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Effects of external debt capacity on infrastructure investment in the SADC region

By

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Research Report submitted in fulfilment of the requirements for the degree of Master of Management in Finance and Investment

FACULTY OF COMMERCE LAW AND MANAGEMENT

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UNIVERSITY OF THE WITWATERSRAND

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DECLARATION

I, Lindokuhle Phumla Matla, declare that the research work reported in this research report is my own work, except where otherwise indicated and acknowledged. It is submitted for the degree of Master of Management in Finance and Investment at the University of the Witwatersrand, Johannesburg. This research has not, either in whole or in part, been submitted for a degree or diploma at any other university.

Signature of candidate: Date:

ABSTRACT

This report examines the effects of external public debt on infrastructure investment in the Southern African Development Community (SADC) region, and particularly assesses member countries' borrowing capacity against the SADC Convergence Target. A multiple regression analysis is conducted on a panel data of 2004-2019 to examine the cross-country dynamics of the 16 SADC countries. The surprising research findings indicate an insignificant relationship between infrastructure investment and external public debt in the SADC region. Furthermore, macroeconomic variables such as Official Development Assistance, Political Stability, Gross National Savings, Gross Government Debt, and Consumer Price Index, individually have a significant and positive association with infrastructure investment. The findings of this research suggest that although government debt is theoretically expected to be an important factor in determining infrastructure investment, other factors appear to be more statistically significant in influencing infrastructure investment.

Key words: External debt, infrastructure investment, SADC

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Chapter 1: Introduction

1.1. Background

Infrastructure is a powerful catalyst for transforming and advancing development on the African continent (United Nations, 2018). This development will positively impact the African population which is at the centre of the need for sustainable development (United Nations, 2018). The African agenda aspires to achieve an integrated and prosperous continent through the mobilisation of its own resources. One of the core aspirations for the African Union is to achieve inclusive growth and sustainable development. Achieving this aspiration requires enhancing resources such as modernising infrastructure that enable the population in cities and other settlements, to benefit from access to affordable and decent housing, water, sanitation, energy, public transportation and Information and Communications Technology (ICT) (African Union, 2015).

Regrettably, the infrastructure in Africa lags when compared to countries in East Asia and the Pacific, Latin America and the Caribbean (Owusu-Sekyere, 2018). The lack of adequate infrastructure therefore reduces the ability of countries to be globally competitive, enhance economic growth and reduce poverty (Owusu-Sekyere, 2018). Furthermore, there exists a large financing gap for investment towards new infrastructure and the rehabilitation of existing infrastructure, which could hinder the potential for economic growth and the ability for countries to provide efficient public services (G20, 2019). The financing gap includes: (i) the need for project preparation funding - which assists to bring early stage concepts to prefeasibility stage, (ii) the need for reforms to improve project design and feasibility analysis, (iii) the maintenance of infrastructure assets, and (iv) to improve the economic and social performance of African countries (ICA, 2019).

1.2. Problem Statement

To meet the demands of Africa's citizens, it is key to increase infrastructure in order to realise its transformative power to connect and create production capabilities (UNDESA, 2019).

However, the road to infrastructure development is accompanied by various challenges which include closing the financing gap on the continent. Infrastructure stock and related performance in Sub-Saharan Africa are low from all aspects, including quality, quantity, and access to infrastructure. The bottlenecks that exist delay the potential growth that could be realised. The infrastructure gap has been estimated to be around US$93 billion per year for the next 10 years, with a majority of the funding expected to be funded by the public sector. This creates great pressure due to limited financial resources that need to be divided between infrastructure investment and other fiscal needs (World Bank, 2018). In order to close the financing gap, countries seek financing from various financing institutions who provide debt finance, including external debt (World Bank, 2018).

Rising external debt has raised concerns regarding countries requiring further debt relief. In addition, high public debt indebtedness restricts a country from managing its National Development Plan and focusing on its priority expenditure items due to servicing high debt costs. Whilst literature on financing infrastructure and the increase in public debt levels exist separately, to the best of my knowledge, there is insufficient literature that addresses the direct relationship between public external debt and infrastructure investment, and the extent to which external debt impacts infrastructure investment, especially, when as a tool to measure performance or progress, infrastructure is represented by one variable such as the Africa Infrastructure Development Index and not by a sector (Kengdo, 2020).

With the scarcity of such knowledge, countries may continue to rely on external debt without considering alternative approaches to financing infrastructure. For instance, countries that have relied on debt from creditors such as China, have suffered the consequences of losing national assets due to their inability to service external debt. Sri Lanka recently handed over a port and 15,000 acres of land surrounding the port for a period of 99 years due to the country's inability to repay its loan (Portelance, 2021). Approximately 22% of Sub-Saharan Africa has a loan with China; and from within the SADC region, Angola has the highest indebtedness to China, followed by Zambia, Zimbabwe and the DRC (Initiative, 2021). Understanding the level of sustainable external debt that positively impacts on infrastructure will help countries to avoid high debt levels and the subsequent required debt relief.

1.3. Purpose of Study

The purpose of this report is to establish the effects of external debt on infrastructure investment. It adds to the relevant body of knowledge that may enable policy makers, governments and debt management offices to make informed decisions on the sustainable level of debt and implement debt management strategies that will assist in addressing the national infrastructure deficit. Thus, the focus of this study is on infrastructure investment in SADC countries, by way of external debt capacity.

1.3.1. Research Questions

Based on the background and problem statement highlighted above, the primary research question is as follows: Does external public debt have a direct impact on infrastructure investment? In answering this main question, answers to the following sub-questions are designed to better highlight the potential significance of this research:

a) What is the degree of external indebtedness in comparison to total public debt across SADC countries?

b) What is the level of external debt of SADC counties against the SADC Regional Convergence target?

c) In addition to external debt capacity, what other economic factors impact on infrastructure investment?

1.4. Research Objectives

Put differently, in responding to the forgoing research questions, the report sought to achieve the following objectives:

I. To assess the degree of external indebtedness compared to the total public debt across SADC countries;

II. To determine the level of external indebtedness of SADC countries against the SADC Regional Convergence Target;

III. To determine how external public debt affects public sector infrastructure investment in SADC countries

1.5. Significance of Study

The benefit of infrastructure development ultimately contributes towards economic growth and development. There is evidence that investment in infrastructure has a positive impact on economic growth, especially export-led economic growth (Pravakar Sahoo, 2010) and that financing through external debt/public sector debt is required to narrow the infrastructure funding gap (UNDESA, 2019). This report increases insight on the extent to which external public debt impacts on infrastructure investment. Secondly, due to the focus on the SADC region, this research can assist SADC countries to improve their infrastructure policy and to assist in managing external debt at sustainable levels required to positively impact on infrastructure development.

1.6. Research Methodology

In responding to the research question, this report has used secondary data which was sourced from various databases and studies which include the World Development Indictors, Organisation for Economic Co-operation and Development, the International Monetary Fund and the World Bank International Debt Statistics. An Ordinary Least Squares (OLS) regression analysis was conducted on panel data to examine the cross-country dynamics of the 16 SADC countries, from 2004 to 2019, in respect of the relevant objectives of the research. Importantly, it is worth noting at this juncture that the sample for the study is dependent on the availability of data.

1.7. Outline of Study

The report is structured in the following sequence: The literature review is explained in Chapter

2, followed by Chapter 3 which discusses the data and research methodology, including the data used for the empirical analysis of the study. Chapter 4 presents the result and outcome of the empirical analysis, and the report is concluded in Chapter 5.

Chapter 2: Literature Review

This chapter introduces the literature review by addressing the benefits of investing in infrastructure, the need to meet the growing demand in Africa, and the financing required to close the identified gaps in infrastructure. The chapter is segmented into five sections where section 2.1. addresses the benefits of infrastructure development, and section 2.2 discusses the need for infrastructure to meet the growing demand. This is followed by section 2.3. on infrastructure gaps and challenges; section 2.4 discusses infrastructure financing with a focus on external debt, and concludes with section 2.5 on gaps in the literature regarding the relationship between external debt and infrastructure investment.

2.1 Addressing the benefits of infrastructure development

Infrastructure investment can be defined as an infrastructure asset that is immovable and capital intensive, such as ports, roads, gas pipelines and electricity power plants (Sawant, 2010). This therefore relates to physical infrastructure, such as, transport, energy, water, telecommunication, health and education infrastructures, which are predominantly financed and constructed through public financing (Palei, 2014).

The development of this infrastructure has great benefits towards the advancement and economic growth of a country. Literature accounts infrastructure as a major determinant of economic growth (Munnell, 1990; World Bank, 1994; Calderone & Serven, 2004; Estache, 2006). Infrastructure investment, especially public infrastructure, is a catalyst to economic growth and improvements. For example, improvement in labour, output and private investment can be expected from infrastructure spending (Munnell,1990). The Solow Growth model developed by Robert Solow is an economic growth model that argues that output is a function of productivity, capital, and labour.

However, due to diminishing returns on capital, a country will experience growth when investment is higher than the rate of depreciation of the capital stock (Ray, 1998). Moreover, infrastructure that is well designed can have positive long-term effects on the economy, increase economic growth, productivity, land values and accessibility and have positive spillover effects (Berganito & Goetz,2013). In addition, infrastructure development has been identified by the SADC as key to achieving regional integration and economic growth (SADC, 2009).

This is also true as infrastructure is an enabler towards regional integration, as logistics improve the efficiency of moving goods and services across countries (UNDESA, 2019). The concept of regional integration can be defined in three components which include (i) economic and trade integration which focuses on free trade areas and unions, (ii) political integration where government officials have co-ordination and harmonisation in working together, and (iii) physical integration in the form of infrastructure (Tomassian, 2009).

