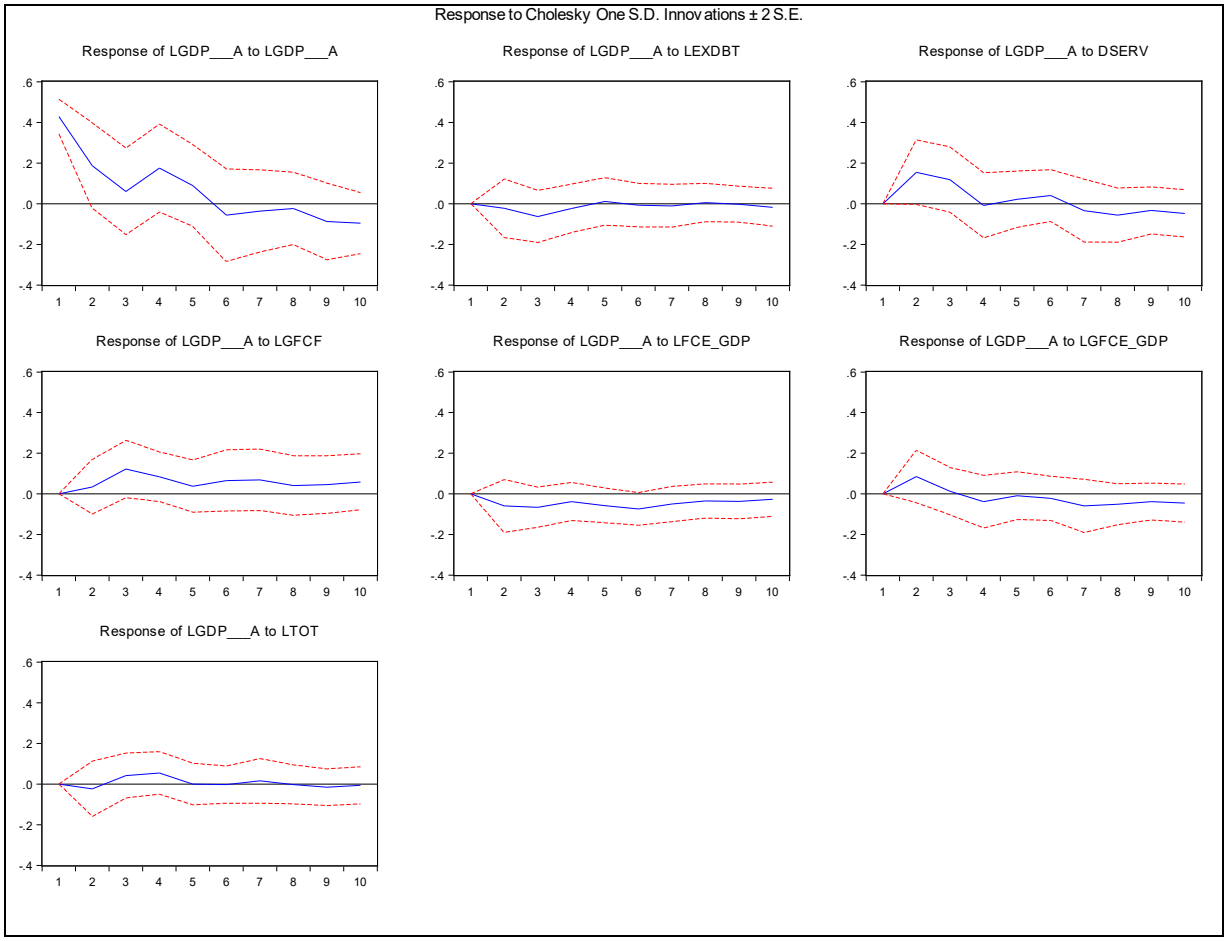
Table 5.16 illustrates Granger Causality Test results in LIC. The results indicate that three variables Granger cause each other. The rejection of the null hypothesis indicates that Gross Domestic Product does Granger Public Investment. The causal relationship is unidirectional, running from gross domestic product to public investment. This illustrates that an increase in gross domestic product can either increase or decrease public investment, though changes in public investment yield zero effect on gross domestic product. Furthermore, Gross Domestic Product also Granger causes Government Spending, yielding a rejection in the null hypothesis.

Comparably, in both the HIC and LIC the variables realised a unidirectional causality. That is, the determination of granger causality in the region can be assumed that the data collected for GDP against the variables carries that same information. Even so, of the three estimated variables, it was economic growth which ultimately carries information indicating the existence of a causal effect on public investment. Notably, none of the actual debt variables had a casual effect in both set of economies.

5.2.9 Impulse response function test results

The impulse response function results are presented in Figure 5.15 and Figure 5.16 below, which indicates the dynamic response of gross domestic product to shocks in the independent variables in HICs and LICs in the SADC region. The figures further reveal the continuance and direction of the responses of gross domestic product to changes in each variable for a ten-year period.

Figure 5.15: Impulse response function test results: high indebted

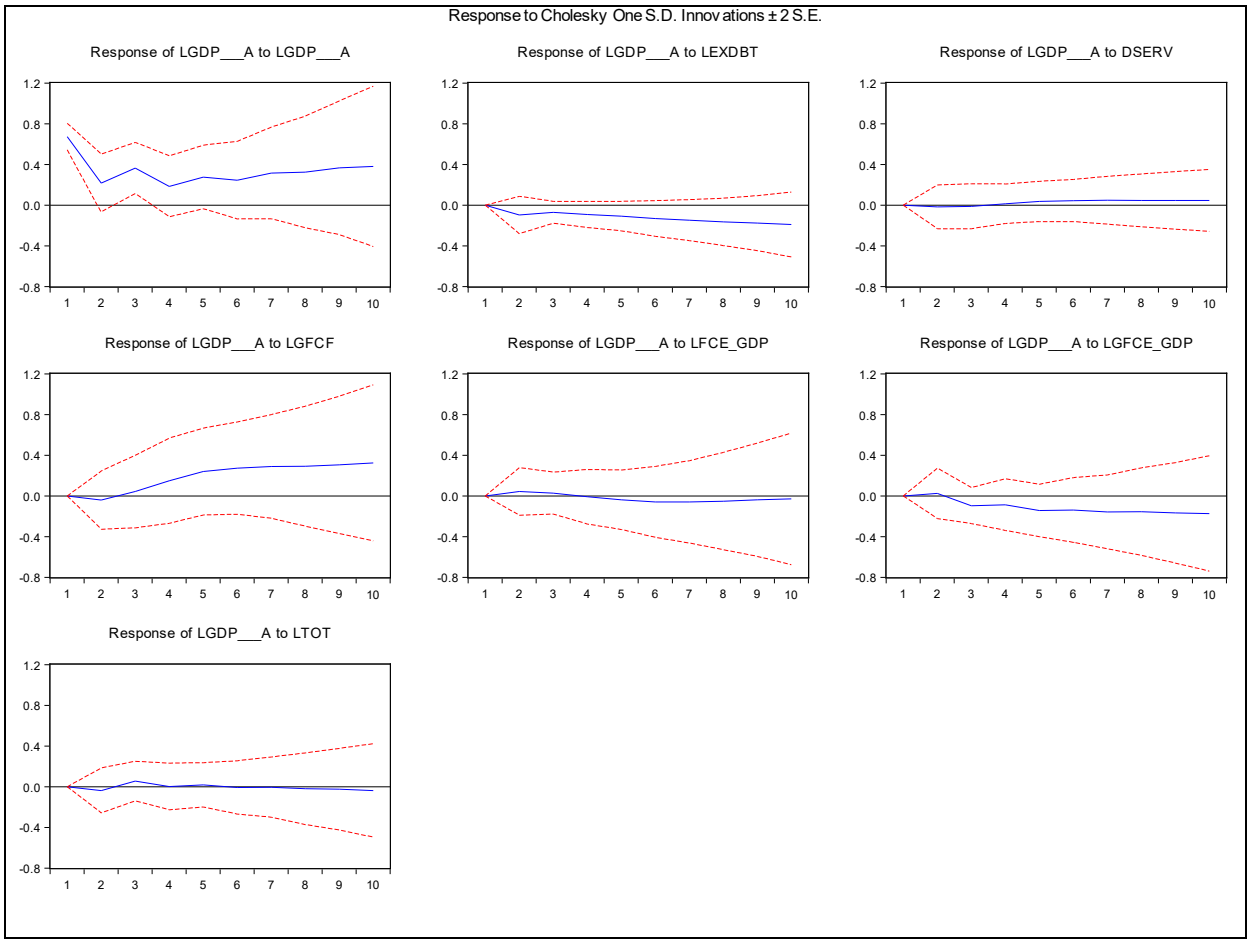


Source: author's computation

In Figure 5.15 above, Figure 5.15a indicates the response of GDP to itself to be positive for a five-year period, the response thus becomes negative from the sixth period until the tenth period. These results show that any enhancement or change in GDP yields either a negative or positive response in GDP. Figure 5.15b shows a negative response of GDP to external debt during most parts of the ten-year period, and at some points there is steady change where the response is at zero. The response of GDP to debt service cost is shown in Figure 5.15c and it is positive, though from the seventh period it began responding negatively. Inversely, there is a positive response of GDP to public investment throughout the ten periods, this is shown in Figure 5.15d. This response is an indication that any changes in public investment will have a positive impact on GDP. However, Figure 5.15e shows that the response of GDP to household expenditure is negative from the first period to the tenth period. That is, any change in household expenditure will inversely impact GDP. Figure 5.15f indicates that from the first-third period, the response of GDP to government expenditure is positive, though the response shifts and becomes negative from the

fourth to the tenth period. Lastly, Figure 5.15g shows that there is an unstable response of GDP to terms of trade, given that, in the ten-year period during period one, five, six, and eight there is zero response of GDP, whereas the response is negative during period two, nine, and ten, with a positive response during period three, four, and seven. This unstable nature indicates that any changes in terms of trade can either have no impact, decline, or improve GDP. All the shocks and response remain within the 0.05 level of significance intervals throughout the ten periods estimated.

Figure 5.16: Impulse response function test results: less indebted



Source: author's computation

Comparably, in Figure 5.16 above, Figure 5.16a indicates that the response of GDP to itself is a positive throughout the estimated ten-year period, that is, any changes in GDP will yield a positive impact on GDP. Figure 5.16b and Figure 5.16f show that there is a negative response of GDP to external debt and government expenditure, for any changes in both external debt and government expenditure will negatively impact GDP. In Figure 5.16c it is indicated that there is a steady response of GDP to debt service cost, in which during period one to three the response is negative though it

shifts to the positive region from the fourth period onwards having limited shocks and moving at a steady rate. Figure 5.16d shows that during period one and two GDP negatively responded to public investment, thus any shocks from public investment had a negative impact on GDP. From the third to the tenth period the response became positive, which can be seen as that any changes to public investment positively impacted GDP.

As for Figure 5.16e, there is a steady movement in the shocks, where from the first to third period GDP responded positively to household expenditure, but from period four it shifted to the negative region, yielding a negative response of GDP to household expenditure until period ten. Conclusively, Figure 5.16g show that during period three and five, the was a positive response of GDP to terms of trade, though there was a zero response during period four. GDP responded negatively to terms of trade during the remaining periods. For the estimated ten-year period, any shock or change determined remained with the 0.05 level of significance interval.

5.2.10 Variance decomposition test results

Table 5.17 and Table 5.18 presents the variance decomposition results for the highly indebted and less indebted countries in the SADC region. The tables present the analysis of the shock that each independent variable will have on the dependent variables and the rate at which the shock causes an impact.

Table 5.17: Variance decomposition test results: high indebted

PERIOD	S.E	LGDP	LEXDBT	LDSERV	LPINV	LFCE	LGFCE	LTOT
1	0.42896	100.000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000
3	0.54635	74.5598	1.51554	12.6447	5.36008	2.67565	2.47410	0.77008
10	0.65311	66.3568	1.34225	11.1917	9.50360	5.71515	4.54229	1.34812

Source: author's computation

Table 5.17 shows that in HIC, during the first period GDP fluctuations are explained by its changes, and it is aligned with Figure 5.15a results that any change in GDP will have a positive impact on GDP. During the second period, changes in GDP account for 85.56% variation in GDP, whilst the other variables account for the remaining 14.14% variations in GDP. This reveals that over the estimated ten periods, the changes in GDP account for significant variations which are provided by significant values. Evenly, the outcomes from Table 5.17 indicates that debt service cost and public investment, further explain the remaining variations in GDP, as they have high

values compared to external debt during the analysed period. Furthermore, the variance decomposition test above also provides the rate at which the independent variables contribute to the variations that occur to the dependent variable. That is, in the tenth period changes in debt service cost and public investment were valued at 11.19% and 9.50% of GDP, respectively. As such, they contributed most to the variations in the dependent variable during the period. Notably, household expenditure and government spending likewise explain the remaining variations of GDP.

Table 5.18: Variance decomposition test results: less indebted

PERIOD	S.E	LGDP	LEXDBT	LDSERV	LPINV	LFCE	LGFCE	LTOT
1	0.67327	100.000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000
3	0.81744	94.6735	2.19098	0.06619	0.52380	0.38494	1.48490	0.67561
10	1.47601	59.0154	7.80255	0.56223	23.9629	0.75126	7.56403	0.34155

Source: author's computation

The results in Table 5.18 also illustrate that in LIC during the first period, GDP variations are explained by changes in GDP, this is consistent with the impulse response in Figure 5.16a where any changes in GDP will have a positive effect on GDP. In the second period GDP takes into consideration 97% of its own variations, whereas the remaining variables account for 3% of the remaining variations in GDP. This is evident that for the ten-year period, the changes in GDP accounted for significant variations which were determined by a significant value. Thus, according to Table 5.18, external debt and public investment significantly contribute to the remaining variations, given that they have the highest values compared to other variables. Conclusively, the variance decomposition results in the table 5.18 give a presentation of the amount at which the independent variables contribute to the variations the occur in the dependent variables. It is during the tenth period that the changes in external debt and public investment were highly valued at 7.80% and 23.96%, respectively, among all the variables.

5.2.11 Diagnostic test results

This section presents the diagnostic tests based on normality test only. According to Nkoro and Uko (2016), the utilisation of VECM allows for the exclusion of other diagnostic tests. This is because if the conditions of using VECM such as unit root and cointegration tests are followed, the use of VECM will ensure correct model specification and consistent and reliable estimates. Table 5.19 below presents the

results of the diagnostic tests based on normality test which is used to check if the residuals in the models are normally distributed.

Table 5.19: Normality test results: high indebted

Model A: LGDP-LEXDBT-LDSERV-LPINV-LFCE-LGFCE-LTOT				
Skewness	**Kurtosis**	**Jarque- Bera**	**Prob-value**	**Conclusion**
0.0001443	3.360809	2.615628	0.270411	Accept Null Hypothesis
Model B: LGDP-LEXDBT-LDSERV-LPINV				
-0.197453	3.478391	1.090291	0.579758	Accept Null Hypothesis

Source: Author's Computations

Table 5.19 presents the results of the normality test for HIC, where in for both model A and model B the probability value is more than the 5% level of significance. Thus, in both models the null hypothesis is accepted which indicates that the residuals are normally distributed. The kurtosis is also set close to 3% as it is at 3.36 and 3.47 in model A and B, respectively. Evenly, the skewness indicates that the residuals are positively skewed in model A at 0.00, and negatively skewed in model B at -0.19. Thus, the results imply that the model was well estimated and specified.

