

**PUBLIC DEBT SERVICING AND ECONOMIC GROWTH; AN EMPIRICAL
ANALYSIS FOR ZAMBIA, 1990 - 2019.**

By

Milambo Chanda

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requirements of the degree of Master of Arts in Economics.

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DECLARATION

I, **MILAMBO CHANDA**, do hereby solemnly declare that this dissertation represents my own original work, except where otherwise acknowledged, and that it has never been previously submitted for a degree at the University of Zambia or any other university.

Signature:

Date:

CERTIFICATE OF APPROVAL

This dissertation of **MILAMBO CHANDA** has been approved as fulfilling the partial fulfilment of the requirements for the award of the degree of Master of Arts Economics by the University of Zambia.

Supervisor's Signature:

Date:

Examiners signatures

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ABSTRACT

Zambia has over the years relied on both internal and external sources of financing to meet budget deficits. As a result the country has amassed huge amounts of domestic and external public debt. Zambia has outstanding Eurobonds that will be coming due in 2024 and it recently defaulted its debt servicing requirement to bondholders in 2022 attributing its failure to meet payments partly because of the COVID pandemic and the impact it has had on the Zambian economy. The implication of having outstanding debt requirements for which a country is unable to service are crowding out of investments, debt overhang and reduced credit rating among others. This study aimed at analyzing the effect of public debt servicing on economic growth by detangling the effects into public domestic debt servicing, public external debt servicing, and finally looking at the total effect of public debt servicing.

The study used annual time series data from the period 1990-2019. Real GDP was used as the dependent variable while the independent variables were physical capital, labor, human capital, trade openness and debt servicing. Three models were specified to examine three objectives; model 1 investigated the effect of public domestic debt servicing on economic growth. Model 2 analyzed the public external debt servicing and economic growth relationship. While model 3 examined the effect of total public debt servicing on economic growth. An ARDL model was used to determine the short run and long run relationship between public debt servicing and economic growth.

The findings of the study suggest that there exists a negative relationship between public domestic debt servicing and economic growth in both the short run and long run in Zambia. It also concludes that there exists a negative relationship between public external debt servicing and economic growth in the short run and long run. For the total effect, the study found a negative and significant relationship in the long run while in the short run the relationship was positive but insignificant.

The Zambian government should adopt prudent policies with better repayment plans when borrowing from external sources. This study further recommends that policy makers need to ensure that borrowed funds are directed towards investments that contribute to economic growth.

DEDICATION

This work is dedicated to my husband Mr. Chola Kaungu who encouraged me to be persistent and supported me. I also dedicate this work to my daughter Amelia Kaungu, may this work be an encouragement to you in future.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AFDB	African Development Bank
ARDL	Auto Regressive Distributed Lag
BOZ	Bank of Zambia
CATEC	China National Aero –Technology Import and Export Corporation
CSO	Central Statistical office
CUTS	Consumer Unity and Trust Society
EU	European Union
FISP	Farmer Input Support Programme
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
IDA	International Development Agency
IMF	International Monetary Fund
IV	Instrumental Variable
OPEC	Organization of the Petroleum Exporting Countries
OSSREA	Organization for Social Science Research for Southern and Eastern Africa
SADC	Southern African Development Community
SIDA	Swedish International Development Agency
TAZARA	Tanzania Zambia Railway Authority
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme

UNECA	United Nations Economic Commission for Africa
VAR	Vector Auto Regression
VECM	Vector Error correction Model.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents the background of the study, the statement of the problem and outlines the objectives of the study. It states the research questions that the study answers and hypothesizes the expected outcomes of the study. The chapter further reflects on the significance and highlights the limitations of the study.