The advantage of regional integration is regional co-operation, such as the Nile Basin. This initiative encourages countries to manage shared natural resources, such as international rivers (Benno Ndulu, 2005). Joint action towards resolving infectious diseases that can travel across borders is a regional solution resulting from regional integration (Benno Ndulu, 2005). Moreover, when political and economic pre-conditions, such as domestic peace and security, mutual trust and macroeconomic stability are met, regional integration becomes a success (Benno Ndulu, 2005). This supports the reason why African countries have signed a number of regional integration agreements with the strategic objective of enhancing development (Hartzenberg, 2011). The regions' determination is reflected in the development plans in place to enable regional integration, despite few success stories and the timelines being unrealistic.

The SADC Regional Indicative Strategic Development Plan (RISDP) 2015-2020 has prioritised infrastructure that will enable regional integration and economic development which will contribute towards reducing poverty (RISDP, 2020). Furthermore, the SADC has developed a Regional Infrastructure Development Master Plan (RIDMP) which highlights the challenges faced by the region. The challenges includes (i) energy supply that is not enough to address the need for access and the production that is at an increase, (ii) transport and logistics

services that are expensive and unpredictable, (iii) no affordable accessibility to information and communications technologies, (iv) lack of clean drinking water for water and sanitation for residents and to assist with agricultural production. The region is determined to create an enabling environment through the delivery of the required infrastructure to address these challenges by 2027 (SADC, 2012).

The African Union (AU) with the Agenda 2063 and the Sustainable Development Goals (SDGs) have prioritised infrastructure development as an important agenda. In enhancing regional integration, infrastructure that is described under the various SDGs is critical and includes water and sanitation, health, energy, and ICT sectors. When the infrastructure is inadequate, it affects the global competitiveness of a country, including domestic and international trade and the ability to integrate into the global economy. The long-term economic growth of African countries is then compromised, as well as efforts to reduce poverty (UNDESA, 2019).

Literature supports the investment in infrastructure as it is described to facilitate international trade (Bougheas et al., 1999), increase investment from the private sector (Cavallo & Duade, 2011) and, according to Calderon and Serven (2010), contribute towards growth that is sustainable. Infrastructure that has a direct and indirect positive effect on trade which is often within the transport sector, such as highways, is essential for regional integration and development. It assists to enhance productivity and competitiveness in markets (Bergantino & Goetz, 2013). Despite the documented benefits of infrastructure, there remains a demand for more infrastructure to meet the increasing population and to address the inequality in Africa.

2.2 The need for infrastructure to meet growing demand

As the African population grows, the need for infrastructure to accommodate a growing population expands (United Nations, 2018). Between 1990 and 2015, the population for 28 African countries is reported to have doubled and there are projections that 26 more countries will double between 2017 and 2050. The population in Africa is expected to reach 2.4 billion by 2050 and over one billion of this increase is from Sub-Saharan Africa.

This is more than half of the world's population growth and includes countries, such as the Democratic Republic of the Congo and the United Republic of Tanzania, from the SADC region (Nations, World Population Prospects, 2019).

In Sub-Saharan Africa, the rural population only have 25% access to electricity, compared to 75% of the urban population. This includes access to water, where within the rural population, only 45% have access to clean drinking water. While there is a growing mobile subscription in Africa, only 18% of households have access to the internet (OECD/ACET, 2020). Countries have not developed their rail infrastructure since gaining independence, the rail network is insufficient and the port performance rate is lower than other countries at 20 containers per hour compared to 25-30 containers in other parts of the world (Owusu-Sekyere, 2018).

The rural population in Africa is 43% and contributes towards 90% of the world's rural population. However, from 1950, rapid urbanisation has taken place and by 2018, the world had more of the population living in urban areas at 55%, than in rural areas (United Nations, 2018). The urban population will experience an urban transition through cities, both small and mega cities, and will assist in moving countries towards a more balanced demographic of rural versus urban areas. As urbanisation increases, the need for digital infrastructure also increases, creating an opportunity to develop modern and quality infrastructure and to create employment and ultimately, reduce poverty (UNDESA, 2019). Urban infrastructure that functions well can be a good support towards accelerating industrialisation (ICA, 2019). Whilst demand is projected to increase in future along with the increase in population on the continent, there remains great challenges and gaps to meet the infrastructure demand.

2.3 Infrastructure gaps and challenges

The infrastructure gap in Africa remains large and not only requires funding but also development (Sawant, 2010). It is an expenditure that is largely financed and driven by government through public investment (Sawant, 2010). The low performance of African countries is negatively impacted by the deficit in infrastructure. Higher user costs and poor service delivery are as a result of poor-quality infrastructure. These costs are twice as high than the average and by global standards, are high (Benno Ndulu, 2005).

This unfortunately affects the potential for African countries to be competitive (Benno Ndulu, 2005).

Studies were conducted by the World Bank to assess the performance of four infrastructure sectors in Sub-Saharan Africa, namely, telecommunications, electric power, transportation and water and sanitation (World Bank, 2018). The focus was on the quantity, quality, and access to the infrastructure. Findings demonstrated that whilst there has been improvement in the region, it continues to fall short, compared to other regions. Secondly, economic growth improves when efforts go towards narrowing the infrastructure gap, and thirdly, there remains a challenge in closing the gap due to the costs involved, as well as the ability to raise the required funding, including grant funding. Lastly, to increase the efficiency of how infrastructure is spent, procurement, public investment management systems and governance of regulations concerning infrastructure projects need to be improved (World Bank, 2018).

A programme was launched in 2010 by the AU, New Partnership for Africa's Development (NEPAD), and African Development Bank (AfDB) called the Programme for Infrastructure Development in Africa (PIDA) to address the infrastructure gap by focusing on energy, ICT, transport and water and sanitation. It became an opportunity for countries to co-operate and develop regional and continental infrastructure (UNDESA, 2019). However, even with progress made by the region, infrastructure sub-sectors continue to face challenges. These sub-sectors include transport, water and sanitation, energy and telecommunications (SADC, 2012). To close the gaps and provide a solution to the identified challenges, financing is required.

2.4 Infrastructure Financing

An estimated US$93 billion per annum infrastructure financing gap is required by 2025 to address infrastructure development, which remains a challenge on the continent (UNDESA, 2019). In addition, there exists a large financing gap for investment towards new, and the rehabilitation of existing infrastructure, which, if not addressed, could hinder the potential for economic growth and the ability of countries to provide efficient public services (G20, 2019). The financing gap includes the need for project preparation funding, which assists to bring early stage concepts to prefeasibility stage, as well as to address the need for reforms to

improve project design and feasibility analysis, the maintenance of infrastructure assets, and to improve the economic and social performance in African countries (ICA, 2019).

There are however, constraints to financing infrastructure in Africa and these include a weak strategic vision that influences the policies put in place to improve investor confidence (Owusu-Sekyere, 2018). Secondly, is the poor knowledge of new and emerging partners which increase the possibility of funding, despite the traditional western funding. Thirdly, when policy is not predictable and countries change policies, lack transparency, and implement poor regulation, this can hinder the progress of infrastructure investment, preventing investors from navigating complex processes, such as receiving permits or understanding complicated tax policy regimes. Lastly, the risks associated with investing in Africa, such as political risk, corruption, macroeconomic instability, that compromises the possible returns achievable from investing in infrastructure (Owusu-Sekyere, 2018).

The fiscal position of a country will often determine the infrastructure investment and depends on the level of debt that exists, the financing required towards public investment and available tax instruments (World Bank, 2018). Public financing contributes towards the majority of investment for African infrastructure, except for ICT (ICA, 2019). Private financing requires government support, such as guarantees from host countries, as a form of protection. Whilst it may be preferable to share more infrastructure investment with the private sector, the infrastructure is often not suitable for private financing as it lacks the ability to generate revenue to attract private investors (ICA, 2019). Sectors such as ICT, electric power and transport are usually more successful in attracting private financing (ICA, 2019). Moreover, identified obstacles which include the poor creditworthiness of the sector, the way in which the political and regulatory risk is perceived, the bureaucracy and corruption, as well as the amount of time it takes for the completion of a project, are often the reason why private investors hesitate to invest (ICA, 2019).

The positive development from the private sector is that there has been an appetite from institutional investors such as pension funds, insurance companies and sovereign wealth funds

to invest in infrastructure as an asset class (ICA, 2019).

However, constraints, such as greenfield projects, which lack a credit record and ability to be traded in capital markets as a liquid security, create a high project risk which will need to be addressed. For instance, infrastructure bonds are tradable in capital markets but do not necessarily have the satisfactory track record and risk profile required (ICA, 2019).

One of the options for a country to provide financing towards infrastructure development is through the domestic or foreign capital markets (Drazen,1997). Unfortunately, due to low developed domestic capital markets, countries rely on external debt to fund the capital expenditure (Todaro & Smith, 2006). Capital markets in Africa are under-developed which, among others, could also be attributable to the colonial legacy issues, including corruption, the lack of political will, lack of prudent fiscal management, under-developed financial sector and economy, and weaker institutional capacity. The expertise and knowledge required for decision making is often lacking and weak and requires support in the form of capacity building and education (Songwe, 2014). The use of capital markets by a country entails the issuance of bonds in the bond market. This form of borrowing has a direct link to an increase in external public debt. Countries will typically rely on external debt to raise funding towards infrastructure. The next section provides an overview of how external debt has contributed towards the debt level in the SADC due to financing infrastructure.