Table 5.20: Normality test results: less indebted

Model A: LGDP-LEXDBT-LDSERV-LPINV-LFCE-LGFCE-LTOT				
Skewness	**Kurtosis**	**Jarque- Bera**	**Prob-value**	**Conclusion**
-0.058952	3.435036	0.677194	0.712770	Accept Null Hypothesis
Model B: LGDP-LEXDBT-LDSERV-LPINV				
-0.292423	3.579291	2.258741	0.323237	Accept Null Hypothesis

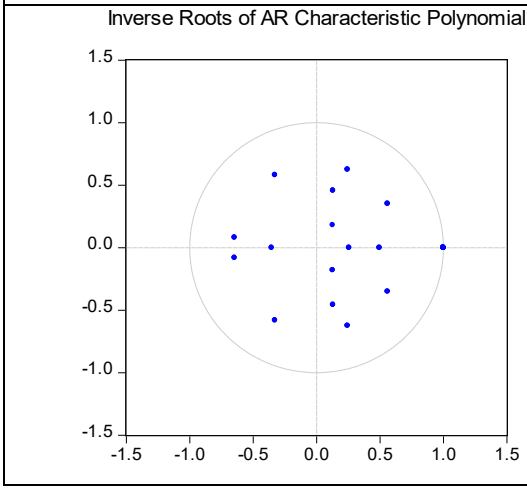
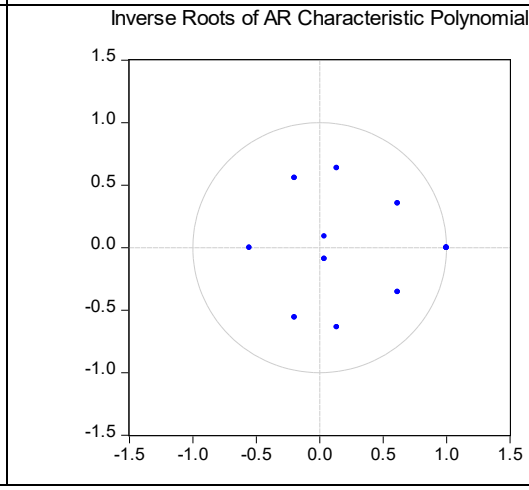
Source: Author's Computation

Similarly, Table 5.20 presents the normality test results for LIC in the SADC region. The results show that for both model A and B, the probability is more than the 5% level of significance, as such the null hypothesis that the residuals are normally distributed is accepted. The kurtosis is close to the set 3%, with 3.43 in model A and 3.57 in model B as the computed values. It is worth noting that the models are negatively skewed, with values of -0.05 and -0.29 in model A and B, respectively. This presents the desirability of the model.

5.2.12 Stability test results

The stability of the models was determined by means of inverse roots of the characteristic AR polynomial and the outcomes are presented in Tables 5.21 and 5.22. The importance of the test was to determine if ever the VAR estimates are stationary or stable. To indicate that they are stable, the modules of the roots must be within the unit circle. Also, the stability of the roots is important given that if they are unstable, the results of the study such as impulse response will be invalid.

Table 5.21: Inverse roots of AR characteristic test results: high indebted

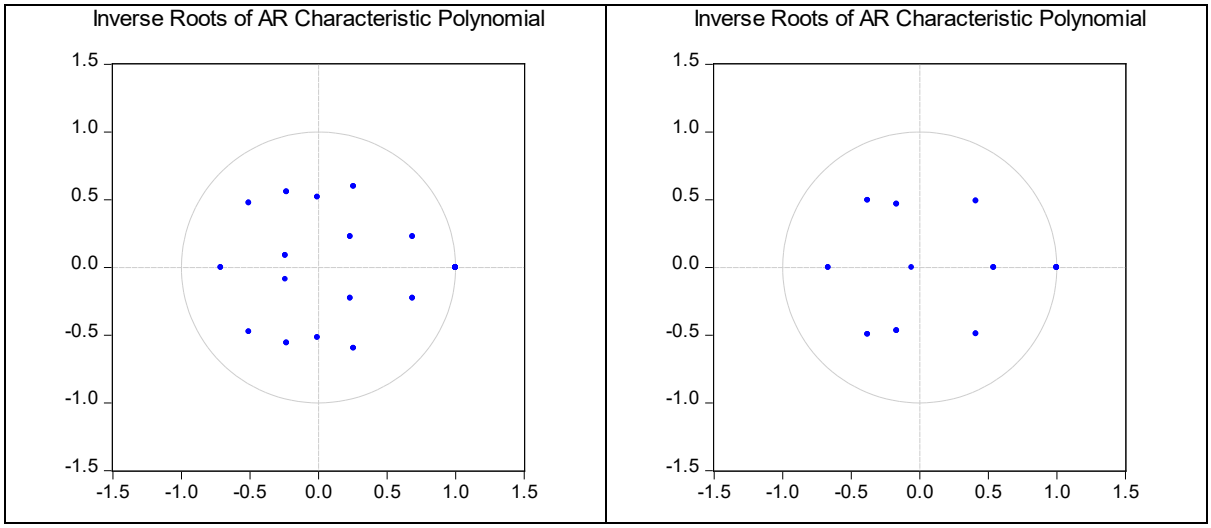
Model A: LGDP- LEXDBT- LDSERV- LPINV- LFCE- LGFCE- LTOT	**Model B: LGDP- LEXDBT- LDSERV- LPINV**
	

Source: Author's Computation with Eviews

Table 5.21 above illustrates the stability results in HIC. From the models, all the roots are within the unity circle, indicating that the estimated models are stable.

Table 5.22: Inverse roots of AR characteristic test results: less indebted

Model A: LGDP- LEXDBT- LDSERV- LGFCF- LFCE- LGFCE- LTOT	**Model B: LGDP- LEXDBT- LDSERV- LGFCF**



Source: Author's Computation

Evenly, Table 5.22 above present the stability test for LICs. All the roots are within the unity circle, implying that the estimated models are both stable.

5.3 SUMMARY

This chapter presented the empirical results of selected highly indebted and less indebted countries in the SADC region. From the analysis, the descriptive statistic was determined, and the bloc's mean average of GDP was at 4.67% and 1.30%, in HIC and LIC, respectively. From the analysis, the HIC recorded the highest percentages of descriptive statistics compared to the LIC. Unit root analysis indicated that the variables are stationary after first differencing. The cointegration test was estimated using the Fisher Combined Johansen, which indicated the presence of a long-run relationship. Panel VECM long-run results indicated that there is a positive relationship between external debt and GDP in both the HIC and LIC. Inversely, the test indicated that there is a negative and positive long-run relationship between public investment and GDP in HIC and LIC, respectively. Debt service cost was found to have a statistically insignificant and negative relationship with GDP in HIC, although the relationship was positive in LIC. The error correction model showed that in both the HIC and LIC there is disequilibrium in the long run, which indicates that the models are bound to converge to equilibrium in the short run.

The Granger causality results indicated that there is a unidirectional causality between GDP and public investment in HIC and LIC. Furthermore, the impulse response showed that the response of GDP to its past values is positive throughout the ten-year

period. Additionally, the results indicated that changes in GDP will negatively affect external debt and partially affect debt service cost negatively and positively during the estimated periods. Also, it was established that GDP affects public investment positively throughout the ten-year period. The analysis of the LIC showed similar outcomes to that of HIC, except for the partial negative impact on public investment. Variance decomposition test focused on three periods, where in the HIC it showed that the second variation in GDP accounts for 85.56% of the variation in GDP, while other variables account for the remaining 14.14% variations in GDP. In the tenth period, changes in debt service cost and public investment account for 11.19% and 9.50% of GDP, respectively. Whereas, in LIC the second period GDP takes into consideration 97% of variation in past GDP values and the remaining variables account for 3% of the remaining variations in GDP. External debt and public investment were noted to significantly contribute to the remaining variations as they have the highest values. Thus, their changes were valued at 7.80% and 23.96%, respectively. Lastly, the Normality test indicated that the residuals are normally distributed, while the AR root indicated stability of the AR model.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY AND INTERPRETATION OF THE FINDINGS

The study aimed to investigate the effect of the debt overhang paradox and public investment on economic growth in selected SADC countries through a comparative debt analysis study. To achieve the objectives of the study used secondary data obtained from the World Bank and IMF from 2004 to 2020. The Panel Vector Error Correction Model (VECM), impulse response function, variance decomposition, and Granger causality were among the tests used to estimate the model of the study. The study also determined the existence of cointegration by running the Pedroni and Fisher (Combined Johansen) cointegration test. Both tests indicated that there are at least four cointegrating equations in both HIC and LIC.

Furthermore, the Panel VECM concluded that HICs have a positive long run relationship between external debt and GDP. This is the same for LICs, indicating that in both groups, an increase in debt accumulation has yielded growth in their economies in the long run. On the contrary, in HICs, the relationship between public investment and economic growth was negative in the long run. That is HICs can have their public funds exceed the set minimum for public infrastructure that requires funding. Though the countries can source investment for infrastructure, they can use it efficiently and effectively to improve economic growth in the long run. The LICs results contradict those of the HICs, where public investment was found to have a positive relationship with GDP in the long run. Thus, in selected LICs in the SADC region, public investment is efficiently allocated and utilised in an effective manner which improves economic growth. This is the realisation made from the study following the identification that most of the mentioned HIC and LIC SADC countries are relying mainly on external borrowing to function their economies, and this has left some economies unstable and with inefficient resources to service or even repay the debt. Thus, investment in public infrastructure can be identified as a near-to-economic sustainability and growth solution although, improvements still need to be made in the

sector for proper growth and economic recovery to be realised by the selected countries.

The model also tested for Granger causality and found a unidirectional causal relationship from GDP to public investment in HICs and LICs. The implication is that the relationship between the two variables runs from GDP to public investment, as GDP causes public investment. Evenly, the ECT results provided that for HICs, the model's disequilibrium, in the long run, would undertake an adjustment in the short run at the speed of 38.57%. Evenly in LICs, the model is bound to converge to equilibrium at a speed of 9.68%. This indicates that the selected SADC countries model elasticities are statistically significant. Additionally, the impulse response indicated that in HICs, GDP responds negatively to external debt in a ten-year period, whereas the response to public investment is positive for the whole ten-year period. Comparably, the results of the LICs showed a negative response from GDP to external debt and a negative response to public investment, although the response was positive during other periods. The variance decomposition test showed that in the HICs, debt service costs and public investment contribute most of the variations in the dependent variables as they are valued at 11.19% and 9.50%, respectively. In the LICs, the majority of the variation is from external debt and public investment at 7.80% and 23.96%, respectively. The study yielded stable results in both the HIC and LIC making the models desirable since the Inverse Roots of AR Characteristic Polynomial showed that the models are stable.

6.2 CONCLUSIONS

Based on the results, in the SADC region, external debt, debt servicing cost and public investment have a short and long-run relationship with economic growth in HIC and LIC. In the HIC, external debt exhibited a beneficial effect on growth, suggesting it was put to good use in the longer term. The same analysis goes for the LICs. The implication is that the debt service cost hinders the growth path of the two SADC debt groups. This is one critical factor inflating the slow growth where debt payment hinders the much-needed public investment needs. As such, the already stated problems of weak economic growth that adversely impact socio-economic challenges such as unemployment and inequality may persist. The inability to finance the debt service costs is excessively high in the LIC, where the beta was higher than the LIC. Should

the current borrowing and subsequent debt payments improve under the current finance system in the long run, the LIC may creep into the LIC classification. This negative effect places vulnerability on the need for economic and social development, which in the long run affords young people an opportunity to enter the labour market. That is, the selected HIC and LIC countries seem to be utilising their accumulated debt effectively as it affects economic growth positively, but servicing the debt is beyond their economic means of affordability. This has yielded negative effects not only on growth but on other economic activities, for instance, public investment funds might be redirected into servicing the debt and thus leaving less funds to invest in crucial sectors essential for economic growth. It is as though funds are being prioritised for servicing debt and have placed a frightening response on individuals' standard of living, given that the need to service the debt robs them of an opportunity to receive the basic service delivery from their governments.

6.3 RECOMMENDATIONS

Given the high levels of external debt the majority of the selected countries have experienced and the inability to service the accumulated debt in both the HIC and LIC SADC countries, the study recommends exploring other means of generating revenue aside from external borrowing. Since well the SADC region has a worrisome 60% debt threshold rate in which countries' debt rates, the study has noted that most of the HICs countries have a problem managing debt and sustaining economic growth. It appears that some of the examined LICs are heading in the route of the HICs. Therefore, the following policy implications apply:

The countries should work on policies and measures to handle their debt rates and debt-service-cost.

Evenly, given the set threshold, the countries should also attempt to keep their debt levels below the threshold, simultaneously considering the effect excessive debt levels will have on the future generation.

The SADC countries may also negotiate lower debt interest payments and/or a payment grace period where the required interest payment is halted for several years. This will allow the countries to provide the much-needed funds directed for public investment.

Public investment can be considered as a way out of the borrowing-dependence era, especially investment in infrastructure development enables economic growth and declines the dependency on external borrowing. Most countries have accumulated debt they are unable to service and repay, which has yielded a debt overhang and eventually undesirable credit ratings. Throughout the years, investment in public infrastructure development has proven to be effective in generating revenue, although in recent years its ability has diminished, and most governments do not prioritise the maintenance and sustenance of their developed infrastructure and consequently their ability to function effectively declines. As such, most governments faced with such a problem can finance the private sector to manage the infrastructures and prioritise sourcing revenue mainly through investment.

6.4 LIMITATIONS OF THE STUDY

The study limited its focus on the period 1990 to 2020, to analyse debt overhang paradox of external debt and public debt on economic growth in indebted SADC countries. As such, underlying factors that may have influenced the data after the aforementioned period are not taken into consideration in the study. There is anticipation for future research and modelling to determine different models in other regions of the African continent and thus, obtain different results. This can be done through a different study model such as an approach at which the relationship between external debt and public investment have on economic growth can be adjusted outside the boundaries of indebtedness and SADC to determine a more robust and evenly detailed analysis.

6.5 AREAS OF FUTURE RESEARCH

Given the fewer studies that have explored the nexus between external debt, debt service cost, and public investment and their relationship with economic growth in the SADC region, further exploration could focus on other regions on the African continent, such as the ECOWAS. Furthermore, the study period could be expanded beyond 2004-2020 depending on data availability, and a different set of variables could be utilized to examine the analysis from a different approach and new point of view.