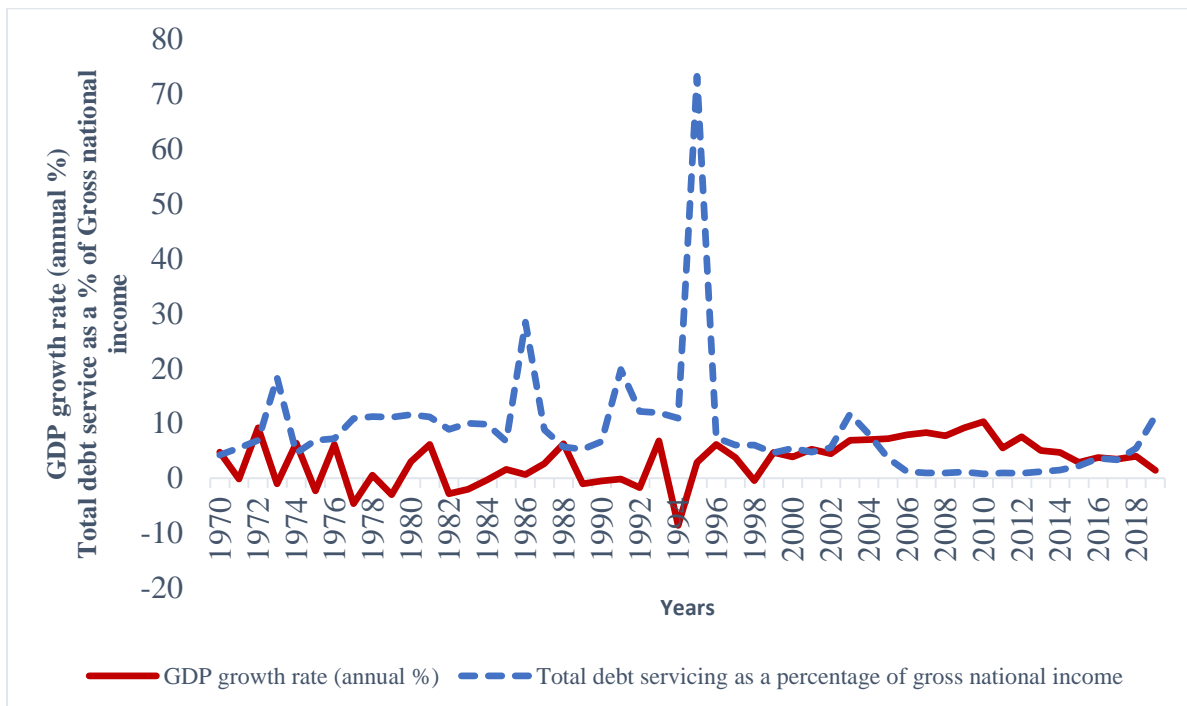
1.1 Background of the Study

Post-independence Zambia focused on industrialization and economic growth as priorities for stimulating economic growth. (UNDP, 2016; UNECA, 2016). With these objectives, a series of political, financial, social, and economic reforms were put in place with the aim of increasing investment flows, ensuring efficient utilization of domestic resources, increased export volumes, and finding sustainable ways of reducing domestic and foreign public debts (Fraser & Larmer, 2010). However, the nationalization programme of the late 1960's significantly increased government expenditures, thereby deteriorating the financial position of the state (Anderson et al., 2000).

In the early 1970's the Zambian economy experienced huge public sector investments, during the same period exogenous factors such as the fall in world market prices of unrefined copper, and the global oil shocks of 1973 and 1978, increased the cost of imports and weakened the country's terms of trade (Langmead et al., 2006; Chongo, 2013). Consequentially leading to extensive balance of payment problems and unsustainable budget deficits (UNCTAD, 2012). According to UNDP (2006) Zambia entered into a loan agreement with the World Bank in 1973, mainly to avoid risks from the oil price shock.

The Zambian government perceived these adverse developments in the economy to be temporal, as such high levels of consumption and capital expenditures were maintained and budget deficits were financed through local and foreign borrowing (Fraser & Larmer, 2010). The mid-1970s saw infrastructural development projects such as the opening up of the Tanzania-Zambia corridor which contributed towards accelerating the depletion of the state's foreign reserves as government opted for debt financing instead of driving down capital costs (UNCTAD, 2011).

Figure 1.1 Zambia's Economic growth and Total Debt servicing as a percentage of gross national income.