2.4.1 Overview of External Debt in SADC countries as a result of infrastructure finance

The increase in bonds' issuance has contributed to high debt levels, including for countries that benefitted under the Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiative (MDRI) (Bokosi & Chikova, 2019). The high levels of debt in African countries can be traced to the 1970s and has been on the increase, despite the interventions made such as the HIPC Initiative of 1996 and the MDRI of 2005 to curb high debt. Studies have shown that many African countries achieved political independence and experienced growth, including infrastructure development, between the 1960s and 1970s. However, by the 1970s, many of the countries had accumulated high levels of debt (Ezenwe, 1993). According to Greene

(2011), in assessing the debt problem in these countries, in 1970, aggregate external debt was estimated at US$6 billion and rose to an estimated US$136 billion by 1988.

This affected the debt service payments which were less than US$1 billion in 1970 and had reached an estimated US$13 billion by 1985, settling at US$11 billion in 1988. The reason for this increase in external debt levels was due to expenditure by countries towards stimulating growth through developing the domestic market, as well as towards infrastructure investment (Greene, 2011).

Countries within the SADC region, such as Malawi, Mauritius, Zambia and Zimbabwe were particularly impacted, resulting in higher debt service costs. In addition, the domestic policies implemented were expansionary expenditure measures which left countries vulnerable to external shocks. In September 1988, the World Bank and the group of Seven Creditors agreed to provide debt relief for countries that qualified for the World Bank IDA programme (Greene, 2011). Debt relief to the amount of US$6 billion was written off for 45 countries subsequent to the 1977-79 United Nations Conference on Trade and Development (UNCTAD) meetings (Arnone, Bandiera & Presbitero, 2005).

Easterley (2002) acknowledges that a reduction in debt did not occur from the debt relief as countries accumulated debt anew until countries became heavily indebted. This was despite the debt relief entailing the rescheduling of debt service, a holiday of interest payments, the reimbursement of old debt through grants, assistance with local costs and the untied compensatory cost. In 1990, more debt relief was considered, following the Houston G7 Summit in the form of concessional rescheduling of debt and is known as the “Toronto terms”. Terms referred to as “Trinadad terms” were agreed on and meant increasing the grant element from 20% to 67% under the “Toronto terms”. These terms were enhanced further in 1993 with concessional terms. The “Naples terms” were announced in December 1994 by the Paris Club. The HIPC Debt Initiative was then announced in September 1996 by the International Monetary Fund (IMF) and World Bank to provide an opportunity for poor countries to no longer rely on the rescheduling process and to allow countries to seek funding with the international financial community. The Paris Club further contributed to the initiative by providing 80% net present value debt reduction (Easterly, 2002).

According to Arnone, Bandiera and Presbitero (2005), the main rationale for the HIPC initiative was to address debt sustainability and poverty reduction. In their research regarding the management and sustainability of debt in African economies, Muhanji and Ojah (2011) maintain that the reason for unsustainable indebtedness is due to three reasons, namely, that (i) the threshold for sustainable debt has not yet been established, (ii) there needs to be an ability to not only manage debt successfully as well as to manage external shocks, (iii) the political will to put in place effective governance structures.

Arnone, Bandiera and Presbitero (2005) explore the different approaches to external debt sustainability which includes the Debt Sustainability Analysis (DSA) which assesses the behaviour of the country that is borrowing and its willingness and ability to service its current and future debt. Failure to do so will increase the cost of servicing debt and may ultimately lead to a default. The study concludes that a more comprehensive framework is required to assess the impact of debt in Low Income Countries (LICs) which should include country specific thresholds, debt service thresholds, an analysis of public deficit financing and an analysis of the external financing gap to finance the public deficit (Arone, Bandiera & Presbitero, 2005).

The World Bank developed in 2005, a Debt Sustainability Framework (DSF) to assist LICs in monitoring the risk of increasing debt to the level of debt distress should it not be managed prudently. It includes assigning risk ratings by selecting debt indicators to estimate thresholds, formulating baseline projects, and conducting a stress test in comparison to the threshold. The DSF is reviewed every five years and can be used by governments, donors, lenders, and borrowers for Debt Sustainability Analysis (DSA) in addition to developing the debt management strategies (World Bank, 2005). A DSA is a tool established by the International Monetary Fund to detect the current level of debt and potential future borrowing impact on how it can repay its debt obligation (International Monetary Fund, 2017).

The difference between the HIPC Initiative and the DSF is that the HIPC based its sustainability analysis on one ratio, debt to exports, and focused on borrowings in the past to determine a debt overhang. The DSF is more future focused with the objective of reducing unsustainable levels of debt that may occur in the future.
It also uses three debt ratios for debt sustainability analysis compared to one for the HIPC Initiative. The DSF additionally assesses the eligibility of LICs to receive grant funding due to debt distress determined by thresholds. The thresholds are determined using the Country Policy and Institutional Assessments (CPIAs) performed by the World Bank (World Bank, 2005).

In analysing the impact of debt relief and how this has impacted the debt stock (AFRODAD, 2014), SADC countries were divided into different groups according to themes, which included those having the advantage of being recipients of the HIPC and MDRI Initiatives, and includes the Democratic Republic of the Congo (DRC), Malawi, Mozambique, Tanzania, Madagascar and Zambia. The second group were countries that had a reliance on external debt to close the funding gap, which included Lesotho, Eswatini and Botswana. The group that followed depends on their domestic capital markets to raise funding, namely South Africa, Namibia, Angola and Mauritius, and lastly, those that had a significant debt burden or were under debt distress. Most countries managed to maintain debt levels within the SADC threshold, however, some countries breached the SADC threshold. In addition, the infrastructure deficit continues to require financing, most likely external debt (AFRODAD, 2014).

Countries that received HIPC and MDRI debt assistance benefitted from a decline in debt levels, especially from 2006, as the debt trend is observed to decline in graphs 2.1-2.6. This helped the countries to have sustainable debt levels, however by 2013, except for the DRC, countries such as Malawi, Mozambique, Tanzania, and Zambia had high debt compared to prior the HIPC initiative. The graphs show Gross Government debt as a percentage of GDP, external debt as a percentage of GNI, the Gross Fixed Capital as a percentage of GDP and the SADC Macroeconomic threshold. Graph 2.1 shows the DRC with high debt levels between 2004 and 2009 as a result of high external debt which was more than 50% of government debt.

Higher government consumption, non-concessional loans and high concessional financing from China contributed to the debt levels ((DFID & SIDA, 2008). The SADC threshold was also breached during this time period and infrastructure expenditure was lower. External debt levels were lower at 29.71% from 2010 due to market conditions that had deteriorated and 15.54% by the end of 2019. Public debt included debt with multilateral and bilateral creditors. Lending from commercial creditors remained steady whilst 40% of external debt consisted of Sicomines for mining and infrastructure projects. The mines are as a result of an agreement between Chinese investors and the government.

Figure 2.1: DRC HIPC and MDRI Beneficiaries

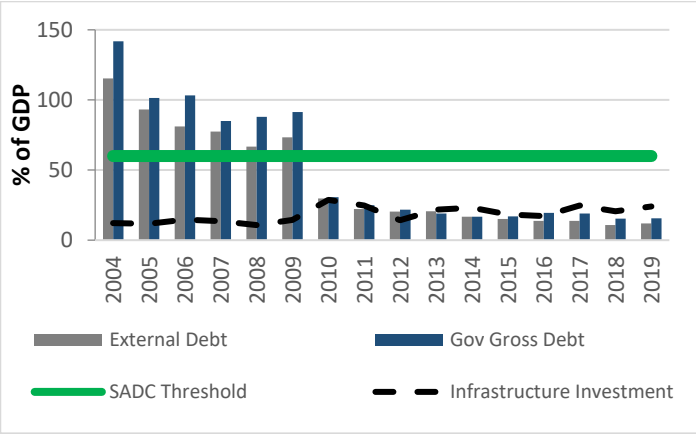


Figure 2.2: Madagascar HIPC and MDRI Beneficiaries

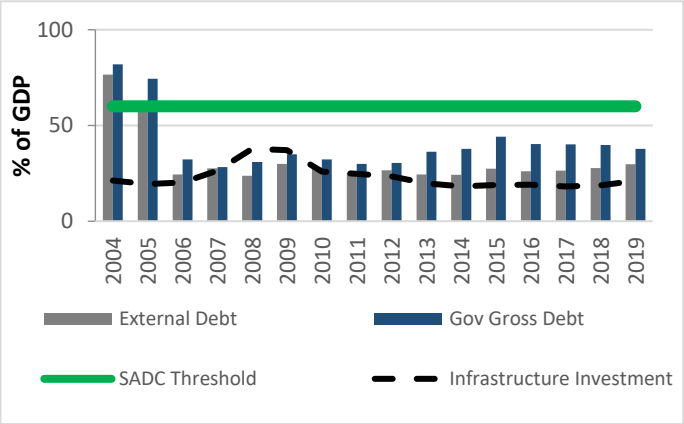
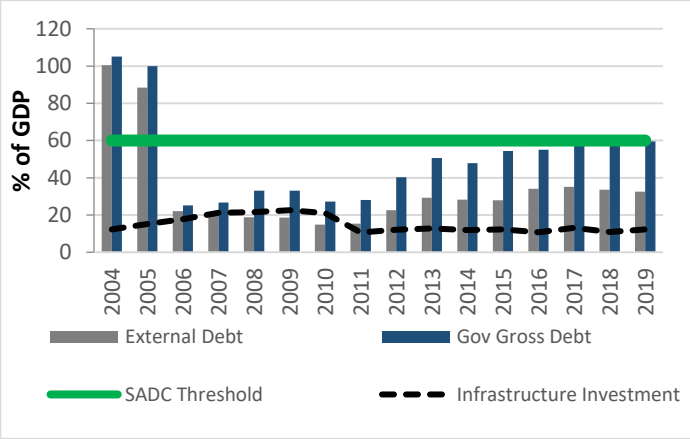