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APPENDIXES

Appendix A: List of SADC Countries

ACRONOMY	HIGHLY INDEBTED COUNTRY
MLW	Malawi
MAD	Madagascar
MOZ	Mozambique
TAN	Tanzania
ZIM	Zimbabwe
	LESS INDEBTED COUNTRY
ANG	Angola
BOT	Botswana
MAU	Mauritius
SA	South Africa

Appendix B: Data for highly indebted countries

COUNTRY	YEARS	GDP	EXDBT	DSERV	PINV	FCE	GFCE	TOT
MOZAMBIQUE	2004	7,9	81,71977	4,786384	25,3222	91,93048	17,56678	68,64675
MOZAMBIQUE	2005	6,6	73,22608	4,802243	22,51535	91,89667	17,0864	68,60272
MOZAMBIQUE	2006	9,7	56,41441	6,426267	21,59488	88,12365	16,38272	64,09237
MOZAMBIQUE	2007	7,7	52,8962	11,75735	20,51164	87,65564	15,77749	63,03715
MOZAMBIQUE	2008	7,3	46,82764	5,076918	20,99189	88,30876	16,33516	62,33313
MOZAMBIQUE	2009	6,3	52,33119	4,381305	18,32691	92,24064	17,47716	64,80519
MOZAMBIQUE	2010	6,5	55,24723	6,237887	21,93967	91,81312	17,84593	70,6407
MOZAMBIQUE	2011	7,4	44,27999	4,757044	28,82836	91,20549	19,20094	80,23035
MOZAMBIQUE	2012	7,3	43,84504	2,920175	49,52865	94,57504	20,40669	101,8716
MOZAMBIQUE	2013	7,0	75,48933	3,083525	53,98797	95,67466	23,46483	103,1505
MOZAMBIQUE	2014	7,4	75,87171	4,278744	52,85512	96,04197	26,47069	111,4652
MOZAMBIQUE	2015	6,7	90,10387	3,735748	41,24913	90,50324	25,92734	93,90871
MOZAMBIQUE	2016	3,8	121,66	4,140834	46,60232	91,94552	26,36285	105,6385
MOZAMBIQUE	2017	3,7	123,3606	3,5108	33,1863	89,37441	24,64937	99,71881
MOZAMBIQUE	2018	3,4	128,3731	3,758322	50,04782	87,41633	21,83751	127,2042
MOZAMBIQUE	2019	2,3	133,2805	5,723585	60,05831	87,40389	22,75522	111,9989
MOZAMBIQUE	2020	-1,2	154,4052	11,34249	57,80089	85,74931	20,93879	103,2839
TANZANIA	2004	7,5	52,54019	0,747387	24,48516	77,03294	11,4759	33,59823
TANZANIA	2005	7,5	46,74834	0,72506	27,3959	75,59664	11,91804	36,95927
TANZANIA	2006	6,5	22,10714	0,472479	30,32396	75,61422	11,88983	42,76817
TANZANIA	2007	6,8	23,45698	0,332567	32,65122	75,74593	13,10926	48,05839
TANZANIA	2008	5,7	21,93144	0,265944	37,48952	72,6078	11,3176	49,02654
TANZANIA	2009	5,3	27,00912	0,570755	34,35568	72,78839	12,33306	43,5326
TANZANIA	2010	6,3	28,42933	0,608824	32,01724	76,40814	10,3622	47,64044
TANZANIA	2011	7,7	29,88535	0,431059	34,73603	78,16153	9,696879	56,16612

TANZANIA	2012	4,5	30,80921	0,430719	34,84444	74,78101	10,42701	54,36959
TANZANIA	2013	6,8	31,09219	0,551066	37,46995	73,13625	10,04524	48,63062
TANZANIA	2014	6,7	33,00316	0,620053	37,65397	71,56364	9,867791	45,35602
TANZANIA	2015	6,2	39,03914	1,00636	32,75869	73,78917	9,927295	40,75768
TANZANIA	2016	6,9	39,93876	1,513161	32,17479	70,54573	9,066506	35,42047
TANZANIA	2017	6,8	41,1049	1,558791	34,01716	67,94122	8,496346	32,23894
TANZANIA	2018	5,4	39,76395	1,857743	38,37657	67,99076	8,112586	32,64261
TANZANIA	2019	5,8	39,03159	2,002136	39,65486	66,32193	7,768396	32,95912
TANZANIA	2020	2,0	41,25045	2,029839	41,01825	65,91827	8,151005	29,60425
ZAMBIA	2004	7,0	129,5041	8,050112	9,995586	10,36736	23,27255	70,81307
ZAMBIA	2005	7,2	69,7399	3,687391	10,0066	10,5093	22,45147	62,20028
ZAMBIA	2006	7,9	19,46583	1,249712	10,18157	10,584	19,69154	57,85682
ZAMBIA	2007	8,4	21,84326	0,997003	10,19773	10,59938	19,92290	65,77146
ZAMBIA	2008	7,8	17,89472	1,012453	10,23877	10,70502	19,45740	59,45489
ZAMBIA	2009	9,2	24,45643	1,142934	10,307	10,73664	17,80709	56,12138
ZAMBIA	2010	10,3	22,49913	0,792571	10,40095	63,97142	9,379637	67,90092
ZAMBIA	2011	5,6	22,27577	0,987046	10,51535	66,00923	10,24575	76,21473
ZAMBIA	2012	7,6	22,82178	0,918343	10,50046	64,61124	11,89744	79,1007
ZAMBIA	2013	5,1	23,40161	1,187279	10,5955	64,38582	12,18435	80,45602
ZAMBIA	2014	4,7	34,56992	1,498674	10,71437	66,75905	14,52389	76,19366
ZAMBIA	2015	2,9	56,52103	2,617487	10,84813	65,42717	14,78059	79,86542
ZAMBIA	2016	3,8	74,93686	3,651867	10,896	67,48327	16,07187	73,95856
ZAMBIA	2017	3,5	92,83179	3,393877	10,98031	60,70205	13,7208	71,58569
ZAMBIA	2018	4,0	90,81824	4,952305	11,07205	57,67675	12,70866	74,88837
ZAMBIA	2019	1,4	121,0538	11,37208	11,1067	59,93322	17,68425	68,7912
ZAMBIA	2020	-2,8	170,6992	23,06473	32,29314	53,19324	14,71164	79,32549
ZIMBABWE	2004	-6,9	91,0885	2,496029	4,509115	102,5909	21,00063	76,03961
ZIMBABWE	2005	-2,2	82,79718	4,546183	1,525177	107,4212	15,21127	76,04371
ZIMBABWE	2006	-3,5	97,59782	2,078834	1,571161	109,3372	5,882665	82,82065
ZIMBABWE	2007	-3,3	118,0371	2,244333	7,109753	101,4924	3,208175	84,1729
ZIMBABWE	2008	-9,9	146,5215	2,365516	5,127906	121,46	2,047121	109,5216
ZIMBABWE	2009	5,3	64,58119	1,276866	12,7468	110,0766	9,4426	61,77844
ZIMBABWE	2010	11,4	56,87092	3,253934	18,7633	105,0791	15,31562	83,12419
ZIMBABWE	2011	11,9	53,35626	8,335991	17,39777	102,4672	18,77392	89,46653
ZIMBABWE	2012	10,6	52,82096	4,410509	9,856977	113,9791	20,00596	74,16253
ZIMBABWE	2013	4,5	44,76412	3,115374	9,209479	105,4715	18,4387	58,65649
ZIMBABWE	2014	3,9	43,62508	2,676643	9,639224	103,1721	19,56028	54,67162
ZIMBABWE	2015	1,5	49,2188	3,381401	10,03564	108,3928	18,87751	56,74881
ZIMBABWE	2016	0,6	56,88835	6,142417	9,861371	101,4706	18,12394	51,21902
ZIMBABWE	2017	2,9	72,41563	4,141331	9,700147	101,0118	21,65066	50,02971
ZIMBABWE	2018	4	70,85902	3,403335	9,687734	103,6598	11,91854	69,44702
ZIMBABWE	2019	-6,5	64,79738	8,401156	7,408702	93,37113	6,635067	63,28192
ZIMBABWE	2020	-4,1	73,02174	5,620856	7,45147	94,146	7,757196	76,00194

Appendix C: Data for less indebted countries

COUNTRY	YEARS	GDP	EXDBT	DSERV	PINV	FCE	GFCE	TOT
ANGOLA	2004	10,95	46,53166	8,9478796	30,89368	55,92555	14,312063	103,57995
ANGOLA	2005	15,03	37,1535	7,9370792	27,55658	47,98185	16,029037	106,59096
ANGOLA	2006	11,55	21,43833	9,5860048	23,30077	44,38866	15,341722	94,625159
ANGOLA	2007	14,01	20,70806	7,7952892	25,73058	46,51792	15,536935	108,06007
ANGOLA	2008	11,17	20,84443	2,1848596	30,80405	45,6106	16,814612	121,36471
ANGOLA	2009	0,86	31,94076	6,3506361	42,82085	62,11067	19,898586	122,44614
ANGOLA	2010	4,86	35,39115	4,012184	28,19732	52,8401	17,042346	104,12364
ANGOLA	2011	3,47	33,66611	3,9587762	26,42435	52,21826	18,235859	99,982506
ANGOLA	2012	8,54	31,3321	5,1579647	26,66758	53,25226	17,842633	91,800097
ANGOLA	2013	4,95	34,75505	4,6426369	26,14297	59,17479	21,621949	86,811933
ANGOLA	2014	4,82	33,94364	6,1901521	27,50046	62,4424	17,975659	79,332923
ANGOLA	2015	0,94	44,66033	10,202926	34,20249	69,17683	16,432833	62,888516
ANGOLA	2016	-2,58	60,33097	23,199037	27,21471	69,90648	13,880685	53,370158
ANGOLA	2017	-0,15	51,62871	14,129114	24,13031	70,11832	12,935819	52,256822
ANGOLA	2018	-1,32	67,59521	15,388408	17,86942	66,83601	10,474544	66,378013
ANGOLA	2019	-0,70	78,68798	18,457004	17,71226	58,53577	8,5988563	57,829538
ANGOLA	2020	-5,50	125,8827	17,221744	16,03013	65,00626	8,1991381	56,858941
BOTSWANA	2004	2,71	6,449163	0,6076254	34,98935	60,31862	20,532344	90,997823
BOTSWANA	2005	4,56	5,06958	0,5893984	27,1847	57,50749	19,400745	88,505352
BOTSWANA	2006	8,36	3,895006	0,6016505	28,53592	55,76881	17,037852	86,334589
BOTSWANA	2007	8,28	4,168161	0,4629227	29,57545	57,23915	17,594781	95,104639
BOTSWANA	2008	6,25	4,398759	0,6833744	41,67964	64,42071	20,351259	96,71591
BOTSWANA	2009	-7,65	16,3853	0,4656632	30,83211	71,75976	21,089543	86,68602
BOTSWANA	2010	8,56	14,87522	0,6548702	38,05304	68,90274	19,756505	94,899795
BOTSWANA	2011	6,05	15,95078	0,5287946	35,45356	64,809	18,486709	103,54558
BOTSWANA	2012	4,46	17,83583	0,4179	38,08283	71,26204	19,291427	110,6549
BOTSWANA	2013	11,34	16,75848	1,3601948	29,40908	70,56998	18,548307	122,55358
BOTSWANA	2014	4,15	15,86365	0,42662	24,95534	72,27092	28,908793	118,08853
BOTSWANA	2015	-5,72	16,14982	1,889198	29,07411	77,84348	31,527521	112,50167
BOTSWANA	2016	7,04	13,93057	1,2226975	22,06769	69,17428	28,475558	100,46467
BOTSWANA	2017	4,00	10,69187	1,1976171	23,83052	70,85242	28,907904	82,009269
BOTSWANA	2018	3,98	10,49999	1,2065856	27,31825	72,21973	28,970765	88,063432
BOTSWANA	2019	3,35	9,46634	1,2447906	29,65062	75,33702	31,36379	83,241925
BOTSWANA	2020	-8,73	10,58309	1,2481158	33,28068	81,56732	35,662957	77,820698
MAURITIUS	2004	4,33	50,71674	9,480034	24,39287	77,42905	14,202052	108,46873
MAURITIUS	2005	1,78	56,03637	12,342016	22,66804	82,52963	14,522659	123,2461

MAURITIUS	2006	4,87	49,49197	19,711862	25,5732	80,87405	14,123929	127,06286
MAURITIUS	2007	5,73	67,74406	19,138177	25,98517	78,85985	12,435593	120,87645
MAURITIUS	2008	5,39	64,10631	13,002263	25,34599	84,72387	12,464556	115,48932
MAURITIUS	2009	3,32	79,71505	21,591393	23,76575	87,17079	13,92225	104,42973
MAURITIUS	2010	4,38	79,98392	22,309612	27,10508	87,00923	13,818488	113,45707
MAURITIUS	2011	4,08	88,21459	12,739418	23,94669	86,84912	13,463603	117,53895
MAURITIUS	2012	3,50	88,63803	27,267215	24,38057	87,60652	13,357708	119,50012
MAURITIUS	2013	3,36	95,0654	19,085987	22,03213	88,85571	14,604844	109,96974
MAURITIUS	2014	3,74	92,64037	45,11784	19,67571	89,38816	14,822656	108,13876
MAURITIUS	2015	3,55	81,40127	33,876446	18,09106	89,6373	14,933409	105,0096
MAURITIUS	2016	3,84	79,09539	13,593207	17,90093	89,00348	15,444435	97,985578
MAURITIUS	2017	3,81	108,7456	20,143146	18,27511	89,99608	15,161165	97,365491
MAURITIUS	2018	3,76	101,4665	20,253253	19,40485	91,04884	15,309523	94,984166
MAURITIUS	2019	3,01	115,043	20,478472	19,79914	91,19445	15,320098	92,139351
MAURITIUS	2020	-14,89	155,6638	21,983364	18,97048	91,71111	18,419214	78,628479
MADAGASCAR	2004	5,3	76,58655	1,657273	21,15103	88,70974	18,752605	48,775382
MADAGASCAR	2005	4,6	61,45235	1,3881259	19,32711	91,1642	16,121092	59,130085
MADAGASCAR	2006	5	24,43694	0,9713966	20,31127	86,81774	16,874709	62,102839
MADAGASCAR	2007	6,2	27,60659	0,4096084	26,51793	84,59239	19,029039	66,702735
MADAGASCAR	2008	7,1	23,80623	0,3702632	38,7461	80,19685	14,076977	74,357354
MADAGASCAR	2009	-4	29,95831	0,5251358	37,2219	84,43815	12,508634	62,411698
MADAGASCAR	2010	0,3	28,02498	0,6300567	27,02739	87,09874	13,116075	57,874895
MADAGASCAR	2011	1,5	25,15933	0,4416058	23,35117	87,69266	14,117114	56,483093
MADAGASCAR	2012	3	26,58412	0,6423267	20,16892	88,92144	15,007693	52,651714
MADAGASCAR	2013	2,4	24,38001	0,6108281	16,51291	93,31036	15,64667	56,367582
MADAGASCAR	2014	3,3	24,22682	0,8147192	16,49069	88,91493	15,800002	61,969432
MADAGASCAR	2015	3,1	27,46083	1,2843281	15,99189	88,44722	15,14032	61,220379
MADAGASCAR	2016	4	26,03005	1,0760614	16,36599	86,28358	14,761291	60,834698
MADAGASCAR	2017	3,9	26,38819	1,0293282	15,80638	87,73176	16,122567	65,343402
MADAGASCAR	2018	4,6	27,85718	0,905455	18,78413	86,03634	14,580701	68,567142
MADAGASCAR	2019	5	29,90058	0,86065	22,5097	83,1582	14,173489	62,21647
MADAGASCAR	2020	-4	38,45754	0,9706432	21,04963	87,02885	15,466424	51,047665
SOUTH AFRICA	2004	4,55	16,94381	1,5951463	16,96035	80,67444	17,004439	45,643575
SOUTH AFRICA	2005	5,28	14,91661	1,6979785	16,83182	79,74203	16,148899	47,427781
SOUTH AFRICA	2006	5,60	18,95228	2,5281088	18,4902	79,42584	15,86074	53,768141
SOUTH AFRICA	2007	5,36	21,94691	1,3574275	19,32597	79,3545	15,886498	57,125139
SOUTH AFRICA	2008	3,19	23,49959	2,2059403	21,28725	80,10973	17,072454	65,974524

SOUTH AFRICA	2009	-1,54	24,76383	1,6404053	18,76694	79,79868	17,793633	49,587535
SOUTH AFRICA	2010	3,04	26,49558	1,5481894	17,59564	80,36355	17,996064	50,406087
SOUTH AFRICA	2011	3,17	26,60847	1,4441114	18,85324	81,12792	18,195143	54,63635
SOUTH AFRICA	2012	2,40	34,91899	2,4497179	18,58454	83,12207	18,820545	55,582617
SOUTH AFRICA	2013	2,49	36,18294	3,3838501	19,16876	82,94771	19,081375	58,875028
SOUTH AFRICA	2014	1,41	38,314	2,2896945	18,48796	83,01037	19,314063	59,499574
SOUTH AFRICA	2015	1,32	36,82091	6,3735551	18,63321	82,6662	18,985071	56,726676
SOUTH AFRICA	2016	0,66	45,66119	4,5088729	16,96045	82,58863	19,307562	55,861258
SOUTH AFRICA	2017	1,16	47,16461	3,9549134	16,61073	82,24505	19,236077	53,535932
SOUTH AFRICA	2018	1,49	44,23645	7,1288732	16,5409	82,98951	19,37161	54,507584
SOUTH AFRICA	2019	0,11	49,00374	6,0606807	16,02114	83,42088	19,607704	54,150246
SOUTH AFRICA	2020	-6,43	51,77591	8,7077323	12,74555	82,90378	20,65017	51,126846

Appendix D: Descriptive statistics

DESCRIPTIVE STATISTICS RESULTS: HIGHLY INDEBTED COUNTRIES

Gross Domestic Product

Mean	4.488512
Median	5.228502
Maximum	19.67532
Minimum	-17.66895
Std. Dev.	4.840642
Skewness	-1.023741
Kurtosis	7.619013
Jarque-Bera	108.4917
Probability	0.000000
Sum	457.8282
Sum Sq. Dev.	2366.613
Observations	102