During the period 1980-2004 total public debt servicing to gross national income on average exceeded the economic growth rate. The country was unable to repay its debt thus there was continuous accumulation of debt and the debt service burden was rising (IMF, 2005). After the 2005 multinational debt relief and highly indebted poor country initiative when most of the debt was pardoned, Zambia’s debt profile changed from being a severely indebted poor country to a moderately indebted country (Sun, 2004; Chirwa and Odhiambo, 2017). The period 2005-2015 saw Zambia’s public debt servicing as a percentage of gross national income remain stable at low levels as a result of the debt relief from the IMF, the World Bank, African Development Bank (AFDB) and the Paris Club (CSO, 2017). During the same period the economy grew at an annual average rate of 7.4 percent (World Bank, 2018).

After 2011, the government adopted an expansionary fiscal policy. It invested heavily in infrastructure, wages and subsidies thus spending beyond its resource capacity (Whitworth, 2015). Furthermore, total public debt as a percentage of GDP increased to 60% in 2016 from 20% in 2011(IMF, 2017).

In 2017, public domestic debt (government securities) accounted for 18 percent of GDP, external public debt represented 29 percent of GDP and total public debt was 47 percent of GDP (MOF, 2018). By 2018, fiscal deficits stood at 7.6 percent of GDP (World Bank, 2019).

Further, public external debt service was ZMW 7.2 billion and domestic debt servicing ZMW 6.9 billion (MOF, 2018). In 2019, fiscal deficits increased to 8.2 percent of GDP, external debt service increased to ZMW14.9 billion and domestic debt service increased to ZMW 8.6 billion (MOF, 2019). This is an indication that over the year's public debt and its servicing has been growing and has remained a challenge to economic growth.

Additionally, the 2019 WB/IMF debt sustainability analysis concluded that Zambia's risk of overall and external debt distress remains very high and that public debt under the current policies is on an unsustainable path. Zambia's debt repayment structure leaves much to be desired as the first two Eurobonds involve lump sum payments at maturity, this coupled with the current interest payments, low foreign reserves and absence of sinking funds poses risk of possible default (Kalikeka et al 2019). Moreover, Zambia recently defaulted its debt servicing requirement to bondholders during the first half of 2022 attributing its failure to meet payments partly because of the COVID pandemic and the impact it has had on the Zambian economy.

1.2 Statement of the Problem

The Public debt servicing and economic growth relationship in Zambia bears a major importance to the economic prospects of the Country. There has been a rising trend in public debt in Zambia, this can be attributed to the continuous borrowing by government from both external and internal sources to finance budget deficits thus creating the need to service the debt.

More specifically, for the period 1990- 1998, the Zambian government in their national budget spent more than their revenues, thus to meet these deficits the government borrowed from both external and internal sources (IMF, 1999). During the same period interest payments on both domestic and foreign debt more than doubled in the subsequent fiscal years (IMF, 1999). Particularly, in 1990, budget allocations towards interest payments on public debt were ZMW 8.8 million and increased to ZMW 18.4 million in 1991 while expenditures on education increased from ZMW 2.4 million to ZMW 6.4 million in 1990 and 1991 respectively (IMF,1999). An indication that a larger fraction of the national budget was spent towards debt servicing obligations compared to social services such as education in this case. This was the trend until 1998 where interest payments on public debt were ZMW 4.2 billion while expenditure on education was ZMW 1.4 billion IMF (1999). Average annual GDP growth rate fell from 1.5 percent in the 1980s and to 0.3 percent in the 1990's (Kemp, A D., et al, 2011).

The Period 2000-2010 saw Zambia achieve macroeconomic stability and registered real GDP growth averaging 7.7 percent per year. It was during this period that Zambia's actual external debt service obligations reduced from US\$ 370.9 million in 2004 to US\$ 156.5 million in 2005 after reaching the completion point and receiving debt relief worth US\$ 224.7 million from IMF (BOZ, 2005).

Post HIPC, the country continued to borrow to meet budget deficits. During the period between 2012 and 2015 Zambia issued three Eurobonds from the financial markets. By 2016 Zambia's public debt stood at ZMW 160 billion. To cover for shortfalls between revenues and expenditures Zambia also borrowed from government securities (Muleya, F.B, 2021). In 2016, Zambia's national budget grew in absolute terms by ZMW 6.47 billion, however the increase did not benefit the main sectors of the budget equally. General services was one of the sectors whose allocation increased but as a result of this increase other sectors such as the social sector, economic affairs and defense had their allocations reduced . Furthermore, 25 percent of the increase in general public service was directed towards public debt servicing (UNICEF, 2016).