Figure 2.3: Malawi HIPC and MDRI Beneficiaries

Figure 2.4: Mozambique HIPC and MDRI Beneficiaries


120
100
80
60
40
20
0
% of GDP
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
External Debt
Gov Gross Debt
SADC Threshold
Infrastructure Investment

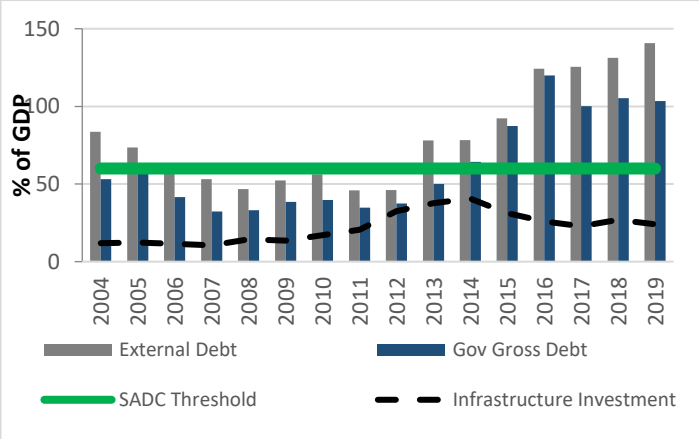

150
100
50
0
% of GDP
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
External Debt
Gov Gross Debt
SADC Threshold
Infrastructure Investment

Figure 2.5: Tanzania HIPC and MDRI Beneficiaries

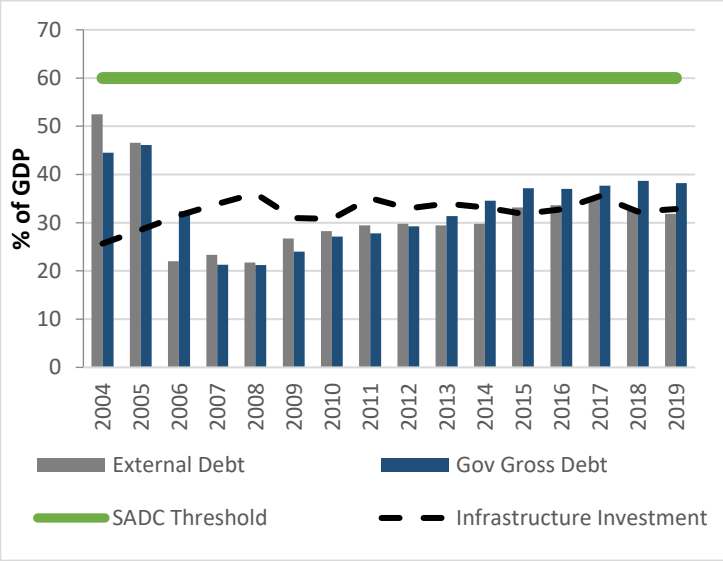
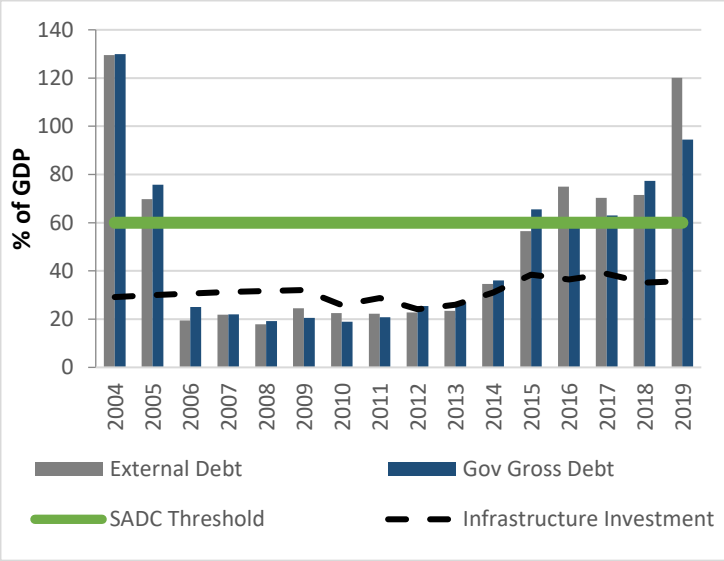


Figure 2.6: Zambia HIPC and MDRI Beneficiaries



Madagascar's debt in Figure 2.2, at the beginning of the period was impacted largely by the deterioration of the Malagasy Franc which was as a result of high imports towards petroleum products whose prices had increased and higher government capital expenditures. Secondly, Madagascar experienced two cyclones which placed a large indent on the shellfish and vanilla industries and their ability to generate income through exports. In 2019, Madagascar's external debt was lower at 29.83% due to the implementation of the debt strategy to focus on concessional lending limited at 2% of external debt and aiming to balance the concessional and non-concessional financing in the medium

term. The SADC threshold has not been breached since 2006 which could be a result of the reforms and debt management strategy being undertaken.

A large portion of Malawi's debt was cancelled by the IMF from US$643 million in 1999 Net Present Value (NPV) terms to US$331 million, lowering the debt-to-exports ratio to the HIPC threshold of 150% which amounted to US$30 million. The debt was as a result of lower international demand for commodities, such as tobacco, higher oil prices which impacted negatively on accumulating foreign exchange revenue and Malawi's ability to service debt and the high interest rates on external debt (IMF, 2004). Malawi's gross government debt increased significantly in 2004 and 2005, reaching a high of 99.7%. The depreciation of the Malawian Kwatcha in 2011 and 2012 contributed towards the external debt value increasing between 2012 and 2013. In 2019, due to high domestic debt, Malawi was at a high risk of debt distress, however there was a moderate risk of external debt distress. This was as a result of high interest rates over the increasing debt over recent years, as indicated through the Debt Sustainability Analysis. The country has managed to keep debt levels below the SADC threshold, though seemingly at the expense of lower infrastructure investment. Tanzania external debt in figure 2.5 remains relatively consistent and reaching a low of 21.76% in 2008 but increasing over the years to reach a relatively higher level of 31.83% by 2019. These levels were supported by macroeconomic policies and IMF programmes which were practical and assisted in containing the public sector debt (World Monetary Fund, 2018).

In Zambia, as seen in figure 2.6, external debt was below 25% between 2006 and 2013 and remained low on average, due to more reliance on domestic debt to finance infrastructure investment and narrow the gap in the budget deficit. In 2012, a 10-year US$750 million Eurobond was issued, increasing the external debt exposure compared to the domestic debt where gross domestic debt was 65.55% by 2015. Due to a reliance on domestic debt over this period, these SADC countries increased the development of their domestic market. The debt levels were also as a result of non-concessional loans towards infrastructure development and domestic expenditure arrears. This was enhanced by exchange rate pressures. South Africa was slightly above the target at 62.15%. Mozambique experienced a number of shocks that resulted in higher debt levels, including the disclosure of hidden debt that was not accounted. Public debt was in distress in the later years and authorities had to negotiate with international creditors as a way of restructuring debt. External debt has been breached since 2013 and

infrastructure investment has declined during this period.