External Debt

	LEXDBT
Mean	52.30998
Median	39.85136
Maximum	170.6992
Minimum	14.89930
Std. Dev.	35.31799
Skewness	1.327818
Kurtosis	4.112853
Jarque-Bera	35.23611
Probability	0.000000
Sum	5335.618
Sum Sq. Dev.	125983.4
Observations	102

Debt Service Cost

	LDSERV
Mean	2.707624
Median	1.447204
Maximum	23.06473
Minimum	0.265944
Std. Dev.	3.212402
Skewness	3.260162
Kurtosis	18.22583
Jarque-Bera	1165.947
Probability	0.000000
Sum	276.1776
Sum Sq. Dev.	1042.272
Observations	102

Public Investment

	LPINV
Mean	21.17658
Median	18.54511
Maximum	60.05831
Minimum	1.525177
Std. Dev.	13.01181
Skewness	1.017803
Kurtosis	3.470530
Jarque-Bera	18.55163
Probability	0.000094
Sum	2160.011
Sum Sq. Dev.	17100.02
Observations	102

Final Consumption Expenditure

	LFCE
Mean	75.20078
Median	86.15996
Maximum	121.4600
Minimum	10.36736
Std. Dev.	30.02570
Skewness	-1.335047
Kurtosis	3.613517
Jarque-Bera	31.89970
Probability	0.000000
Sum	7670.480
Sum Sq. Dev.	91055.80
Observations	102

Terms of Trade

	LTOT
Mean	65.78374
Median	63.15953
Maximum	127.2042
Minimum	29.60425
Std. Dev.	18.76772
Skewness	0.732984
Kurtosis	3.857545
Jarque-Bera	12.25890
Probability	0.002178
Sum	6709.942
Sum Sq. Dev.	35574.97
Observations	102

Government Final Consumption Expenditure

	LGFCE
Mean	17.14409
Median	17.81870
Maximum	34.08150
Minimum	2.047121
Std. Dev.	5.814910
Skewness	-0.071552
Kurtosis	3.163818
Jarque-Bera	0.201088
Probability	0.904345
Sum	1748.697
Sum Sq. Dev.	3415.131
Observations	102

DESCRIPTIVE STATISTICS RESULTS: HIGHLY INDEBTED COUNTRIES

Gross Domestic Product

	LGDP
Mean	3.274890
Median	3.752127
Maximum	15.03000
Minimum	-14.89468
Std. Dev.	5.021682
Skewness	-0.752891
Kurtosis	5.244320
Jarque-Bera	20.69566
Probability	0.000032
Sum	222.6925
Sum Sq. Dev.	1689.558
Observations	68

External Debt

	LEXBDT
Mean	43.84466
Median	35.15507
Maximum	155.6638
Minimum	3.895006
Std. Dev.	33.31565
Skewness	1.104439
Kurtosis	3.820093
Jarque-Bera	15.72981
Probability	0.000384
Sum	2981.437
Sum Sq. Dev.	74365.47
Observations	68

Debt Service Cost

	LDSERV
Mean	8.693509
Median	4.900301
Maximum	45.11784
Minimum	0.417900
Std. Dev.	9.325594
Skewness	1.464334
Kurtosis	5.251521
Jarque-Bera	38.66492
Probability	0.000000
Sum	591.1586
Sum Sq. Dev.	5826.770
Observations	68

Public Investment

	LPINV
Mean	24.35807
Median	24.03850
Maximum	42.82085
Minimum	12.74555
Std. Dev.	6.629248
Skewness	0.727454
Kurtosis	3.096031
Jarque-Bera	6.023608
Probability	0.049203
Sum	1656.349
Sum Sq. Dev.	2944.444
Observations	68

Final Consumption Expenditure

	LFCE
Mean	73.59183
Median	78.35166
Maximum	91.71111
Minimum	44.38866
Std. Dev.	12.91227
Skewness	-0.597819
Kurtosis	2.314297
Jarque-Bera	5.382597
Probability	0.067793
Sum	5004.244
Sum Sq. Dev.	11170.69
Observations	68

Terms of Trade

	LTOT
Mean	86.25314
Median	91.39896
Maximum	127.0629
Minimum	45.64358
Std. Dev.	25.02268
Skewness	-0.153479
Kurtosis	1.636695
Jarque-Bera	5.532997
Probability	0.062882
Sum	5865.214
Sum Sq. Dev.	41951.00
Observations	68

Government Final Consumption Expenditure

	LGFCE
Mean	17.99615
Median	17.33362
Maximum	35.66296
Minimum	8.199138
Std. Dev.	5.155243
Skewness	1.326109
Kurtosis	5.237413
Jarque-Bera	34.11413
Probability	0.000000
Sum	1223.738
Sum Sq. Dev.	1780.627
Observations	68

Appendix E: Panel unit root test

UNIT ROOT TEST RESULTS: HIGHLY INDEBTED COUNTRIES

Level *I* (0)

Gross Domestic Product (Individual Intercept)

Panel unit root test: Summary
Series: LGDP
Date: 08/07/22 Time: 12:56
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.54984	0.9998	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.74123	0.9592	6	90
ADF - Fisher Chi-square	7.66158	0.8110	6	90
PP - Fisher Chi-square	12.5077	0.4058	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept)

Panel unit root test: Summary
Series: LEXDBT
Date: 08/07/22 Time: 12:58
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.22668	0.0000	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.01827	0.0000	6	90
ADF - Fisher Chi-square	59.3763	0.0000	6	90
PP - Fisher Chi-square	36.5633	0.0003	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept)

Panel unit root test: Summary
Series: LDSERV
Date: 08/07/22 Time: 12:59
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.38503	0.9915	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.79281	0.7861	6	90
ADF - Fisher Chi-square	18.5470	0.1001	6	90
PP - Fisher Chi-square	14.4551	0.2726	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept)

Panel unit root test: Summary
Series: LPINV
Date: 08/07/22 Time: 13:00
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.05770	0.4770	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.82453	0.7952	6	90
ADF - Fisher Chi-square	11.2251	0.5097	6	90
PP - Fisher Chi-square	7.12592	0.8492	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: LFCE
Date: 08/07/22 Time: 13:01
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.56897	0.7153	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.04236	0.8514	6	90
ADF - Fisher Chi-square	10.0930	0.6078	6	90
PP - Fisher Chi-square	12.4089	0.4134	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept)

Panel unit root test: Summary
Series: LTOT
Date: 08/07/22 Time: 13:02
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.28700	0.3871	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.04760	0.4810	6	90
ADF - Fisher Chi-square	9.69462	0.6427	6	90
PP - Fisher Chi-square	13.2112	0.3539	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: LGFCE
Date: 08/07/22 Time: 13:03
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.02248	0.4910	6	90
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.14383	0.5572	6	90
ADF - Fisher Chi-square	13.5189	0.3325	6	90
PP - Fisher Chi-square	13.0936	0.3623	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LGDP
Date: 08/09/22 Time: 10:00
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.69718	0.7572	6	90
Breitung t-stat	3.61282	0.9998	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.84990	0.8023	6	90
ADF - Fisher Chi-square	7.94793	0.7892	6	90
PP - Fisher Chi-square	8.61209	0.7357	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LEXDBT
Date: 08/09/22 Time: 10:02
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.3443	0.0000	6	90
Breitung t-stat	1.28974	0.9014	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.0662	0.0000	6	90
ADF - Fisher Chi-square	67.2921	0.0000	6	90
PP - Fisher Chi-square	41.2739	0.0000	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LDSERV
Date: 08/09/22 Time: 10:03
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.42122	0.6632	6	90
Breitung t-stat	2.20525	0.9863	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.92776	0.8232	6	90
ADF - Fisher Chi-square	17.4842	0.1323	6	90
PP - Fisher Chi-square	15.4889	0.2158	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LPINV
Date: 08/09/22 Time: 10:05
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.43551	0.3316	6	90
Breitung t-stat	1.95076	0.9745	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.19817	0.5785	6	90
ADF - Fisher Chi-square	12.7238	0.3894	6	90
PP - Fisher Chi-square	6.31825	0.8992	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LFCE
Date: 08/09/22 Time: 10:07
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.05367	0.5214	6	90
Breitung t-stat	-1.24960	0.1057	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.04818	0.5192	6	90
ADF - Fisher Chi-square	10.2105	0.5975	6	90
PP - Fisher Chi-square	12.6635	0.3940	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Term of Trade (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LTOT
Date: 08/09/22 Time: 10:09
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.44775	0.3272	6	90
Breitung t-stat	-0.12834	0.4489	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.05025	0.5200	6	90
ADF - Fisher Chi-square	8.89981	0.7115	6	90
PP - Fisher Chi-square	15.6842	0.2061	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LGFCE
Date: 08/09/22 Time: 10:10
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.15847	0.5630	6	90
Breitung t-stat	0.31353	0.6231	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.31319	0.3771	6	90
ADF - Fisher Chi-square	12.6311	0.3964	6	90
PP - Fisher Chi-square	14.9782	0.2426	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (None)

Panel unit root test: Summary
Series: LGDP
Date: 08/09/22 Time: 10:12
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.49368	0.0063	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	21.5574	0.0428	6	90
PP - Fisher Chi-square	25.5032	0.0126	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (None)

Panel unit root test: Summary
Series: LEXDBT
Date: 08/09/22 Time: 10:13
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.21246	0.4159	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	19.3231	0.0810	6	90
PP - Fisher Chi-square	24.6133	0.0168	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (None)

Panel unit root test: Summary
Series: LDSERV
Date: 08/09/22 Time: 10:13
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.38872	0.6513	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	11.5620	0.4815	6	90
PP - Fisher Chi-square	10.8876	0.5386	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (None)

Panel unit root test: Summary
Series: LPINV
Date: 08/09/22 Time: 10:15
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.72559	0.7660	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	5.06145	0.9559	6	90
PP - Fisher Chi-square	4.79901	0.9644	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: LFCE
Date: 08/09/22 Time: 10:17
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.55058	0.0605	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	9.81558	0.6321	6	90
PP - Fisher Chi-square	16.8007	0.1572	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (None)

Panel unit root test: Summary
Series: LTOT
Date: 08/09/22 Time: 10:17
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.03137	0.4875	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	5.83331	0.9243	6	90
PP - Fisher Chi-square	4.62028	0.9695	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: LGFCE
Date: 08/09/22 Time: 10:19
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.37628	0.3534	6	90
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	10.0715	0.6097	6	90
PP - Fisher Chi-square	9.83221	0.6307	6	96

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

First Difference *I* (1)

Gross Domestic Product (Individual Intercept)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 10:21
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.22458	0.4112	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.00014	0.0013	6	84
ADF - Fisher Chi-square	29.5112	0.0033	6	84
PP - Fisher Chi-square	63.3916	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept)

Panel unit root test: Summary
Series: D(LEXDBT)
Date: 08/09/22 Time: 10:23
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.0195	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.4987	0.0000	6	84
ADF - Fisher Chi-square	87.2581	0.0000	6	84
PP - Fisher Chi-square	34.5997	0.0005	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 10:24
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.52239	0.0640	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.11178	0.0174	6	84
ADF - Fisher Chi-square	28.7439	0.0043	6	84
PP - Fisher Chi-square	47.1179	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept)

Panel unit root test: Summary
Series: D(LPINV)
Date: 08/09/22 Time: 10:26
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.59341	0.0048	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.08411	0.0186	6	84
ADF - Fisher Chi-square	24.2949	0.0185	6	84
PP - Fisher Chi-square	32.5069	0.0012	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 10:27
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.92363	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.47431	0.0003	6	84
ADF - Fisher Chi-square	36.8029	0.0002	6	84
PP - Fisher Chi-square	68.8882	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Term of Trade (Individual Intercept)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 10:28
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.94306	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.23124	0.0006	6	84
ADF - Fisher Chi-square	31.6917	0.0015	6	84
PP - Fisher Chi-square	64.3439	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 10:29
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.35737	0.0004	6	84
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.14725	0.0008	6	84
ADF - Fisher Chi-square	31.6140	0.0016	6	84
PP - Fisher Chi-square	60.8669	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 10:36
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.13777	0.5548	6	84
Breitung t-stat	1.30669	0.9043	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.79857	0.0360	6	84
ADF - Fisher Chi-square	20.6890	0.0551	6	84
PP - Fisher Chi-square	62.4918	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LEXDBT)
Date: 08/09/22 Time: 10:37
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-11.1125	0.0000	6	84
Breitung t-stat	0.36865	0.6438	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.09892	0.0000	6	84
ADF - Fisher Chi-square	69.1166	0.0000	6	84
PP - Fisher Chi-square	35.2445	0.0004	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 10:38
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.20977	0.1132	6	84
Breitung t-stat	-3.77092	0.0001	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.39557	0.0814	6	84
ADF - Fisher Chi-square	19.3988	0.0793	6	84
PP - Fisher Chi-square	40.0048	0.0001	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LPINV)
Date: 08/09/22 Time: 10:40
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.76875	0.0385	6	84
Breitung t-stat	1.01441	0.8448	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.47697	0.3167	6	84
ADF - Fisher Chi-square	14.2165	0.2871	6	84
PP - Fisher Chi-square	21.2146	0.0473	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 10:41
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.14180	0.0008	6	84
Breitung t-stat	1.33579	0.9092	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.85949	0.0315	6	84
ADF - Fisher Chi-square	27.9263	0.0057	6	84
PP - Fisher Chi-square	56.1104	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 10:44
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.32028	0.0004	6	84
Breitung t-stat	-1.11847	0.1317	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.77812	0.0377	6	84
ADF - Fisher Chi-square	22.0664	0.0368	6	84
PP - Fisher Chi-square	49.2153	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 10:46
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.20880	0.0007	6	84
Breitung t-stat	-1.13648	0.1279	6	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.74039	0.0409	6	84
ADF - Fisher Chi-square	21.0983	0.0490	6	84
PP - Fisher Chi-square	50.5414	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (None)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 10:47
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.42391	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	51.2419	0.0000	6	84
PP - Fisher Chi-square	94.9280	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (None)

Panel unit root test: Summary
Series: D(LEXDBT)
Date: 08/09/22 Time: 10:47
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.0035	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	91.4019	0.0000	6	84
PP - Fisher Chi-square	62.8493	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (None)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 10:48
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.62636	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	51.7087	0.0000	6	84
PP - Fisher Chi-square	67.3616	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (None)

Panel unit root test: Summary
Series: D(LPINV)
Date: 08/09/22 Time: 10:49
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.19112	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	44.9972	0.0000	6	84
PP - Fisher Chi-square	55.7585	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 10:50
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.44218	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	60.1873	0.0000	6	84
PP - Fisher Chi-square	86.8442	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (None)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 10:51
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.95867	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	59.6651	0.0000	6	84
PP - Fisher Chi-square	95.6192	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 10:52
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.27866	0.0000	6	84
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	54.5790	0.0000	6	84
PP - Fisher Chi-square	83.6369	0.0000	6	90

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

UNIT ROOT RESULTS: LESS INDEBTED COUNTRIES

Level *I* (0)

Gross Domestic Savings (Individual Intercept)

Panel unit root test: Summary
Series: LGDP
Date: 08/09/22 Time: 13:34
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.57563	0.9424	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.82012	0.7939	4	60
ADF - Fisher Chi-square	6.68812	0.5706	4	60
PP - Fisher Chi-square	8.14117	0.4198	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept)

Panel unit root test: Summary
Series: LEXBDT
Date: 08/09/22 Time: 13:36
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.70954	0.9563	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	3.33318	0.9996	4	60
ADF - Fisher Chi-square	1.87624	0.9846	4	60
PP - Fisher Chi-square	1.42314	0.9939	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept)

Panel unit root test: Summary
Series: LDSERV
Date: 08/09/22 Time: 13:37
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.72600	0.7661	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.10886	0.8663	4	60
ADF - Fisher Chi-square	5.52828	0.6999	4	60
PP - Fisher Chi-square	13.3573	0.1001	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept)