In 2017, Zambia's interest payments to service public debt accounted for 25 percent of the government revenues an equivalent of the 2017 total national budget allocations to health, social protection and farmer input support programs (CUTS, 2018). The amount allocated to debt servicing in 2019 also depicted that debt servicing alone is now consuming the majority of the national revenues at the expense of social spending, specifically, the total combined allocation towards health, education and social protection were ZMW 8.1 billion, ZMW 13.3 billion and ZMW 2.2 billion respectively. These allocations were equivalent to public debt servicing costs of ZMW 23. 6 billion (CUTS, 2018). Further, the country experienced low growth of 2 percent of GDP, had rising debt service obligations and low international reserves (Muleya, F.B, 2021).

The aforementioned background depicts a policy problem in Zambia's public debt servicing situation, the period 1990 to 2005 highlights the adverse effects of accumulation of debt to unsustainable levels. The country was classified as a highly indebted country with no capacity to repay its debt obligations. The recent upward and rapid debt trajectory between the period 2011 and 2019 bears a similarity to the debt situation that led the country to a HIPC classification. Additionally, it is argued that public debt, when properly managed, is meant to be a solution for most countries as it allows governments raise funds to grow their economy through productive investment projects (Kharusi and Ada 2018), however, in Zambia's case it

has become a burden as the country has continued to borrow beyond its capacity to payback, thus making it susceptible to some of the threats to the economy that come as a result of high public debt servicing such as debt overhang, crowding out of private investments, credit rationing and reduced credit rating among others (Fuso 2010; Akram, 2011). Further, the fraction of the budget directed towards debt repayment has increased over the years as a result of this accumulation, as such it has had a trickle-down effect on the Zambian economy as various budget allocations to social expenditure such as education has been reducing or growing at a slower rate compared to that of debt servicing. Thus Zambia is not precluded to the implications of huge debt service obligations and this creates a need for an empirical analysis of the impact of public debt servicing on economic growth.

Despite the concerns about Zambia's public debt service situation, few studies have examined its effect on economic growth in Zambia. Particularly, only two studies in the Zambian context by Saungweme and Ohdiambo (2019; 2020) have focused on the relationship between total public debt servicing and economic growth. Thus the public debt servicing and economic growth relationship for Zambia is not yet established in literature.

1.3 Objectives of the Study

The main objective of this study was to analyze the effect of public debt servicing on economic growth in Zambia. The specific objectives that guided this study were:

- i. To examine the effect of public domestic debt servicing on economic growth.
- ii. To examine the effect of public external debt servicing on economic growth.
- iii. To investigate the overall effect of total public debt servicing on economic growth.

1.4 Research Questions

The study answered the following questions.

- i. What is the effect of public domestic debt servicing on economic growth?
- ii. What effect does public external debt servicing have on economic growth?
- iii. What is the overall effect of total public debt servicing on economic growth?

1.5 Research hypothesis

Hypothesis 1

H_0 : Public domestic debt servicing has a negative effect on economic growth.

H_1 : Public domestic debt servicing has no effect economic growth.

Hypothesis 2

H_0 : Public external debt servicing has a negative effect on economic growth.

H_1 : Public external debt servicing has no effect on economic growth.

Hypothesis 3

H_0 : Total debt servicing has a negative effect on economic growth.

H_1 : Total debt servicing has no effect on economic growth.

1.6 Significance of the study

Focus by most studies on a global level in analyzing public debt servicing has been placed on examining the relationship between external public debt servicing and economic growth (Makau, 2008; Adesola, 2009; Wijeweera et al., 2007; Mera and Ryskulov, 2012). With the exception of few studies that have looked at either the impact of total public debt servicing on economic growth or public domestic debt servicing and its impact on economic growth (Sheikh et al., 2010; Mathew and Mordecai, 2016).