Figure 2.7: Botswana External Debt Dependent

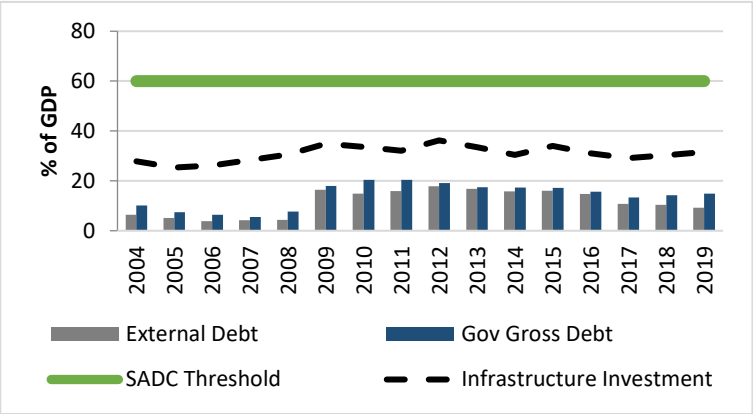


Figure 2.8 : Angola External Debt Dependent

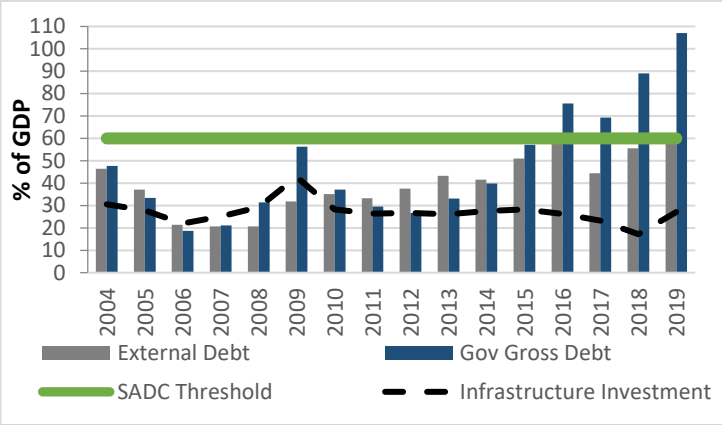
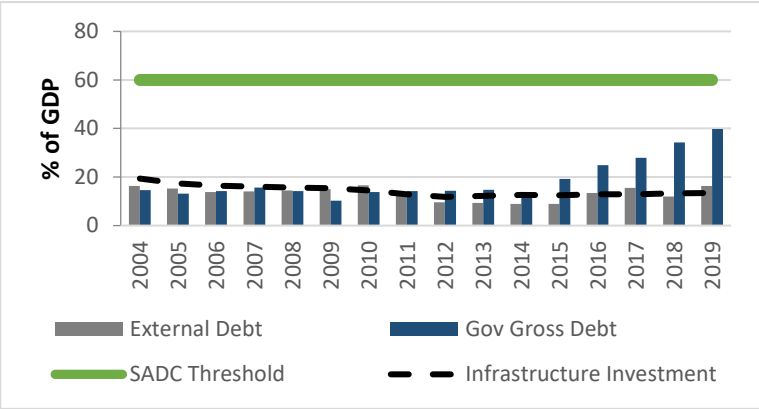
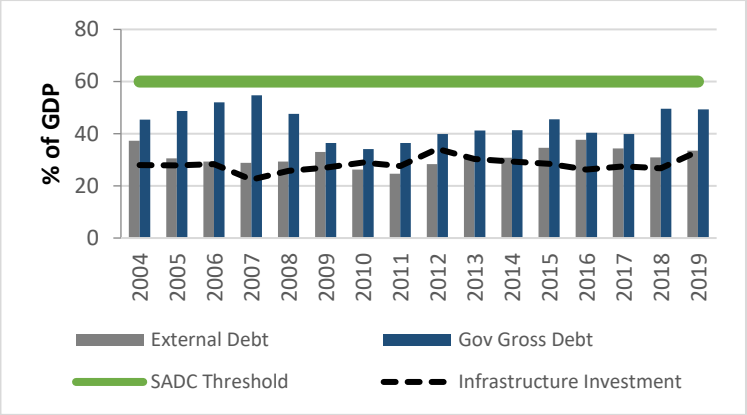


Figure 2.9: Eswatini External Debt dependent

Figure 2.10: Lesotho External Debt dependent


80
60
40
20
0
% of GDP
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
External Debt
Gov Gross Debt
SADC Threshold
Infrastructure Investment


80
60
40
20
0
% of GDP
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
External Debt
Gov Gross Debt
SADC Threshold
Infrastructure Investment

As countries that rely on external debt, Botswana and Eswatini managed debt levels as low as 10%, compared to Lesotho, which reached a debt level of 54.78% in 2007. All three countries have not breached the SADC threshold. The Southern African Customs Union (SACU) receipts declined in 2009 which had an impact on the SACU countries, namely Botswana, Eswatini and Lesotho. Surprisingly, only Lesotho has shown an overall increase in debt. Lesotho's debt declined during 2005 and 2007 and started on an upward trend from 2012 to 2016 due to the government's efforts to manage debt service through the implementation of their policy that encourages concessional loans.

In figure 2.7, Botswana experienced lower debt between 2004 and 2008 which was followed by higher debt which included an African Development Bank Economic Diversification Support Loan of US$1.5 billion. This loan was to address the impact experienced in the country from the global economic crisis. Overall, these countries' share of gross and external debt increased due their reliance on external debt. Angola, as a country that relies on external debt, also shows lower levels of debt at the beginning of the period and rises due to Sonangol, the state-owned oil company, raising debt in 2009. The debt levels breached the SADC threshold from 2016 due to the prolonged oil price decline since 2014 which adversely impacted on Angola's fiscal revenue, exports, and economic growth, given the high dependence on oil. During the higher debt levels from 2015, infrastructure investment had a lower and downward trend, suggesting yet again that high external debt levels, especially that breach the SADC threshold, could result in lower infrastructure investment due to re-prioritising public expenditure, possibly towards debt repayments.

In figure 2.9, Eswatini debt levels increased due to the decline in government revenues. The country had to rely more on external debt due to lower SACU receipts. The slightly elevated external debt levels can be seen between 2004 and 2010. Overall government debt increased from 2015 to 2019 due to fiscal expansion and declining SACU revenue. This negatively impacted on the current account which narrowed and international reserves which declined to three months of imports.

Figure 2.11: South Africa Domestic Market dependent

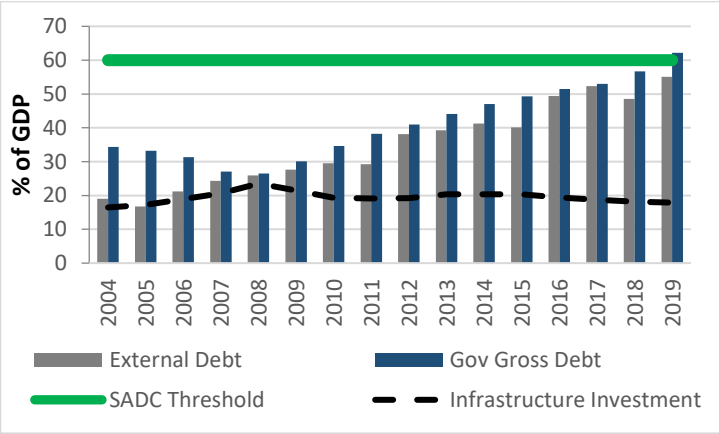


Figure 2.12: Mauritius Domestic Market Dependent

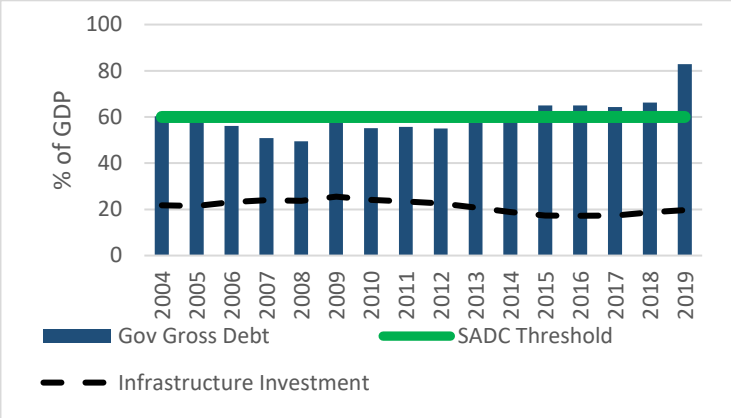
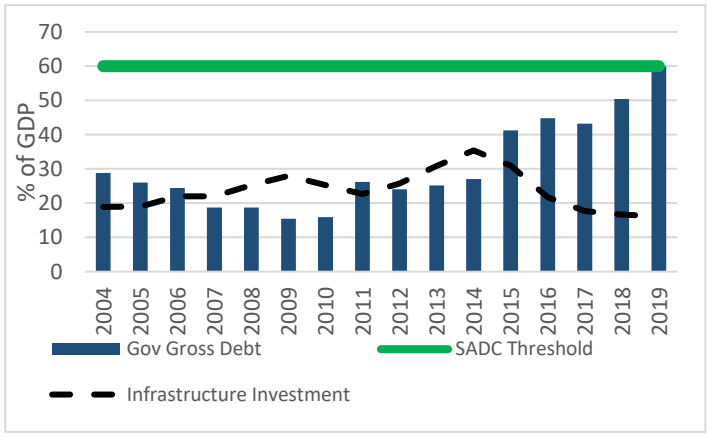


Figure 2.13: Namibia domestic Market Dependent


70
60
50
40
30
20
10
0
% of GDP
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Gov Gross Debt
SADC Threshold
Infrastructure Investment

South Africa, Mauritius and Namibia rely more on their domestic capital markets to source debt. This was a deliberate move by the countries to rely less on external debt to reduce the exposure to exchange rate risk. External debt data for Mauritius and Namibia is unavailable, however Gross Government Debt as a percentage of GDP is used in this analysis. For example, South Africa implements its strategy through its Debt Management Report whilst Namibia through its Sovereign Debt Management Strategy and Mauritius Debt Management Strategy published in 2008. The strategies also assist in developing their domestic markets. South Africa and Namibia did not breach the SADC threshold of 60% until 2019, whilst Mauritius breached from 2015 as a result of external debt dedicated towards the state-owned company's acquiring aircrafts, as well infrastructure finance.