Panel unit root test: Summary
Series: LPINV
Date: 08/09/22 Time: 13:39
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.84599	0.9676	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.01893	0.8459	4	60
ADF - Fisher Chi-square	3.41655	0.9056	4	60
PP - Fisher Chi-square	7.39127	0.4951	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: LFCE
Date: 08/09/22 Time: 13:41
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.59449	0.2761	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.75690	0.7754	4	60
ADF - Fisher Chi-square	3.16829	0.9234	4	60
PP - Fisher Chi-square	6.56305	0.5844	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept)

Panel unit root test: Summary
Series: LTOT
Date: 08/09/22 Time: 13:43
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.40085	0.6557	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.11074	0.5441	4	60
ADF - Fisher Chi-square	9.59940	0.2943	4	60
PP - Fisher Chi-square	8.82746	0.3571	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: LGFCE
Date: 08/09/22 Time: 13:44
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.37316	0.9151	4	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.49463	0.9937	4	60
ADF - Fisher Chi-square	0.88109	0.9989	4	60
PP - Fisher Chi-square	0.37883	1.0000	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LGDP
Date: 08/09/22 Time: 13:45
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.41411	0.9921	4	60
Breitung t-stat	3.65785	0.9999	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.16797	0.4333	4	60
ADF - Fisher Chi-square	10.0570	0.2610	4	60
PP - Fisher Chi-square	16.8349	0.0319	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LEXBDT
Date: 08/09/22 Time: 13:47
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.07519	0.9810	4	60
Breitung t-stat	3.62369	0.9999	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.51825	0.9355	4	60
ADF - Fisher Chi-square	6.32147	0.6113	4	60
PP - Fisher Chi-square	22.6062	0.0039	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LDSERV
Date: 08/09/22 Time: 13:48
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.09321	0.1372	4	60
Breitung t-stat	-0.06555	0.4739	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.30402	0.6194	4	60
ADF - Fisher Chi-square	5.47649	0.7056	4	60
PP - Fisher Chi-square	20.6271	0.0082	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LPINV
Date: 08/09/22 Time: 13:50
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.32825	0.3714	4	60
Breitung t-stat	1.05805	0.8550	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.32341	0.6268	4	60
ADF - Fisher Chi-square	5.10502	0.7463	4	60
PP - Fisher Chi-square	5.87086	0.6617	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LFCE
Date: 08/09/22 Time: 13:51
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.05991	0.4761	4	60
Breitung t-stat	-2.01519	0.0219	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.37573	0.3536	4	60
ADF - Fisher Chi-square	7.99680	0.4338	4	60
PP - Fisher Chi-square	12.1740	0.1436	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LTOT
Date: 08/09/22 Time: 13:53
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.19185	0.5761	4	60
Breitung t-stat	-0.01906	0.4924	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.11458	0.5456	4	60
ADF - Fisher Chi-square	6.93510	0.5437	4	60
PP - Fisher Chi-square	7.85474	0.4478	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: LGFCE
Date: 08/09/22 Time: 13:55
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.56164	0.2872	4	60
Breitung t-stat	1.46329	0.9283	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.21295	0.5843	4	60
ADF - Fisher Chi-square	7.37817	0.4964	4	60
PP - Fisher Chi-square	4.21195	0.8375	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (None)

Panel unit root test: Summary
Series: LGDP
Date: 08/09/22 Time: 13:56
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.98924	0.0014	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	17.4369	0.0259	4	60
PP - Fisher Chi-square	18.3414	0.0188	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (None)

Panel unit root test: Summary
Series: LEXBDT
Date: 08/09/22 Time: 13:58
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.66297	0.9999	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	1.11384	0.9974	4	60
PP - Fisher Chi-square	1.19083	0.9967	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (None)

Panel unit root test: Summary
Series: LDSERV
Date: 08/09/22 Time: 13:59
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.11707	0.8680	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	2.41193	0.9657	4	60
PP - Fisher Chi-square	3.41318	0.9058	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (None)

Panel unit root test: Summary
Series: LPINV
Date: 08/09/22 Time: 14:00
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.17230	0.1205	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	6.70988	0.5682	4	60
PP - Fisher Chi-square	8.18604	0.4155	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: LFCE
Date: 08/09/22 Time: 14:02
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.58878	0.9439	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	0.84161	0.9991	4	60
PP - Fisher Chi-square	0.92888	0.9987	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (None)

Panel unit root test: Summary
Series: LTOT
Date: 08/09/22 Time: 14:03
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.84946	0.0322	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	10.3328	0.2424	4	60
PP - Fisher Chi-square	7.90709	0.4426	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: LGFCE
Date: 08/09/22 Time: 14:05
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.15164	0.9843	4	60
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	2.91130	0.9398	4	60
PP - Fisher Chi-square	2.14892	0.9761	4	64

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

FIRST DIFFERENCE *I* (1)

Gross Domestic Product (Individual Intercept)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 14:07
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.52607	0.7006	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.92333	0.0272	4	56
ADF - Fisher Chi-square	20.5839	0.0083	4	56
PP - Fisher Chi-square	52.0503	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept)

Panel unit root test: Summary
Series: D(LEXBDT)
Date: 08/09/22 Time: 14:08
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.31315	0.0946	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.87039	0.0307	4	56
ADF - Fisher Chi-square	18.8797	0.0155	4	56
PP - Fisher Chi-square	43.1229	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 14:10
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.26002	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.96674	0.0000	4	56
ADF - Fisher Chi-square	37.5458	0.0000	4	56
PP - Fisher Chi-square	88.2753	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 14:11
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.30359	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.29894	0.0000	4	56
ADF - Fisher Chi-square	32.6372	0.0001	4	56
PP - Fisher Chi-square	61.9079	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 14:12
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.78349	0.0027	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.37037	0.0089	4	56
ADF - Fisher Chi-square	19.0396	0.0146	4	56
PP - Fisher Chi-square	30.8068	0.0002	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 14:13
Sample: 2004 2020
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.28356	0.0996	4	56
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.12175	0.0169	4	56
ADF - Fisher Chi-square	17.4837	0.0254	4	56
PP - Fisher Chi-square	24.2736	0.0021	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 14:15
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.40737	0.9203	4	56
Breitung t-stat	3.16482	0.9992	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.65040	0.2577	4	56
ADF - Fisher Chi-square	12.9069	0.1151	4	56
PP - Fisher Chi-square	43.3793	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LEXBDT)
Date: 08/09/22 Time: 14:15
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.56839	0.0584	4	56
Breitung t-stat	1.91089	0.9720	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.15595	0.1239	4	56
ADF - Fisher Chi-square	13.6419	0.0916	4	56
PP - Fisher Chi-square	36.2823	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 14:17
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.93710	0.0000	4	56
Breitung t-stat	-6.26778	0.0000	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.58992	0.0000	4	56
ADF - Fisher Chi-square	33.3629	0.0001	4	56
PP - Fisher Chi-square	80.3927	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LPINV)
Date: 08/09/22 Time: 14:18
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.23332	0.4078	4	56
Breitung t-stat	-1.13481	0.1282	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.27706	0.1008	4	56
ADF - Fisher Chi-square	12.8001	0.1189	4	56
PP - Fisher Chi-square	45.6525	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 14:19
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.18063	0.0000	4	56
Breitung t-stat	-1.94136	0.0261	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.28877	0.0005	4	56
ADF - Fisher Chi-square	25.3623	0.0013	4	56
PP - Fisher Chi-square	45.1736	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 14:19
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.28448	0.0112	4	56
Breitung t-stat	-2.93019	0.0017	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.40413	0.0801	4	56
ADF - Fisher Chi-square	13.3254	0.1011	4	56
PP - Fisher Chi-square	27.8552	0.0005	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (Individual Intercept and Trend)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 14:20
Sample: 2004 2020
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.72530	0.2341	4	56
Breitung t-stat	0.07833	0.5312	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.70445	0.0441	4	56
ADF - Fisher Chi-square	15.0897	0.0574	4	56
PP - Fisher Chi-square	23.5132	0.0028	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Gross Domestic Product (None)

Panel unit root test: Summary
Series: D(LGDP)
Date: 08/09/22 Time: 14:22
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.40730	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	32.9610	0.0001	4	56
PP - Fisher Chi-square	56.1516	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

External Debt (None)

Panel unit root test: Summary
Series: D(LEXBDT)
Date: 08/09/22 Time: 14:23
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.93388	0.0017	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	17.1856	0.0282	4	56
PP - Fisher Chi-square	39.3328	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Debt Service Cost (None)

Panel unit root test: Summary
Series: D(LDSERV)
Date: 08/09/22 Time: 14:24
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.80192	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	55.6781	0.0000	4	56
PP - Fisher Chi-square	93.4185	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Public Investment (None)

Panel unit root test: Summary
Series: D(LPINV)
Date: 08/09/22 Time: 14:25
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.33216	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	34.5306	0.0000	4	56
PP - Fisher Chi-square	68.9935	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: D(LFCE)
Date: 08/09/22 Time: 14:25
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.93405	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	39.6851	0.0000	4	56
PP - Fisher Chi-square	60.5377	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Terms of Trade (None)

Panel unit root test: Summary
Series: D(LTOT)
Date: 08/09/22 Time: 14:26
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.18553	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	33.9855	0.0000	4	56
PP - Fisher Chi-square	50.0640	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Government Final Consumption Expenditure (None)

Panel unit root test: Summary
Series: D(LGFCE)
Date: 08/09/22 Time: 14:27
Sample: 2004 2020
Exogenous variables: None
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.14433	0.0000	4	56
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	26.5255	0.0009	4	56
PP - Fisher Chi-square	38.7984	0.0000	4	60

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix F: Lag order selection criteria

LAG ORDER SELECTION CRITERIA: HIGHLY INDEBTED COUNTRIES

VAR Lag Order Selection Criteria
Endogenous variables: LGDP LEXDBT LDSERV LPINV LFCE LGFCE LTOT
Exogenous variables: C
Date: 08/10/22 Time: 09:06
Sample: 2004 2020
Included observations: 90

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2322.007	NA	7.08e+13	51.75571	51.95014	51.83412
1	-1846.508	866.4642	5.43e+09	42.27797	43.83340*	42.90521*
2	-1788.220	97.14751*	4.50e+09*	42.07155*	44.98800	43.24764

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

LAG ORDER SELECTION CRITERIA: LESS INDEBTED COUNTRIES

VAR Lag Order Selection Criteria
Endogenous variables: LGDP LEXBDT LDSERV LPINV LFCE LGFCE LTOT
Exogenous variables: C
Date: 08/10/22 Time: 09:17
Sample: 2004 2020
Included observations: 60

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1478.492	NA	7.54e+12	49.51642	49.76076	49.61199
1	-1156.085	558.8401	8.40e+08*	40.40282	42.35755*	41.16742*
2	-1106.703	74.07197*	8.85e+08	40.39011*	44.05522	41.82374

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix G: Correlation matrix

CORRELATION MATRIX: HIGHLY INDEBTED COUNTRIES

	LGDP	LFCE	LEXDBT	LDSERV	LGFCE	LPINV	LTOT
LGDP	1	-0.3981133...	-0.3281953...	-0.4395676...	0.32771842...	0.05793875...	0.03209424...
LFCE	-0.3981133...	1	0.23824212...	0.14287341...	0.03919097...	0.37553336...	0.15943029...
LEXDBT	-0.3281953...	0.23824212...	1	0.46809532...	-0.1181730...	-0.0017192...	0.05460899...
LDSERV	-0.4395676...	0.14287341...	0.46809532...	1	-0.1450917...	-0.0731364...	-0.1349783...
LGFCE	0.32771842...	0.03919097...	-0.1181730...	-0.1450917...	1	0.32028219...	-0.3069589...
LPINV	0.05793875...	0.37553336...	-0.0017192...	-0.0731364...	0.32028219...	1	0.13562216...
LTOT	0.03209424...	0.15943029...	0.05460899...	-0.1349783...	-0.3069589...	0.13562216...	1

CORRELATION MATRIX: LESS INDEBTED COUTRIES

	LGDP	LEXBDT	LDSERV	LPINV	LFCE	LGFCE	LTOT
LGDP	1	-0.6326354...	-0.0688593...	0.02923656...	-0.4742859...	-0.5685528...	0.47908133...
LEXBDT	-0.6326354...	1	-0.0533363...	-0.0520375...	0.44533740...	0.34773904...	-0.2150049...
LDSERV	-0.0688593...	-0.0533363...	1	0.23504996...	0.14788897...	-0.2109972...	-0.1902170...
LPINV	0.02923656...	-0.0520375...	0.23504996...	1	0.41779157...	-0.0385823...	0.19103973...
LFCE	-0.4742859...	0.44533740...	0.14788897...	0.41779157...	1	0.53378797...	-0.1281332...
LGFCE	-0.5685528...	0.34773904...	-0.2109972...	-0.0385823...	0.53378797...	1	-0.0838092...
LTOT	0.47908133...	-0.2150049...	-0.1902170...	0.19103973...	-0.1281332...	-0.0838092...	1

Appendix H: Cointegration test

COINTEGRATION TEST: HIGHLY INDEBTED COUNTRIES

Date: 08/23/22 Time: 10:05
Sample (adjusted): 2011 2020
Included observations: 60 after adjustments
Trend assumption: No deterministic trend
Series: LGDP LEXDBT LDSERV LPINV LFCE LGFCE LTOT
Lags interval (in first differences): 1 to 6

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.869505	288.7838	111.7805	0.0000
At most 1 *	0.719689	166.5985	83.93712	0.0000
At most 2 *	0.558707	90.28714	60.06141	0.0000
At most 3 *	0.295420	41.20437	40.17493	0.0392
At most 4	0.191587	20.19512	24.27596	0.1502
At most 5	0.093776	7.434178	12.32090	0.2840
At most 6	0.025114	1.526062	4.129906	0.2542

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.869505	122.1852	42.77219	0.0000
At most 1 *	0.719689	76.31138	36.63019	0.0000
At most 2 *	0.558707	49.08277	30.43961	0.0001
At most 3	0.295420	21.00924	24.15921	0.1262
At most 4	0.191587	12.76095	17.79730	0.2436
At most 5	0.093776	5.908116	11.22480	0.3603
At most 6	0.025114	1.526062	4.129906	0.2542

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGDP	LEXDBT	LDSERV	LPINV	LFCE	LGFCE	LTOT
-0.129434	-1.908030	-4.249263	3.528595	-0.074331	-6.962730	3.509073
-0.167791	24.03219	-4.268923	-0.249560	1.105230	25.41854	-38.16744
0.576982	-23.00811	11.44564	-3.184902	3.391102	-31.53508	37.29687
0.097814	29.68137	-8.188104	-3.170660	-2.972826	-2.956635	-17.67039
-0.169400	-8.716488	9.058449	5.307203	-4.992756	-23.45241	24.25265
0.613636	-3.799416	0.667938	-1.769941	-0.600880	0.336332	2.663441
-0.320363	0.728305	-0.883566	-7.749564	1.528174	-10.37641	10.95512

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	0.865628	0.114734	0.136924	-0.197026	-0.049867	-0.223886	-0.173026
D(LEXDBT)	-0.018112	-0.023252	-0.008755	0.000230	0.005414	0.000492	0.000895
D(LDSERV)	-0.011096	-0.043733	-0.015455	0.025926	-0.009154	-0.002775	0.004807
D(LPINV)	-0.033945	0.013475	0.003704	0.004792	0.011538	0.002404	-0.002768
D(LFCE)	-0.035307	0.026298	-0.017826	0.003992	0.006505	0.002500	8.28E-05
D(LGFCE)	-0.006956	-0.002922	-0.003797	-0.003936	0.005533	-0.001527	0.001145
D(LTOT)	-0.016660	0.006355	0.003169	-0.007278	-0.000201	-0.001398	-0.001981

1 Cointegrating Equation(s): Log likelihood 712.1006

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LEXDBT	LDSERV	LPINV	LFCE	LGFCE	LTOT
1.000000	14.74133	32.82958	-27.26174	0.574275	53.79368	-27.11091
	(30.9931)	(12.0224)	(7.92886)	(4.96339)	(33.4690)	(42.6482)

COINTEGRATION TEST: LESS INDEBTED COUNTRIES

Date: 08/23/22 Time: 09:47
Sample (adjusted): 2007 2020
Included observations: 56 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LGDP LEXBDT LDSERV LPINV LFCE LGFCE LTOT
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.616116	181.4869	134.6780	0.0000
At most 1 *	0.553082	127.8717	103.8473	0.0005
At most 2 *	0.375965	82.77049	76.97277	0.0169
At most 3 *	0.330656	56.36380	54.07904	0.0308
At most 4	0.310355	33.88220	35.19275	0.0688
At most 5	0.179729	13.07383	20.26184	0.3580
At most 6	0.034724	1.979095	9.164546	0.7819

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.616116	53.61517	47.07897	0.0087
At most 1 *	0.553082	45.10124	40.95680	0.0162
At most 2	0.375965	26.40669	34.80587	0.3515
At most 3	0.330656	22.48160	28.58808	0.2473
At most 4	0.310355	20.80837	22.29962	0.0796
At most 5	0.179729	11.09474	15.89210	0.2449
At most 6	0.034724	1.979095	9.164546	0.7819

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGDP	LEXBDT	LDSERV	LPINV	LFCE	LGFCE	LTOT	C
-0.048792	-3.651743	4.654649	19.32541	0.784945	-1.980657	-15.15637	6.827538
-0.365283	4.517053	-0.734840	14.26489	-0.731137	0.651770	-5.854316	-12.50807
-0.095931	-4.759262	4.397165	-5.521780	-7.094458	8.244312	2.436267	9.801866
0.702456	-0.045701	3.122802	18.63409	20.33347	16.41847	-17.14272	-56.07164
-0.104816	-3.307317	-0.499491	2.259809	8.347721	-14.37019	-0.897753	6.093759
-0.118280	-4.551120	2.585146	-7.867526	4.658278	2.475733	0.445995	4.258679
-0.232868	0.952538	-1.900097	-9.344015	-14.36392	-0.711163	1.153258	38.82266

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	-1.276516	0.388029	0.627615	-0.231590	1.427845	-0.835592	0.258224
D(LEXBDT)	0.041095	-0.009412	-0.017560	-0.017378	0.002871	0.015866	-0.001454
D(LDSERV)	-0.026259	0.052637	-0.052049	0.012166	-0.027366	0.005342	0.019486
D(LPINV)	-0.003907	-0.024976	0.006514	0.006269	-0.004378	0.000405	0.004762
D(LFCE)	0.006574	-0.008661	-0.006179	-0.003013	-0.006591	-0.002737	0.000622
D(LGFCE)	-0.005270	-0.016642	-0.012470	0.000704	-0.005421	5.97E-05	-0.003270
D(LTOT)	0.006781	-0.004991	-0.002736	0.012567	0.014443	-0.006270	9.93E-05

1 Cointegrating Equation(s): Log likelihood 439.0110

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LEXBDT	LDSERV	LPINV	LFCE	LGFCE	LTOT	C
1.000000	74.84348	-95.39832	-396.0796	-16.08765	40.59412	310.6340	-139.9323
	(26.4200)	(21.4498)	(86.4892)	(55.5673)	(56.7878)	(53.9501)	(157.885)

Adjustment coefficients (standard error in parentheses)

PEDRONI COINTEGRATION: HIGHLY INDEBTED COUNTRIES

Pedroni Residual Cointegration Test
Series: LGDP LEXDBT LDSERV LPINV LFCE LGFCE LTOT
Date: 09/13/22 Time: 19:38
Sample: 2004 2020
Included observations: 102
Cross-sections included: 6
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on AIC with a max lag of 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.207028	0.8863	-1.174325	0.8799
Panel rho-Statistic	2.777540	0.9973	1.987909	0.9766
Panel PP-Statistic	-2.035877	0.0209	-6.617637	0.0000
Panel ADF-Statistic	-1.469592	0.0708	-5.661336	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.937655	0.9983
Group PP-Statistic	-8.126870	0.0000
Group ADF-Statistic	-5.619794	0.0000

PEDRONI COINTEGRATION TEST: LESS INDEBTED COUNTRIES

Pedroni Residual Cointegration Test
Series: LGDP LEXBDT LDSERV LPINV LFCE LGFCE LTOT
Date: 09/13/22 Time: 19:58
Sample: 2004 2020
Included observations: 68
Cross-sections included: 4
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on AIC with a max lag of 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.611023	0.7294	-0.947359	0.8283
Panel rho-Statistic	1.888599	0.9705	2.078651	0.9812
Panel PP-Statistic	-7.732444	0.0000	-5.318593	0.0000
Panel ADF-Statistic	-4.679156	0.0000	-3.521519	0.0002

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	2.792692	0.9974
Group PP-Statistic	-9.732864	0.0000
Group ADF-Statistic	-3.743176	0.0001

KAO COINTEGRATION TEST: HIGHLY INDEBTED COUNTRIES

Kao Residual Cointegration Test
Series: LGDP LEXDBT DSERV LPINV
Date: 06/03/23 Time: 10:59
Sample: 2004 2020
Included observations: 68
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on AIC with a max lag of 3
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.822077	0.0024
Residual variance	8.286816	
HAC variance	7.979253	

Kao Residual Cointegration Test
Series: LGDP LEXDBT DSERV LPINV
Date: 06/03/23 Time: 10:54
Sample: 2004 2020
Included observations: 68
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 3
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-3.140642	0.0008
Residual variance	8.286816	
HAC variance	7.979253	

KAO COINTEGRATION TEST: LESS INDEBTED COUNTRIES

Kao Residual Cointegration Test

Series: LGDP LEXDBT DSERV LPINV
Date: 06/03/23 Time: 10:41
Sample: 2004 2020
Included observations: 85
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on AIC with a max lag of 3
Newey-West fixed bandwidth and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.726329	0.0032
Residual variance	18.70827	
HAC variance	11.52949	

Kao Residual Cointegration Test
Series: LGDP LEXDBT DSERV LPINV
Date: 06/03/23 Time: 10:38
Sample: 2004 2020
Included observations: 85
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 2
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.162224	0.0153
Residual variance	0.418926	
HAC variance	0.303731	

Appendix H: Vector error correction model

VECM TEST RESULTS: HIGHLY INDEBTED COUNTRIES

Vector Error Correction Estimates
Date: 08/11/22 Time: 11:58
Sample (adjusted): 2007 2020
Included observations: 84 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LGDP(-1)	1.000000
LEXDBT(-1)	-4.513504 (3.53215) [-1.27784]
LDSERV(-1)	-0.372679 (1.92256) [-0.19385]
LPINV(-1)	-0.468380 (1.69146) [-0.27691]
LFCE(-1)	4.827655 (1.25032) [3.86112]
LGFCE(-1)	15.22117 (3.77544) [4.03163]
LTOT(-1)	-2.562421 (5.09743) [-0.50269]
C	-19.43302

Error Correction:	D(LGDP)	D(LEXDBT)	D(LDSERV)	D(LPINV)	D(LFCE)	D(LGFCE)	D(LTOT)
CointEq1	-0.675589 (0.11917) [-5.66934]	0.002719 (0.00272) [0.99940]	-0.011171 (0.00511) [-2.18703]	-0.020722 (0.00354) [-5.84804]	-0.002663 (0.00275) [-0.96721]	-0.008355 (0.00221) [-3.77705]	0.001602 (0.00204) [0.78429]
D(LGDP(-1))	-0.284953 (0.13184) [-2.16143]	-0.001632 (0.00301) [-0.54232]	0.017323 (0.00565) [3.06558]	0.008315 (0.00392) [2.12108]	-0.002808 (0.00305) [-0.92175]	-0.004580 (0.00245) [-1.87154]	0.002875 (0.00226) [1.27222]
D(LGDP(-2))	-0.121013 (0.13811) [-0.87623]	-0.000667 (0.00315) [-0.21159]	0.008154 (0.00592) [1.37751]	-0.001937 (0.00411) [-0.47171]	-0.002933 (0.00319) [-0.91891]	-0.001834 (0.00256) [-0.71523]	0.003003 (0.00237) [1.26841]
D(LEXDBT(-1))	-6.332984 (3.26298) [-1.94086]	0.056371 (0.07450) [0.75667]	0.429807 (0.13986) [3.07308]	-0.039382 (0.09703) [-0.40589]	0.017121 (0.07540) [0.22706]	-0.153228 (0.06057) [-2.52967]	0.008112 (0.05593) [0.14502]
D(LEXDBT(-2))	-5.110856 (3.51646) [-1.45341]	0.119551 (0.08029) [1.48905]	0.355874 (0.15073) [2.36105]	-0.206702 (0.10456) [-1.97681]	-0.085687 (0.08126) [-1.05447]	-0.015410 (0.06528) [-0.23607]	-0.011673 (0.06028) [-0.19365]
D(LDSERV(-1))	-1.740770 (2.71587) [-0.64096]	0.019932 (0.06201) [0.32145]	-0.061596 (0.11641) [-0.52912]	-0.212469 (0.08076) [-2.63095]	0.102591 (0.06276) [1.63466]	0.002887 (0.05042) [0.05726]	0.021682 (0.04655) [0.46573]
D(LDSERV(-2))	2.089483 (2.68851) [0.77719]	-0.042368 (0.06138) [-0.69023]	-0.463902 (0.11524) [-4.02559]	0.096576 (0.07994) [1.20804]	0.050877 (0.06213) [0.81892]	0.025027 (0.04991) [0.50147]	-0.011477 (0.04609) [-0.24903]
D(LPINV(-1))	-11.59323 (4.73032) [-2.45083]	0.151586 (0.10800) [1.40356]	-0.115948 (0.20276) [-0.57186]	-0.172517 (0.14066) [-1.22650]	0.134103 (0.10931) [1.22680]	-0.220337 (0.08781) [-2.50921]	0.034279 (0.08109) [0.42274]
D(LPINV(-2))	1.956555 (4.19977) [0.46587]	-0.165065 (0.09589) [-1.72144]	-0.334691 (0.18002) [-1.85924]	-0.348478 (0.12488) [-2.79046]	-0.059412 (0.09705) [-0.61218]	0.411912 (0.07796) [5.28346]	-0.138002 (0.07199) [-1.91692]
D(LFCE(-1))	-0.156201 (22.1535) [-0.00705]	-0.181404 (0.50580) [-0.35865]	0.687492 (0.94957) [0.72400]	-0.170765 (0.65874) [-0.25923]	-0.106121 (0.51193) [-0.20729]	-0.223218 (0.41125) [-0.54278]	0.057085 (0.37975) [0.15032]
D(LFCE(-2))	9.918893 (22.0158) [0.45054]	-0.141669 (0.50266) [-0.28184]	-0.232433 (0.94367) [-0.24631]	-1.255710 (0.65465) [-1.91814]	-0.189628 (0.50875) [-0.37273]	1.051029 (0.40869) [2.57170]	-0.008130 (0.37739) [-0.02154]
D(LGFCE(-1))	33.60704 (5.73295) [5.86209]	-0.142202 (0.13089) [-1.08640]	0.248130 (0.24573) [1.00975]	0.191048 (0.17047) [1.12070]	0.049642 (0.13248) [0.37472]	0.555303 (0.10642) [5.21785]	0.035564 (0.09827) [0.36189]
D(LGFCE(-2))	8.156386 (7.85029) [1.03899]	0.158758 (0.17923) [0.88575]	0.657045 (0.33649) [1.95265]	0.646482 (0.23343) [2.76947]	0.192906 (0.18141) [1.06338]	0.025486 (0.14573) [0.17489]	-0.144729 (0.13457) [-1.07551]
D(LTOT(-1))	14.06761 (8.17809) [1.72016]	-0.197469 (0.18672) [-1.05757]	-0.353971 (0.35054) [-1.00979]	0.279273 (0.24318) [1.14842]	-0.158033 (0.18898) [-0.83622]	0.205054 (0.15181) [1.35069]	-0.153518 (0.14019) [-1.09510]
D(LTOT(-2))	3.406033 (7.72723) [0.44078]	0.195442 (0.17643) [1.10779]	0.254778 (0.33121) [0.76923]	0.561676 (0.22977) [2.44449]	0.066718 (0.17856) [0.37363]	-0.097179 (0.14344) [-0.67747]	0.030754 (0.13246) [0.23218]
C	-0.416138 (0.39061) [-1.06536]	0.021040 (0.00892) [2.35920]	0.045935 (0.01674) [2.74357]	0.023683 (0.01161) [2.03903]	0.002682 (0.00903) [0.29714]	0.004089 (0.00725) [0.56392]	0.002936 (0.00670) [0.43843]

Highly Indebted Countries: Probability Value

System: UNTITLED
Estimation Method: Least Squares
Date: 08/11/22 Time: 12:02
Sample: 2007 2020
Included observations: 84
Total system (balanced) observations 588

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.675589	0.119165	-5.669344	0.0000
C(2)	-0.284953	0.131836	-2.161426	0.0312
C(3)	-0.121013	0.138106	-0.876231	0.3813
C(4)	-6.332984	3.262981	-1.940858	0.0529
C(5)	-5.110856	3.516461	-1.453409	0.1468
C(6)	-1.740770	2.715870	-0.640962	0.5219
C(7)	2.089483	2.688510	0.777190	0.4374
C(8)	-11.59323	4.730324	-2.450833	0.0146
C(9)	1.956555	4.199769	0.465872	0.6415
C(10)	-0.156201	22.15350	-0.007051	0.9944
C(11)	9.918893	22.01579	0.450535	0.6525
C(12)	33.60704	5.732949	5.862086	0.0000
C(13)	8.156386	7.850286	1.038992	0.2993
C(14)	14.06761	8.178092	1.720158	0.0861
C(15)	3.406033	7.727234	0.440783	0.6596
C(16)	-0.416138	0.390609	-1.065358	0.2873
C(17)	0.002719	0.002721	0.999397	0.3181
C(18)	-0.001632	0.003010	-0.542322	0.5879
C(19)	-0.000667	0.003153	-0.211593	0.8325
C(20)	0.056371	0.074499	0.756669	0.4496
C(21)	0.119551	0.080287	1.489049	0.1371
C(22)	0.019932	0.062008	0.321450	0.7480
C(23)	-0.042368	0.061383	-0.690228	0.4904
C(24)	0.151586	0.108001	1.403564	0.1611
C(25)	-0.165065	0.095888	-1.721444	0.0858
C(26)	-0.181404	0.505801	-0.358647	0.7200
C(27)	-0.141669	0.502656	-0.281841	0.7782
C(28)	-0.142202	0.130893	-1.086404	0.2779
C(29)	0.158758	0.179235	0.885754	0.3762
C(30)	-0.197469	0.186719	-1.057573	0.2908
C(31)	0.195442	0.176425	1.107790	0.2685
C(32)	0.021040	0.008918	2.359199	0.0187
C(33)	-0.011171	0.005108	-2.187028	0.0292
C(34)	0.017323	0.005651	3.065576	0.0023
C(35)	0.008154	0.005920	1.377513	0.1690
C(36)	0.429807	0.139862	3.073080	0.0022
C(37)	0.355874	0.150727	2.361054	0.0186
C(38)	-0.061596	0.116411	-0.529124	0.5970
C(39)	-0.463902	0.115238	-4.025594	0.0001
C(40)	-0.115948	0.202757	-0.571855	0.5677
C(41)	-0.334691	0.180016	-1.859235	0.0636
C(42)	0.687492	0.949570	0.724003	0.4694
C(43)	-0.232433	0.943667	-0.246308	0.8055
C(44)	0.248130	0.245733	1.009754	0.3131
C(45)	0.657045	0.336488	1.952654	0.0514
C(46)	-0.353971	0.350539	-1.009790	0.3131
C(47)	0.254778	0.331214	0.769225	0.4421
C(48)	0.045935	0.016743	2.743573	0.0063
C(49)	-0.020722	0.003543	-5.848038	0.0000
C(50)	0.008315	0.003920	2.121084	0.0344
C(51)	-0.001937	0.004107	-0.471713	0.6373
C(52)	-0.039382	0.097026	-0.405894	0.6850
C(53)	-0.206702	0.104563	-1.976813	0.0486
C(54)	-0.212469	0.080758	-2.630946	0.0088
C(55)	0.096576	0.079944	1.208043	0.2276
C(56)	-0.172517	0.140658	-1.226501	0.2206
C(57)	-0.348478	0.124882	-2.790458	0.0055
C(58)	-0.170765	0.658744	-0.259228	0.7956
C(59)	-1.255710	0.654649	-1.918143	0.0557
C(60)	0.191048	0.170472	1.120702	0.2630
C(61)	0.646482	0.233432	2.769472	0.0058
C(62)	0.279273	0.243179	1.148425	0.2514
C(63)	0.561676	0.229773	2.444488	0.0149
C(64)	0.023683	0.011615	2.039028	0.0420
C(65)	-0.002663	0.002754	-0.967213	0.3339
C(66)	-0.002808	0.003047	-0.921751	0.3571
C(67)	-0.002933	0.003191	-0.918908	0.3586
C(68)	0.017121	0.075403	0.227062	0.8205
C(69)	-0.085687	0.081260	-1.054474	0.2922
C(70)	0.102591	0.062760	1.634658	0.1028
C(71)	0.050877	0.062127	0.818918	0.4132
C(72)	0.134103	0.109311	1.226805	0.2205