Figure 2.14: Seychelles Debt Overhang

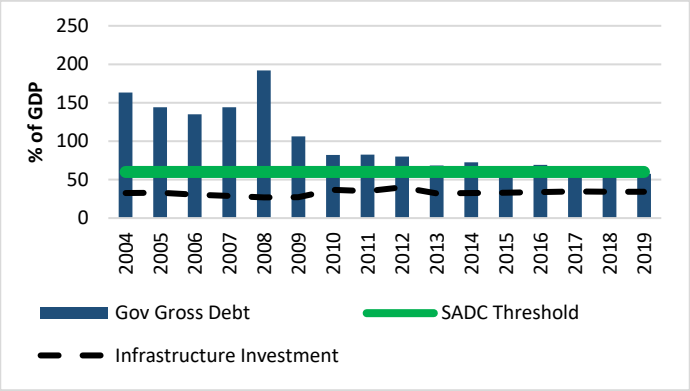


Figure 2.15: Zambia Debt Overhang

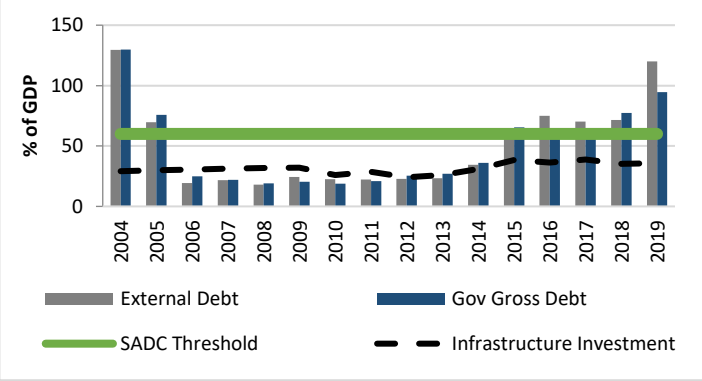
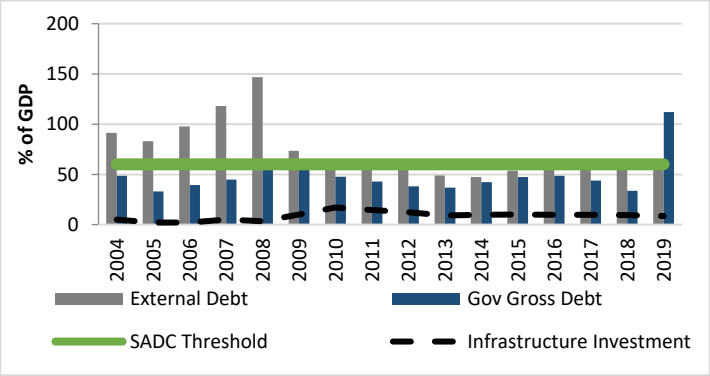


Figure 2.16: Zimbabwe Debt Overhang



Seychelles, Zambia, and Zimbabwe have been countries that were not able to manage debt within the 60% threshold as seen in table 2.14, 2.15 and 2.16 due to large budget deficits and defaults, such as Seychelles defaulting in October 2008 on its US$230 million Eurobond and Zimbabwe's high inflation rates. Zambia maintained low levels of debt between 2006 and 2014 and experienced high debt levels post 2015, despite benefiting from the HIPC and MDRI initiatives. This study relates to a certain extent to some literature sources reviewed. Certain aspects of the papers reviewed deal with the topic individually, however, there still remains a gap in literature that focuses on both public external debt and infrastructure investment. The studies illustrate a more negative relationship between external debt and investment, and it is likely to be the outcome in this research.

2.5 Gaps in Literature

Literature that addresses the relationship of external debt with economic development is more frequently documented than between external debt with infrastructure (Aschuer, 1989; Munnell,1990; World Bank, 1994; Calderon & Serven, 2003; Estache, 2006; Sahoo & Dash, 2008). For instance, empirical research findings indicate a negative impact of external debt on economic growth in Sub-Saharan Africa (Senadza et al., 2017). Presbitero (2012) had earlier raised this argument and further emphasised the negative impact when the debt, as a percentage of GDP, is 90% and higher. Reinhart and Roggoff (2010) make an interesting argument that high domestic debt can result in countries defaulting or restructuring debt despite low external debt levels. In the study on Malawi however, Tchereni et al. (2013) find that the relationship between economic growth and foreign debt is statistically insignificant. Literature is yet to adequately explore the direct relationship between external public debt and infrastructure investment. The next chapter discusses how this study sought to explore this relationship by highlighting the research methodology adopted.

Chapter 3: Data and Research Methodology

3.1. Introduction

This chapter focuses on defining the hypothesis, assessing the model used to measure the relationship between external debt and infrastructure investment, and the statistical techniques applied to the data. This chapter also assesses the data collected and utilised to derive the econometric results produced in chapter 4.

3.1.1. Hypothesis

The hypothesis test addressed the primary research question which is*: Does external public debt have a direct impact on infrastructure investment?* The significance was tested by analysing the significance of the relationship between the dependent variables and the independent variables.

i. H_0: There is a no significant relationship between higher external public debt and infrastructure investment; and

ii. H_a: There is significant relationship between higher external public debt and infrastructure investment

3.1.2. Model to Measure Infrastructure Investment and external debt

A linear relationship was explored in relation to infrastructure investment and external debt. An Ordinary Linear Regression Model (OLS) was conducted in testing for stationarity. The purpose of this model was to assess how the changes of one variable (the dependent variable) affects the changes of a related variable (the independent variable). The coefficients quantify the impact of the changes that the independent variable has on the changes to the coefficient of the dependent variable (Brooks, 2019). Econometrically, the OLS model is represented as follows:

$$y_{it} = \alpha + \beta x_{it} + u_{it}$$

Where the dependent variable is y_{it}, the intercept is α and the coefficient β measures the parameters that are estimated whilst the independent variables are represented by x_{it}, which are the explanatory variables , t = 1,…, T: I = 1,…., N^2((Brooks, 2019).

The linear regression model is expressed as an equation:

$$GFC_{it} = rGDP_{it} + RIR_{it} + REER_{it} + CPI_{it} + ED_{it} + Trade_{it} + Pop_{it} + ODA_{it} + PolStab_{it} + GNS_{it}$$

Where

GFC_{it} = Gross Fixed Capital,
$rGDP_{it}$ = Real GDP,
RIR_{it} = Real Interest Rate,
$REER_{it}$ = Real Effective Exchange Rate,
CPI_{it} = Consumer Price Index,
ED_{it} = External Debt,
$Trade_{it}$ = Trade Openness
Pop_{it} = Population
ODA_{it} = Official Development Assistance.
$PolStab_{it}$ = Political Stability and Absence of Violence/Terrorism: Estimate
GNS_{it} = Gross National Savings

3.2. Econometric tools and Statistical techniques

The panel data was secondary data, which was sourced from the World Bank, OECD. and IMF databases, which are reliable, consistent, and reputable data sources due to the application of international standards and norms (World Bank, n.d.). The data is from the years 2004 – 2019 and the variables selected for the model are variables that have an impact on decision making towards investing in infrastructure. Panel data analysis is suitable due to its ability to observe

both time series, which is over a long period of time and cross-sectional data which is the different variables included in the model (Brooks, 2019). The data benefits the study in viewing the impact of the various variables over time.

3.2.1. Unit Root Test

Unit root testing for stationarity was conducted on the data using the Augmented Dickey Fuller (ADF) test which was pioneered by Dickey and Fuller and is important for data to be stationary as this has an influence on how the data behaves over time (Wolters et al., 2005). Should this data be used in a regression model, this may result in spurious regressions. In other words, the results may appear to be good, for example, the coefficient estimates may appear to be significant, however there would be no overall value of the output (Brooks, 2019). To test for Unit Root is to determine the null and alternative hypothesis. The null hypothesis is represented as:

$$y_t = \emptyset y_{t-1} + u_t$$

Where $\emptyset = 1$ which means the data contains a unit root and the alternative hypothesis is $\emptyset<1$ and where the data is stationary.

3.2.2. Granger Causality test

To determine whether there is causality, the test for Granger causality test is conducted (Granger, 1969). In other words, how much of the dependent variable is explained by its past or lagged value and whether the lagged independent variables can explain the impact on the dependent variable (Granger, 1969). The test determines whether the past value of a variable has an impact on the present value where the null hypothesis assumes that there is no causality and is expressed as

$H_0: \beta_{i1} = \cdots = \beta_{iK} = 0$ $\forall$ i = 1,...,N

The alternative hypothesis $H_1: \beta_{i1} = \cdots = \beta_{ik} = 0$ $\forall_i + 1, \ldots, N_1$

$\beta_{i1} \neq 0$ or … or $\beta_{iK} \neq 0$ $\forall_i = N_1 + 1, \ldots, N$

Where $N_1 = 0$ indicates causality for all the panel data. If N_1 is greater than N then there is no causality and we accept the null hypothesis, however if N_1 is smaller, we accept the alternate hypothesis (Lopaz & Weber, 2017).

3.2.3. Cointegration tests

A spurious regression can result from a regression between non-stationary time series. The signs that can be detected include very high t-statistics, high R^2, low Durbin Watson statistics and non-stationary residuals. A cointegration test therefore assists in avoiding spurious regression results that cannot be interpreted economically despite being significant (Newbold & Granger, 1974).

3.3. Data Analysis

3.3.1. The Sample

The sample for this study was selected based on the topic of the report which looks into external debt capacity and infrastructure investment in the Southern African Development Community (SADC). The data is a cross-sectional dataset organised by 16 countries in the SADC Region.

SADC is made up of countries which include Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Malawi, Madagascar, Mauritius, Mozambique, Namibia, South Africa, Seychelles, Tanzania, Zambia, and Zimbabwe. The sample assisted in achieving the analysis required to answer the questions and address the objectives in the report. Data availability for certain variables in certain countries was lacking. The gaps in this data have been replaced with zero. The variables and sources of data collected are explained in the table that follows:

Variables	Units	Description	Source
Gross Fixed Capital Formation (GFC)	% of GDP	A proxy variable for Infrastructure investment. Includes land improvements, plant, machinery, and equipment as well as infrastructure such as railways and roads.	World Development Indicators
Gross Domestic Product, Real, Percent change, Previous period, Percent (rGDP)	%	Gross Domestic Product measures the total value of final goods and services at constant prices. These are goods and services produced in a country over a particular period of time.	International Monetary Fund, World Economic Outlook Database
Consumer Price Index (CPI)	Index	Inflation has an impact on the purchasing power of funds and therefore the government budget, especially when having to service debt that is in another currency.	International Monetary Fund, Regional Economic Outlook Database
Exchange Rates, Real Effective Exchange Rate, based on Consumer Price Index (REER)	Index	The exchange rate plays a key role in servicing external debt by virtue of the debt not being in domestic currency. A country that can take out a foreign loan should be receiving trade revenue and have sufficient foreign reserves to service the loan	International Monetary Fund, Regional Economic Outlook Database
Net Official Development Assistance received (ODA)	% of GNI	Net official development assistance (ODA) is comprised of loans that have disbursed and concluded on concessional terms. This includes grants and is net of principal repayments. These grants are received from multilateral institutions, Development Assistance Committee (DAC) members and non DAC countries.	Organisation for Economic Co-operation & Development (OECD)
Real Interest Rate (RIR)	%	The real interest rate is the inflation adjusted lending rates of the country as a borrower. However, due to the differing lending rates in each country, this variable may not be easy to compare with others.	World Development Indicators

External Debt stocks (ED)	% of GNI	External debt stock is the total owed to non-residents and includes public, publicly guaranteed, and private non-guaranteed long-term debt. This also includes IMF credit and short-term debt - all repayable in currency, goods or services.	IMF, World Development Indicators
Trade	% of GDP	Trade is a proxy for trade openness. Trade is the total imports and exports of goods and services in a country.	World Development Indicators
Political Stability and Absence of Violence/Terrorism: Estimate	Index	An aggregate indicator in unit of standard normal distribution that measures the likelihood of terrorism, violence motivated by politics and the overall likelihood that a country may experience political instability.	World Development Indicators
Population growth	annual %	Percentage annual growth rate for year t and includes all residents taking into account the legal status and citizenship.	World Development Indicators – United Nations Population Division
Gross national savings	% of GDP	Gross national savings is the difference between final consumption expenditure and gross disposable income and factors in pension fund adjustments. Gross national savings and GDP are expressed in local currency.	World Development Indicators

The empirical analysis of the data was conducted in the following manner: The infrastructure investment is the dependent variable and is represented by Gross Fixed Capital Formation as a proxy which is the public investment made by government towards infrastructure (Han et al.,2020). To analyse the impact on infrastructure investment, the independent variables included are, namely, external debt represented by external debt stock, as well as variables that impact the decision making for countries to borrow money which includes real GDP, inflation, interest rates, official development assistance where studies have shown, for instance, how countries have benefitted, particularly in receiving

access to water and sanitation (Botting et al., 2010), governance, trade openness which impacts positively on economic growth on condition that, for instance, the quality of infrastructure is high Olarreaga, 2016) and population growth which has the potential to negatively impact infrastructure, especially when no legal and regulatory framework is in place (Asoka, Thuo, & Bunyasi, 2013). The political changes in a country, such as a change in leadership, may negatively impact on infrastructure investment, especially when there are disputes. This can also dampen the appetite of private financing towards infrastructure (OECD/ACET, 2020). The variables above help determine the objective of the report which are discussed in chapter 4.

Chapter 4: Analysis and Results

This chapter summarises the results from the econometric tests conducted on the data. They demonstrate the relationship between the dependent variable and the independent variables to determine their impact on infrastructure investment. The chapter is outlined as follows: 4.1. an analysis of descriptive statistics, 4.2. a unit root test analysis to determine stationarity. This is followed by 4.3. Granger causality test and 4.4. a cointegration test. Finally, results from the regression model are discussed.

4.1. Descriptive Statistics

The descriptive statistics in table 1 demonstrate that the maximum values of infrastructure development is 53.99 which is an indication of higher infrastructure development than the mean of 23.6. The countries that fall into this category include Botswana, Mozambique, Tanzania, and Zambia where the mean GFC is above 32. Interestingly, only Mozambique, Tanzania and Zambia have a high mean of 5% and above of real GDP within this category. This may suggest that higher economic growth does not always indicate a higher level of infrastructure investment. Furthermore, only Mozambique and Zambia demonstrate high levels of external debt, breaching the SADC threshold of 65%.

Table 1: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	# of Obs.
GFC	23.66	22.14	53.99	2.00	9.80	256
rGDP	4.26	4.34	19.68	-16.32	3.79	256
RIR	9.64	7.28	52.44	-17.16	10.71	256
ED	31.40	25.73	146.67	0.00	29.42	256
ODA	5.82	4.23	25.08	0.06	5.77	256
PolStab	-0.09	-0.10	1.20	-2.39	0.80	256
POP	1.99	2.24	3.71	-2.63	1.10	256
REER	92.00	97.16	156.35	0.00	27.54	256
TRADE	82.59	76.84	225.02	0.00	44.51	256
GGD	44.82	38.24	192.10	5.51	29.19	256
CPI	266.20	101.49	5176.79	18.11	656.88	256
GNS	18.74	17.25	47.65	-21.46	12.51	256

4.2. Panel unit root test

The results of the Levin, Lin and Chu Test at level with constant, demonstrate that the independent variables are all insignificant therefore we accept the null hypothesis that the data has unit root. The variables are stationary at 5% level with first difference. All independent variables are significant and therefore we reject the null hypothesis at first difference as all variables are stationery. The model method conducted takes into account the robustness of the data at first difference I(1).

Table 2: Levin, Lin & Chu Test

	Level		First difference	
GFC	-2.05	**	-10.62	***
ED	-2.66	***	-6.67	***
rGDP	-5.01	***	-14.83	***
POP	-4.59	***	-8.33	***
PolStab	-3.46	***	-10.81	***
REER	-4.25	***	-9.39	***
RIR	-6.11	***	-17.48	***
Trade	-2.46	***	-9.36	***
CPI	3.07		-4.97	***
ODA	-7.68	***	-27.97	***
GGD	-0.09		-10.99	***
GNS	-1.95	**	-13.75	***

Source: E-views generated results, where ***,**,* represents the rejection of the null hypothesis at 1%,5% and 10% level of significance respectively.

4.3. Granger Causality

The Granger causality test was conducted on the data in table 3 to determine whether there is a two-way causation between the dependent and independent variables. The test assumes data to be stationery, thus the differenced data was used to produce the results. The results demonstrate that there is a unidirectional causation for all variables. GFC Granger causes ODA due to the probability being less than 5%. The outcome supports the objective of how

countries receive ODA for the purpose of infrastructure, amongst other government objectives. ODA is comprised of 25% of the total aid that is non-refundable and includes non-concessional loans. In the case of Vietnam, for example, development investment in key sectors was enhanced by ODA as an external source of capital (Tien, 2020).

Table 3: Granger Causality Test results

Null Hypothesis:	Lags	Obs	F-Statistic	Prob.
GFC does not Granger Cause ODA	3	192	3.41	0.02
GFC does not Granger Cause REER	3	192	3.14	0.03
GFC does not Granger Cause RIR	3	192	3.78	0.01
GFC does not Granger Cause PSTAB	4	176	2.51	0.04
GGD does not Granger Cause GFC	5	160	2.50	0.03
GFC does not Granger Cause CPI	6	144	6.14	0.00
GFC does not Granger Cause ED	7	128	3.88	0.00
CPI does not Granger Cause GFC	7	128	1.82	0.09
TRADE does not Granger Cause GFC	8	112	2.45	0.02

GFC Granger causes REER as the development of infrastructure, such as increasing power generation and distribution in a country, or building rail infrastructure enables a country to be more competitive through international trade. The high demand of goods and services causes the exchange rate to appreciate and a country to import goods more affordably and export expensively.

The same can be said regarding real interest rates. The cost of infrastructure investment is the debt service costs that are derived from interest rates. These costs are incurred due to the need for governments to address the infrastructure deficit through the issuance of government bonds. Ultimately, investors use these interest rates as a benchmark of how to price for investment assets (Asian Development Bank Institute and Keio University, 2020).

Interestingly, in the case of GFC causing political stability, a country advancing in its economy and having political stability provides a support for the development of infrastructure. The impact of political stability on infrastructure project investment was analysed and results demonstrate that Tunisia, from a sample of five countries that represent

the Northern and Southern African region, had a lower level of political stability and higher trend of infrastructure development (Damijan & Padilla, 2014).

GFC Granger causes ED demonstrated by countries increasing external debt for the purpose of funding infrastructure, as argued in the literature review of this paper. The relationship is aligned to GGD causing GFC as gross debt allows for countries to prioritise for infrastructure and improved service delivery from existing infrastructure. A paper argues that infrastructure-led development can assist in reducing inflationary pressure and demonstrated such in Saudi Arabia (Looney, 1990).

International trade can prompt investment in infrastructure which facilitates economic development and stimulates higher levels of trade. This is especially true when the initial infrastructure condition of a country is poor, the focus should then be more domestically rather than internationally to improve the domestic condition (Olareaga, 2016).

The results also mean that there is no two-way causality between GFC and POP, GNS and rGDP despite certain research arguing otherwise.

4.4. Panel Cointegration

The outcome of the unit root test confirmed the data to be non-stationary at I(0) at level and stationary at I(1) or in first difference. Therefore, the precondition is that the data is non-stationary at level and that after converting at first difference, the data is stationary. To determine whether a long run equilibrium relationship exists, a panel cointegration test was conducted. A Kao Residual Cointegration Test was conducted at level from 2004 to 2019 with a sample size of 256. The trend assumption is no deterministic trend. The null hypothesis for the test is no cointegration and the alternative hypothesis is that there is cointegration. The outcome of the results in table 4 demonstrate that for all, the outcome is to reject the null hypothesis due to the probability being significant at 0%.