LESS INDEBTED COUNTRIES

Vector Error Correction Estimates
Date: 08/11/22 Time: 13:14
Sample (adjusted): 2008 2020
Included observations: 52 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LGDP(-1)	1.000000
LEXBDT(-1)	-3.370272 (2.19097) [-1.53826]
LDSERV(-1)	-2.613545 (2.07965) [-1.25672]
LPINV(-1)	-33.32371 (8.92884) [-3.73214]
LFCE(-1)	12.48324 (4.58238) [2.72419]
LGFCE(-1)	6.593732 (4.63952) [1.42121]
LTOT(-1)	17.61651 (5.78731) [3.04399]
C	-16.09839

Error Correction:	D(LGDP)	D(LEXBDT)	D(LDSERV)	D(LPINV)	D(LFCE)	D(LGFCE)	D(LTOT)
CointEq1	-0.188631 (0.44353) [-0.42530]	-0.006644 (0.00924) [-0.71923]	-0.025660 (0.01900) [-1.35087]	0.015945 (0.00525) [3.03901]	0.000363 (0.00250) [0.14538]	0.014687 (0.00330) [4.45240]	0.001494 (0.00486) [0.30744]
D(LGDP(-1))	-0.554305 (0.52894) [-1.04796]	0.010270 (0.01102) [0.93226]	0.027164 (0.02265) [1.19913]	-0.012301 (0.00626) [-1.96589]	0.002566 (0.00298) [0.86117]	-0.007896 (0.00393) [-2.00722]	0.000169 (0.00579) [0.02922]
D(LGDP(-2))	0.118570 (0.43483) [0.27268]	0.002840 (0.00906) [0.31361]	0.032621 (0.01862) [1.75165]	-0.002212 (0.00514) [-0.43007]	0.003767 (0.00245) [1.53782]	-0.007487 (0.00323) [-2.31504]	-0.000394 (0.00476) [-0.08266]
D(LGDP(-3))	0.328115 (0.25094) [1.30756]	-0.006297 (0.00523) [-1.20500]	0.039921 (0.01075) [3.71461]	-0.001223 (0.00297) [-0.41203]	0.000374 (0.00141) [0.26480]	-0.003648 (0.00187) [-1.95449]	-0.001691 (0.00275) [-0.61510]
D(LEXBDT(-1))	6.333906 (10.7732) [0.58793]	0.029731 (0.22437) [0.13251]	-0.069987 (0.46139) [-0.15169]	0.325797 (0.12744) [2.55640]	0.012053 (0.06069) [0.19859]	0.036261 (0.08012) [0.45256]	0.217548 (0.11801) [1.84347]
D(LEXBDT(-2))	29.49059 (11.3192) [2.60536]	-0.389978 (0.23574) [-1.65430]	0.244037 (0.48477) [0.50341]	0.112071 (0.13390) [0.83696]	-0.033347 (0.06377) [-0.52297]	0.049576 (0.08418) [0.58889]	0.109584 (0.12399) [0.88381]
D(LEXBDT(-3))	0.845788 (9.00077) [0.09397]	-0.029345 (0.18745) [-0.15655]	-0.246214 (0.38548) [-0.63872]	-0.027072 (0.10648) [-0.25426]	-0.107559 (0.05070) [-2.12127]	0.059091 (0.06694) [0.88273]	0.071592 (0.09859) [0.72612]
D(LDSERV(-1))	-3.306695 (4.14372) [-0.79800]	-0.093852 (0.08630) [-1.08754]	-0.686966 (0.17747) [-3.87099]	-0.053056 (0.04902) [-1.08236]	-0.028463 (0.02334) [-1.21934]	0.071966 (0.03082) [2.33517]	-0.025985 (0.04539) [-0.57247]
D(LDSERV(-2))	-5.670290 (4.72523) [-1.20000]	0.011733 (0.09841) [0.11922]	-0.399584 (0.20237) [-1.97452]	-0.037304 (0.05590) [-0.66736]	-0.012133 (0.02662) [-0.45581]	0.023408 (0.03514) [0.66608]	0.043880 (0.05176) [0.84776]
D(LDSERV(-3))	-3.591534 (4.11722) [-0.87232]	-0.012847 (0.08575) [-0.14983]	0.284724 (0.17633) [1.61472]	-0.001324 (0.04871) [-0.02718]	-0.005757 (0.02319) [-0.24821]	-0.007359 (0.03062) [-0.24034]	0.008379 (0.04510) [0.18579]
D(LPINV(-1))	-47.38369 (15.2998) [-3.09701]	1.050228 (0.31864) [3.29599]	-0.852596 (0.65525) [-1.30117]	0.056757 (0.18099) [0.31359]	0.177441 (0.08619) [2.05872]	0.041364 (0.11379) [0.36351]	0.066602 (0.16759) [0.39740]
D(LPINV(-2))	-4.849572 (16.4455) [-0.29489]	-0.429559 (0.34250) [-1.25420]	0.534451 (0.70432) [0.75882]	-0.131985 (0.19454) [-0.67843]	0.089739 (0.09264) [0.96864]	0.134259 (0.12231) [1.09769]	-0.096677 (0.18014) [-0.53666]
D(LPINV(-3))	-18.71516 (17.1557) [-1.09090]	0.297087 (0.35729) [0.83150]	-1.034051 (0.73474) [-1.40737]	-0.105012 (0.20295) [-0.51744]	-0.062085 (0.09665) [-0.64240]	0.041338 (0.12759) [0.32398]	0.244967 (0.18792) [1.30354]
D(LFCE(-1))	31.87519 (43.7121) [0.72921]	0.350924 (0.91036) [0.38548]	-0.583751 (1.87208) [-0.31182]	-0.630146 (0.51710) [-1.21862]	-0.433322 (0.24625) [-1.75970]	-0.166777 (0.32510) [-0.51300]	-0.247750 (0.47882) [-0.51741]
D(LFCE(-2))	-104.9881 (44.0775) [-2.38190]	1.673542 (0.91797) [1.82309]	3.282614 (1.88773) [1.73892]	0.331124 (0.52142) [0.63504]	0.252741 (0.24831) [1.01786]	-0.206682 (0.32782) [-0.63047]	-0.614413 (0.48283) [-1.27253]
D(LFCE(-3))	-12.86294 (43.0972) [-0.29846]	-0.165810 (0.89755) [-0.18474]	2.839917 (1.84575) [1.53863]	0.053958 (0.50983) [0.10584]	0.207784 (0.24278) [0.85584]	-0.030382 (0.32053) [-0.09479]	-0.712565 (0.47209) [-1.50939]
D(LGFCE(-1))	-30.22171 (29.0196) [-1.04142]	-0.010415 (0.60437) [-0.01723]	2.650914 (1.24284) [2.13295]	-0.460574 (0.34329) [-1.34164]	0.113370 (0.16348) [0.69348]	-0.250724 (0.21583) [-1.16168]	0.043187 (0.31788) [0.13586]
D(LGFCE(-2))	41.75957 (27.2195) [1.53418]	-0.087774 (0.56688) [-0.15484]	-0.595062 (1.16575) [-0.51046]	-0.327299 (0.32200) [-1.01646]	-0.039221 (0.15334) [-0.25578]	-0.397410 (0.20244) [-1.96309]	0.094920 (0.29816) [0.31835]
D(LGFCE(-3))	45.26200 (24.7840) [1.82626]	-0.880634 (0.51616) [-1.70613]	2.153063 (1.06144) [2.02844]	-0.011921 (0.29319) [-0.04066]	-0.160853 (0.13962) [-1.15209]	-0.636886 (0.18433) [-3.45519]	-0.256790 (0.27149) [-0.94587]
D(LTOT(-1))	0.737145 (17.8612) [0.04127]	-0.080436 (0.37198) [-0.21624]	-0.634896 (0.76495) [-0.82998]	-0.260548 (0.21129) [-1.23312]	-0.173192 (0.10062) [-1.72126]	-0.244915 (0.13284) [-1.84368]	-0.054150 (0.19565) [-0.27677]
D(LTOT(-2))	-41.99460 (17.3809) [-2.41613]	0.931415 (0.36198) [2.57311]	0.981615 (0.74438) [1.31870]	-0.477758 (0.20561) [-2.32361]	0.018565 (0.09791) [0.18961]	0.075663 (0.12927) [0.58532]	-0.165705 (0.19039) [-0.87034]
D(LTOT(-3))	16.80642 (22.1657) [0.75822]	-0.044464 (0.46163) [-0.09632]	-0.610928 (0.94930) [-0.64355]	-0.456302 (0.26221) [-1.74020]	0.004539 (0.12487) [0.03635]	-0.107977 (0.16485) [-0.65498]	-0.193523 (0.24280) [-0.79703]
C	-2.328773 (1.14865) [-2.02741]	0.054117 (0.02392) [2.26222]	0.029569 (0.04919) [0.60107]	-0.031648 (0.01359) [-2.32908]	0.014061 (0.00647) [2.17304]	-0.001593 (0.00854) [-0.18652]	-0.015929 (0.01258) [-1.26595]

System: UNTITLED
Estimation Method: Least Squares
Date: 08/11/22 Time: 14:48
Sample: 2008 2020
Included observations: 52
Total system (balanced) observations 364

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.188631	0.443527	-0.425298	0.6711
C(2)	-0.554305	0.528936	-1.047962	0.2959
C(3)	0.118570	0.434830	0.272681	0.7854
C(4)	0.328115	0.250937	1.307558	0.1925
C(5)	6.333906	10.77321	0.587931	0.5572
C(6)	29.49059	11.31919	2.605362	0.0099
C(7)	0.845788	9.000772	0.093968	0.9252
C(8)	-3.306695	4.143723	-0.798001	0.4258
C(9)	-5.670290	4.725229	-1.200003	0.2315
C(10)	-3.591534	4.117224	-0.872319	0.3841
C(11)	-47.38369	15.29981	-3.097012	0.0022
C(12)	-4.849572	16.44548	-0.294888	0.7684
C(13)	-18.71516	17.15574	-1.090898	0.2766
C(14)	31.87519	43.71213	0.729207	0.4667
C(15)	-104.9881	44.07753	-2.381896	0.0181
C(16)	-12.86294	43.09724	-0.298463	0.7657
C(17)	-30.22171	29.01961	-1.041424	0.2989
C(18)	41.75957	27.21954	1.534176	0.1265
C(19)	45.26200	24.78401	1.826258	0.0693
C(20)	0.737145	17.86119	0.041271	0.9671
C(21)	-41.99460	17.38094	-2.416129	0.0166
C(22)	16.80642	22.16571	0.758217	0.4492
C(23)	-2.328773	1.148647	-2.027406	0.0439
C(24)	-0.006644	0.009237	-0.719232	0.4728
C(25)	0.010270	0.011016	0.932264	0.3523
C(26)	0.002840	0.009056	0.313614	0.7541
C(27)	-0.006297	0.005226	-1.205001	0.2296
C(28)	0.029731	0.224366	0.132510	0.8947
C(29)	-0.389978	0.235736	-1.654297	0.0996
C(30)	-0.029345	0.187452	-0.156547	0.8758
C(31)	-0.093852	0.086298	-1.087536	0.2781
C(32)	0.011733	0.098409	0.119224	0.9052
C(33)	-0.012847	0.085746	-0.149828	0.8810
C(34)	1.050228	0.318638	3.295994	0.0012
C(35)	-0.429559	0.342498	-1.254197	0.2112
C(36)	0.297087	0.357290	0.831503	0.4067
C(37)	0.350924	0.910360	0.385478	0.7003
C(38)	1.673542	0.917970	1.823090	0.0698
C(39)	-0.165810	0.897554	-0.184735	0.8536
C(40)	-0.010415	0.604370	-0.017234	0.9863
C(41)	-0.087774	0.566881	-0.154837	0.8771
C(42)	-0.880634	0.516158	-1.706132	0.0895
C(43)	-0.080436	0.371982	-0.216237	0.8290
C(44)	0.931415	0.361980	2.573114	0.0108
C(45)	-0.044464	0.461629	-0.096321	0.9234
C(46)	0.054117	0.023922	2.262224	0.0247
C(47)	-0.025660	0.018995	-1.350871	0.1782
C(48)	0.027164	0.022653	1.199130	0.2319
C(49)	0.032621	0.018623	1.751654	0.0813
C(50)	0.039921	0.010747	3.714607	0.0003

Appendix K: Granger Causality

GRANGER CAUSALITY TEST RESULTS: LESS INDEBTED COUNTRIES

Pairwise Granger Causality Tests
Date: 08/11/22 Time: 18:30
Sample: 2004 2020
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LEXBDT does not Granger Cause LGDP	60	0.43080	0.6522
LGDP does not Granger Cause LEXBDT		0.17370	0.8410
LDSERV does not Granger Cause LGDP	60	0.69129	0.5052
LGDP does not Granger Cause LDSERV		3.65258	0.0324
LPINV does not Granger Cause LGDP	60	2.25577	0.1144
LGDP does not Granger Cause LPINV		5.60220	0.0061
LFCE does not Granger Cause LGDP	60	0.97988	0.3818
LGDP does not Granger Cause LFCE		3.49903	0.0371
LGFCE does not Granger Cause LGDP	60	1.09465	0.3418
LGDP does not Granger Cause LGFCE		7.09184	0.0018
LTOT does not Granger Cause LGDP	60	0.78154	0.4627
LGDP does not Granger Cause LTOT		0.85662	0.4302

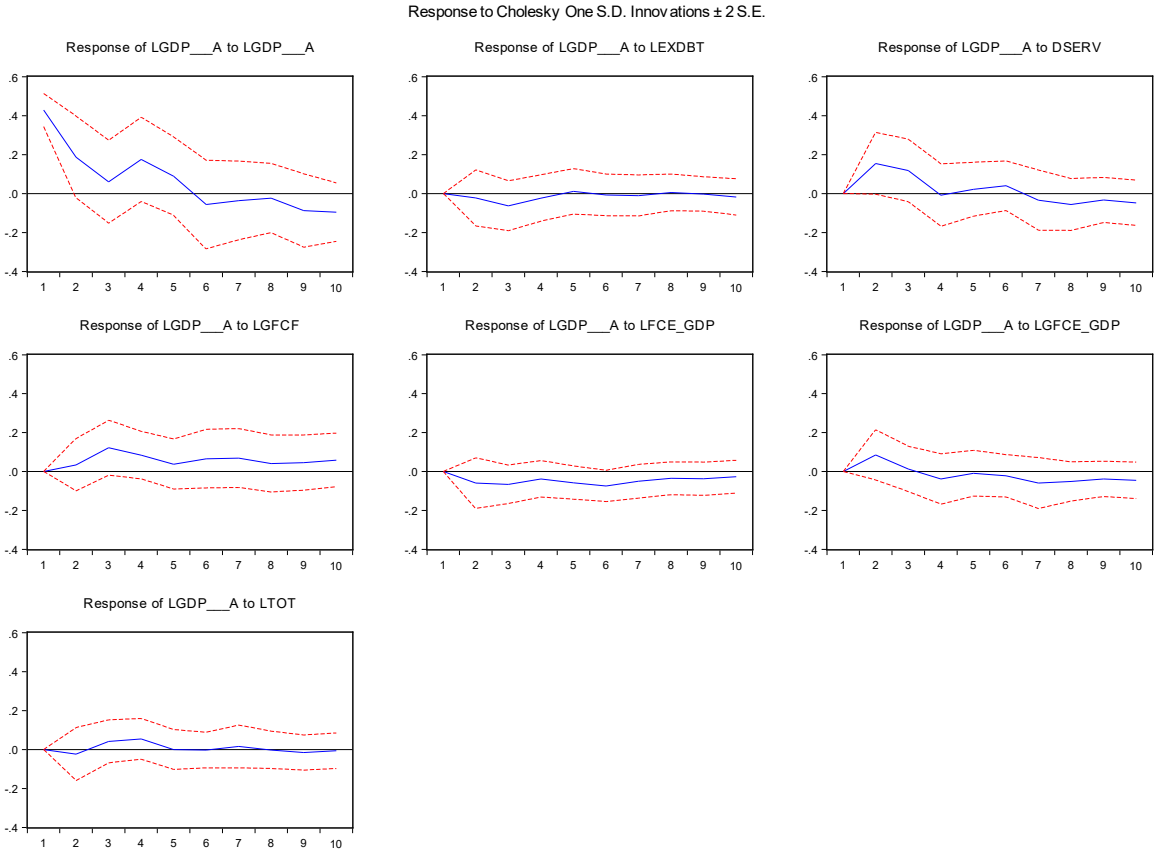
GRANGER CAUSALITY TEST RESULTS: HIGHLY INDEBTED COUTRIES

Pairwise Granger Causality Tests
Date: 08/11/22 Time: 18:33
Sample: 2004 2020
Lags: 2

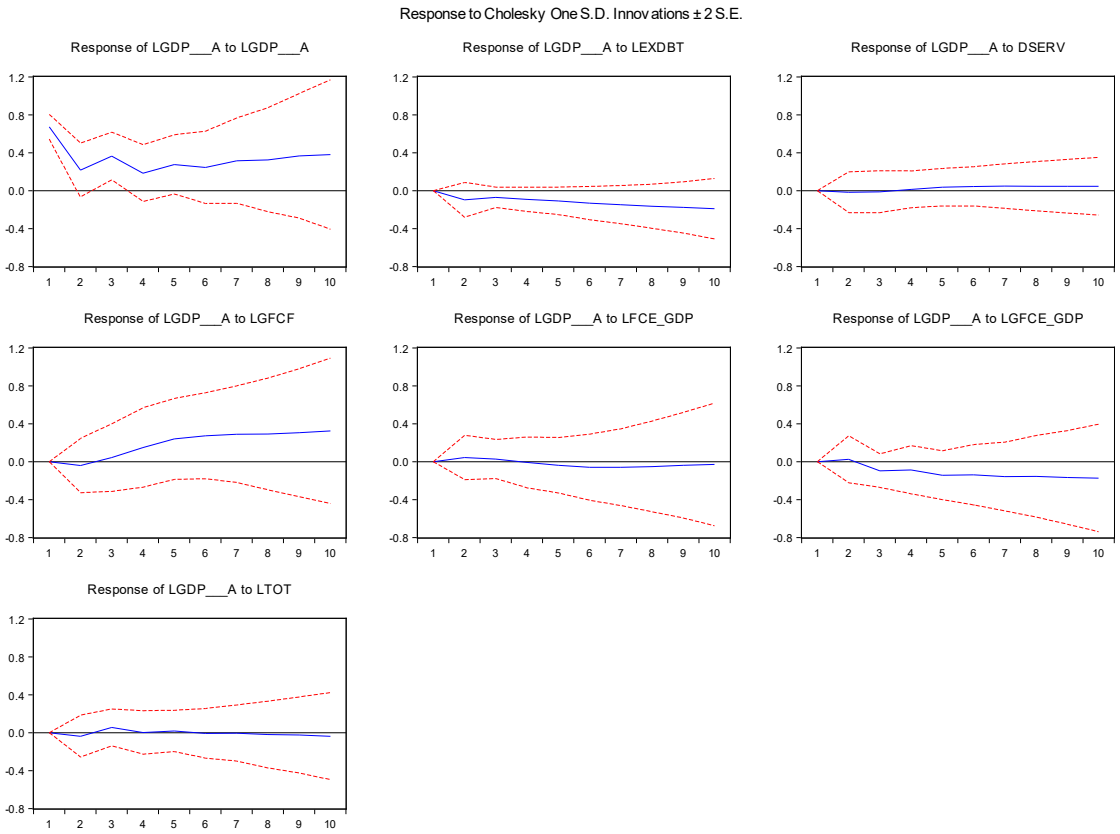
Null Hypothesis:	Obs	F-Statistic	Prob.
LEXDBT does not Granger Cause LGDP	90	1.56225	0.2156
LGDP does not Granger Cause LEXDBT		0.46950	0.6269
LDSERV does not Granger Cause LGDP	90	0.05724	0.9444
LGDP does not Granger Cause LDSERV		3.84599	0.0252
LPINV does not Granger Cause LGDP	90	1.91143	0.1542
LGDP does not Granger Cause LPINV		3.80751	0.0261
LFCE does not Granger Cause LGDP	90	1.92315	0.1525
LGDP does not Granger Cause LFCE		1.05113	0.3540
LGFCE does not Granger Cause LGDP	90	21.2042	3.E-08
LGDP does not Granger Cause LGFCE		13.1946	1.E-05
LTOT does not Granger Cause LGDP	90	0.14895	0.8618
LGDP does not Granger Cause LTOT		4.33226	0.0162

Appendix L: Impulse response function test

HIC


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of LGDP___A to LGDP___A
Response of LGDP___A to LEXDBT
Response of LGDP___A to DSERV
Response of LGDP___A to LGFCF
Response of LGDP___A to LFCE_GDP
Response of LGDP___A to LGFCE_GDP
Response of LGDP___A to LTOT

LIC


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of LGDP___A to LGDP___A
Response of LGDP___A to LEXDBT
Response of LGDP___A to DSERV
Response of LGDP___A to LGFCF
Response of LGDP___A to LFCE_GDP
Response of LGDP___A to LGFCE_GDP
Response of LGDP___A to LTOT

Appendix M: Variance decomposition test

HIC

Variance Decomposition of LGDP: Period	S.E.	LGDP	LEXDBT	DSERV	LPINV	LFCE	LGFCE	LTOT
1	0.428962	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.505866	85.56579	0.208453	9.319543	0.446084	1.407484	2.822287	0.230357
3	0.546354	74.55980	1.515540	12.64472	5.360081	2.675658	2.474108	0.770086
4	0.585315	73.89356	1.482118	11.04076	6.711144	2.759859	2.596364	1.516201
5	0.596607	73.34540	1.459071	10.75199	6.857389	3.602801	2.523923	1.459426
6	0.609276	71.20055	1.414076	10.73565	7.736287	4.950920	2.560000	1.402515
7	0.620374	69.01488	1.392902	10.65638	8.686994	5.435999	3.398416	1.414427
8	0.627951	67.50581	1.365759	11.22389	8.897798	5.626498	3.998151	1.382102
9	0.639016	67.06851	1.321267	11.11530	9.087577	5.785337	4.225038	1.396970
10	0.653117	66.35687	1.342253	11.19170	9.503604	5.715157	4.542295	1.348121

LIC

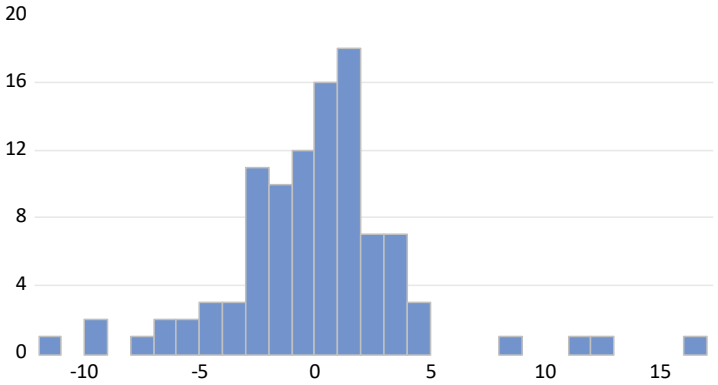
Period	S.E.	LGDP	LEXDBT	DSERV	LGFCF	LFCE_GDP	LGFCE_GDP	LTOT
1	0.673273	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.718051	97.00241	1.852273	0.059141	0.332459	0.359639	0.116222	0.277858
3	0.817449	94.67354	2.190981	0.066197	0.523807	0.384949	1.484909	0.675615
4	0.860381	90.04048	3.119710	0.081924	3.423471	0.358720	2.365387	0.610311
5	0.953447	81.67466	3.827882	0.202827	9.086754	0.456083	4.217497	0.534298
6	1.042067	73.89478	4.834809	0.349660	14.43585	0.715904	5.315529	0.453466
7	1.149538	68.25197	5.651427	0.456241	18.15895	0.854137	6.252416	0.374867
8	1.252315	64.22356	6.499288	0.517434	20.71683	0.889030	6.810059	0.343806
9	1.363238	61.40319	7.177415	0.546637	22.46229	0.832610	7.252945	0.324913
10	1.476019	59.01543	7.802554	0.562239	23.96294	0.751263	7.564032	0.341551

Cholesky Ordering: LGDP_A LEXDBT DSERV LGFCF LFCE_GDP LGFCE_GDP LTOT

Appendix M: Diagnostic Test

NORMALITY TEST FOR HICs

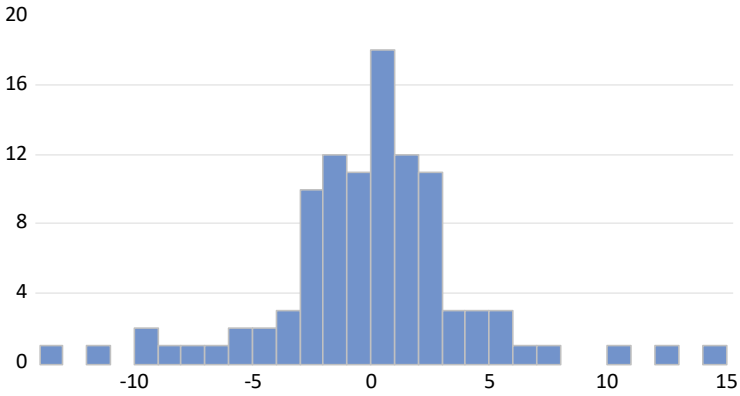
MODEL A



Series: Standardized Residuals
Sample 2004 2020
Observations 102

Mean	5.31e-16
Median	0.315195
Maximum	16.17201
Minimum	-11.95210
Std. Dev.	3.958853
Skewness	0.684194
Kurtosis	6.970104
Jarque-Bera	74.94543
Probability	0.000000

MODEL B

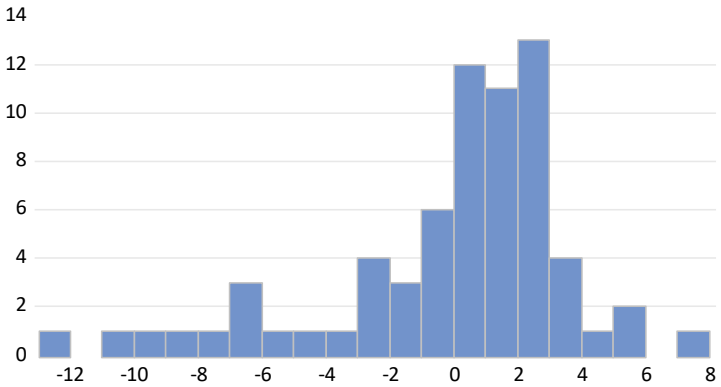


Series: Standardized Residuals
Sample 2004 2020
Observations 102

Mean	1.92e-15
Median	0.201657
Maximum	14.96287
Minimum	-13.95471
Std. Dev.	4.192635
Skewness	0.011519
Kurtosis	5.994509
Jarque-Bera	38.11236
Probability	0.000000

NORMALITY TEST FOR LICs

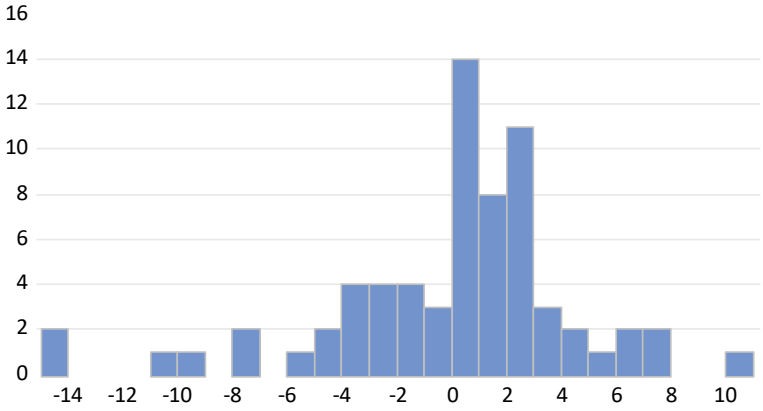
MODEL A



Series: Standardized Residuals
Sample 2004 2020
Observations 68

Mean	1.60e-14
Median	0.977491
Maximum	7.218890
Minimum	-12.14554
Std. Dev.	3.762739
Skewness	-1.223831
Kurtosis	4.397470
Jarque-Bera	22.50793
Probability	0.000013

MODEL B



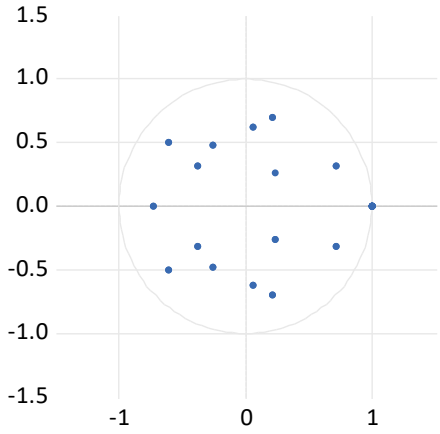
Series: Standardized Residuals	
Sample 2004 2020	
Observations 68	
Mean	-1.59e-15
Median	0.725245
Maximum	10.66758
Minimum	-14.82828
Std. Dev.	4.591172
Skewness	-1.024077
Kurtosis	5.117741
Jarque-Bera	24.59265
Probability	0.000005

Appendix N: Stability Test

INVERSE ROOTS OF AR CHARACTERISTIC POLYNOMIAL LESS INDEBTED COUNTRIES

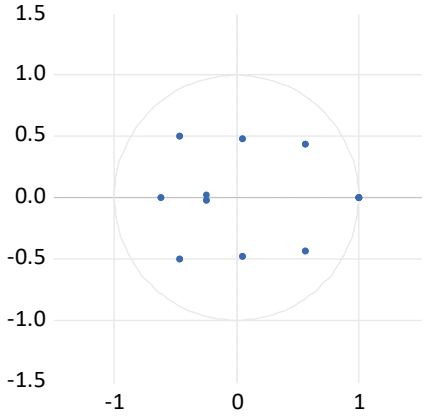
Model A

Inverse Roots of AR Characteristic Polynomial



Model B

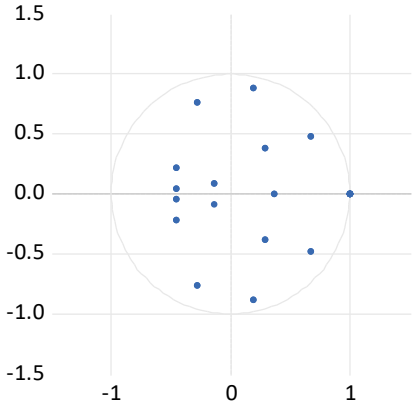
Inverse Roots of AR Characteristic Polynomial



INVERSE ROOTS OF AR CHARACTERISTIC POLYNOMIAL HIGHLY INDEBTED COUNTRIES

Model A

Inverse Roots of AR Characteristic Polynomial



Model B

Inverse Roots of AR Characteristic Polynomial