Table 4: Kao Residual Cointegration Test

	t-Statistic	Prob.
ADF	-4.1096	0.0000
Augmented Dickey-Fuller Test Equation		15.30393
HAC variance		12.33178

Sample (adjusted): 2007 2019
Included observations: 208 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.5913	0.0708	-8.3572	0.0000
D(RESID(-1))	0.2042	0.0724	2.8207	0.0053
D(RESID(-2))	0.2307	0.0680	3.3907	0.0008

R-squared	0.2672	Mean dependent var	0.1310
Adjusted R-squared	0.2601	S.D. dependent var	4.3536
S.E. of regression	3.7449	Akaike info criterion	5.4930
Sum squared resid	2875.0230	Schwarz criterion	5.5411
Log likelihood	-568.2721	Hannan-Quinn criteria.	5.5125
Durbin-Watson stat	2.0794		

4.5. Model Results

The variables are stationary at first difference and cointegrated, therefore a multiple regression model with logged transformed independent variables was used to determine the long run relationship. The results of the model in table 5 indicate that independent variables account for 59% of the impact on GFC and the adjusted R squared confirms that this model is a good fit at 54%. Secondly, the probability value (F statistic) of the model is significant.

However, the Durbin Watson is at 0.81 which is less than 2, meaning there is autocorrelation in the data. This therefore means that most of the independent variables significantly explain the Gross Fixed Effects under the OLS model. Population is significant at 1% level and has a positive relationship with GFC. A 1% increase in population results in 2.36% increase in GFC and confirms the expected relationship. ODA has a 5% significant and positive relationship with GFC, which is supported by Miyamoto and Chiofalo (2016), who indicate that part of official development assistance, forming part of official development finance, has contributed towards the increase of infrastructure. In 2014, the support received from development partners towards infrastructure amounted to USD60 billion (Miyamoto & Chiofalo, 2016).

Table 5: Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRGDP	0.3771	0.9286	0.4061	0.6856
LRIR	-0.7066	0.7803	-0.9055	0.3677
LREER	7.9933	4.5687	1.7496	0.0837
LPOP	2.3604	0.6684	3.5316	0.0007
LODA	1.2886	0.5712	2.2559	0.0266
LPOLSTAB	1.3006	0.5891	2.2077	0.0299
LGNS	6.8095	1.2739	5.3454	0.0000
LGGD	5.4744	1.0015	5.4665	0.0000
LED	0.1302	0.1374	0.9477	0.3459
LCPI	5.2676	1.2739	4.1349	0.0001
LTRADE	0.1486	0.1931	0.7696	0.4436
C	-73.0399	23.0207	-3.1728	0.0021

R-squared	0.5947	Mean dependent var	27.1452
Adjusted R-squared	0.5435	S.D. dependent var	7.4941
S.E. of regression	5.0634	Akaike info criterion	6.1952
Sum squared resid	2230.5460	Schwarz criterion	6.5097

Log likelihood	-294.6616	Hannan-Quinn criteria.	6.3225
F-statistic	11.6063	Durbin-Watson stat	0.8198
Prob(F-statistic)	0		

PolStab has a positive and significant relationship with GFC which confirms that the political environment in a country and rate of population growth has a large influence in determining how a country will invest more towards infrastructure. GNS and GGD are significant at 1% level, meaning the national savings of a country and the government debt are key sources towards infrastructure investment and should ideally be explored prior to considering external debt.

CPI has a positive relationship with GFC, implying that infrastructure can be an enabler of price stability. Inflation can also be viewed as protection for investors as an infrastructure asset class (First State Investments, 2018). Interestingly, ED and TRADE are not significant despite literature supporting the significant impact these variables have on infrastructure.

Chapter 5: Discussion and Conclusion

This study aimed to determine the impact of the debt capacity of countries in the SADC region on infrastructure investment. This study also looked at macro-economic variables that could impact infrastructure investment and whether there is a significant statistical relationship between them and infrastructure investment. This study further aimed to achieve the following objectives:

I. To assess the degree of external indebtedness compared to gross government debt across SADC countries

II. To determine the level of external indebtedness of SADC countries against the SADC regional convergence target;

III. To determine how external public debt affects public sector infrastructure investment in SADC countries

The results in table 5 were determined by categorising the SADC countries into four main groupings, namely, Group - 1 which is those having the advantage of being recipients of the HIPC and MDRI Initiatives, Group 2 - being countries that had a reliance on external debt, Group 3 - are those that depended on their domestic capital markets, and lastly, Group 4 - being those that had a significant debt burden or were under debt distress.

Objective one sought to see the level of indebtedness compared to gross government debt over the period of 2004 – 2019. In Group 1, the DRC, Madagascar, and Malawi managed external debt levels below GGD and for Mozambique, Zambia and Tanzania external debt exceeded GGD at various points in years. Overall external debt dominated in all countries which supports the reason why the countries qualified for a HIPC and MIDR programme. Two countries did not seem to have benefitted in the long run as debt levels began to increase which are Mozambique and Zambia. In Group 2, except for Angola, all countries maintained low levels of external debt compared to GGD. This may be as a result of implementing a

strategic debt management strategy that ensures a sustainable level of external debt. For Group 3, only South Africa includes external debt data which were on average 40% of total public debt therefore, countries that rely on domestic debt seem to also be able to maintain lower external debt levels due to their reliance on domestic debt markets. In Group 4, Zimbabwe's external debt levels have consistently been higher, reaching a high of 146.67% in 2008 and averaging 60% within the observed time period. As a country within the debt overhang group, a high external debt level would be expected. The various outcomes of objective one may imply that relying on domestic debt may be the better approach for countries when investing in infrastructure, however this will limit many countries due to the under-developed domestic market. Efforts may need to be directed towards developing deep domestic markets.

For objective two, except for the DRC, the countries that benefitted from the HIPC MIDR programme managed to progressively reduce debt levels until 2013, debt levels were also below 60% between 2010 and 2013. From 2014, debt levels began to increase which demonstrates that countries that have been forgiven, do not necessarily sustainably maintain reduced debt levels. External dependent countries maintained debt levels below 60%. Angola maintained debt levels below 60% until 2016 where GGD breached the threshold, however, external debt remained within the threshold. External debt for these countries followed the same trend as the GGD but remained lower on average. This may mean that countries with a debt management strategy, to rely on external debt should have the right tools in managing external debt.

The domestic dependent countries that were observed included South Africa, Mauritius, and Namibia. Whilst there is outstanding external debt data on Mauritius and Namibia, we are still able to see the trend of debt over the observed years. South African and Namibia did not breach the SADC Threshold and Mauritius breached from 2015. South Africa's external debt has reached equal levels to GGD in 2017 which means that as a domestic dependent country, it has increasingly relied more on external debt which brings its own challenges. This could be as a result of a constrained domestic capital market where countries are required to diversify their source of funding. Countries experiencing a debt overhang

breached the threshold from the beginning of the period. Seychelles has no external debt data, but the GGD breached between 2004 and 2016. Zimbabwe has higher external debt than GGD and breached between 2004 and 2011 and again in 2016 and 2017. Zambia breached in 2004 and 2015 but seemed to manage debt levels until 2015 to 2019 where external debt was as high as 120%. Zambia and Zimbabwe continue to struggle in managing debt levels and have defaulted on some commitments in recent years.

The Debt Overhang theory argues that a country that already has high external debt cannot further increase debt. Therefore, a creditor has two options, to either lend to the country with the knowledge that they may not receive debt repayment or may have to forgive debt (Krugman, 1988). However, high debt has a negative effect on economic performance, which can be further explained as disincentive effects as it reduces investment. This is "taxed" by foreign creditors and creates uncertainty on the ability of a country to repay debt from its own resources after receiving debt relief (Arnone, Bandiera & Presbitero, 2005). Secondly, the liquidity is enhanced when debt can be reduced from debt relief, increasing the level of investment and the access to international financial markets (Arnone, Bandiera & Presbitero, 2005). Lastly, introducing conditionality in the rescheduling of debt prevents a moral hazard where countries take advantage of the willingness of creditors to forgive future debt when repayment may be unlikely (Arnone, Bandiera & Presbitero, 2005).

Objective three determined the impact and relationship of external debt to infrastructure investment through a multiple regression. The results did not demonstrate a significant statistical relationship between the two variables and seemed to suggest that external debt becomes more significant when combined and assessed together with domestic debt or as part of gross government debt. In other words, countries determine to invest towards infrastructure after taking into account the total debt stock and the capacity to increase either domestic or external debt. The sources of funding which include national savings and ODA are also key in determining infrastructure and most probably, the level of external debt to undertake. Other factors that need to be considered when investing in infrastructure are political stability and population growth. The political stability supports the lower probability that infrastructure may be destroyed as a result of violent protests and also

considers the governance of a country. As indicated in the literature review, population growth determines the demand for infrastructure and the results seem to support literature. Furthermore, inflation has a significant impact on infrastructure investment. A stable inflation environment strengthens the predictability of the infrastructure costs.

Based on the above findings, further work is required in determining the impact of external debt on infrastructure investment and this remains an area to be further explored. The research does however contribute towards literature and could assist policy makers in determining the key factors to consider when investing in infrastructure as well as the sustainable level of external debt to be considered to avoid debt distress.

The major limitation experienced in this study relates to the availability of external debt data for countries, such as, Namibia, Seychelles, and Mauritius. This limits the study in getting a better view of the debt situation in the SADC region. The areas of future studies required should continue to focus on the relationship between public debt (whether total debt, external debt, or domestic debt) and infrastructure investment. There remains a gap in this area of research which can significantly assist in informing countries on which funding is best for infrastructure without increasing a burden on the government budget.

Chapter 6: References

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