Empirical investigations in Zambia on public debt servicing have focused on the impact of total public debt servicing on economic growth rather than public domestic debt servicing or public external debt servicing (Saungweme and Ohdiamo (2019); Saungweme and Ohdiamo, 2020). The use of total debt servicing in these studies ignores the potential heterogeneous effect of domestic and external public debt service on growth. It is evident from literature that public domestic debt servicing and public external debt servicing have their individual negative repercussions on economic growth (Cordella et al., 2010; Blavy, 2006; Wijeweera et al 2007; Fonseka and Ranasinghe, 2007).

Therefore, this research deviates from these studies by detangling the individual effects of total public debt servicing, by analyzing the individual effects of public domestic debt servicing and public external debt servicing on economic growth. Doing so extends literature by separately identifying the threats to the economy associated with public debt servicing, this is useful in formulation of policies specifically meant to address the challenges arising from either public domestic debt servicing or public external debt servicing by building on past experiences and looking at what can be done differently to ensure improved economic growth.

Additionally, the study employs an extension of the Cunningham's (1993) production function model by Karagol (2002) which includes human capital as a factor of production, this raises

the effects on output due to changes in resources devoted to capital accumulation and is different from the models used in (Saungweme and Ohdiamo's (2019); Saungweme and Ohdiamo (2020)). It also focused on the period between 1990 and 2019.

1.7 Limitations of the study

The major limitation of this study was that of unavailability of data, particularly data on public debt servicing prior to 1990 was unavailable for some years this led to the limiting of the sample that was used in this study.

1.8 Organization of the study

This study follows a six-chapter arrangement. While the first chapter introduces the paper, chapter two gives the context of the study by looking public debt stock, public debt servicing and economic growth in Zambia. Chapter three reviews the theoretical and empirical literature on the public debt servicing-growth relationship. Chapter four discusses the methodology used in the study. This is followed by chapter five which analyses data and discusses the findings. Chapter six provides policy implications, recommendations and a conclusion of the study.

CHAPTER TWO

OVERVIEW OF THE ZAMBIAN ECONOMY

2.0 Overview

This chapter presented the Zambian economy and the various dynamics over the years relating to public debt, public debt servicing, economic growth, and other economic factors.

2.1 Zambia's Public Debt Stock, its servicing and Economic Growth

Zambia's public indebtedness can be traced back to the early 1970s, Post-independence the country was heavily dependent on the mining sector for revenue, employment and foreign exchange earnings (Andersson et al., 2000). The rise in the level of public debt, both domestic and external debt, is attributed to a number of factors which include declining terms of trade as a result of a fall in the price of export commodities (copper), poor gross investment levels, the need to finance the massive infrastructural development projects and a general lack of public sector financial discipline (Chongo, 2013; Saungweme and Odhiambo, 2018). Central government's revenues from mineral taxation and exports declined by 82.6% from ZMK339 million in 1974 to ZMW 59 million in 1975, and further to ZMW 12 million in 1976 (OSSREA, 2007).

Throughout the 1970's Zambia run a consistent budget deficit, public expenditures and net lending were sustained at high levels of about 30 percent of GDP (Gulhati, 1991). Consequently, the government resorted to finance its expenditures through borrowing. Between the period 1975 and 1984 Zambia's foreign public borrowing was at approximately US\$3.8 million (SADC, 2010). By 1986 Zambia's overall public debt was US\$ 5.7 million (Gulhati, 1991). Furthermore, the share of interest payments rose from 5 percent in 1975 to 41 percent in 1986 (Gulhati, 1991).

Zambia has gone through three debt cycles since 1990, the first period was considered as each year throughout the 1990's where the country spent more than 30 percent of the national budget on debt payments and where expenditures on basic services were roughly 10 percent of the national budget (Sachs et al., 1999). In 1990 Zambia's overall fiscal deficit to GDP ratio was 14.9 percent (Mungule, 2020). Furthermore, external debt stock as a percentage of GDP was 231 percent and the debt service ratio stood at 64.4 percent (Mungule, 2020). After Change of government in 1991, Zambia's inflation rate was over 90 percent and the government deficit reduced to 7.3 percent of GDP (Republic of Zambia, 1993 and IMF, 1999). Public expenditures

accounted for 60 percent of GDP (Gulhati, 1991). Furthermore, scheduled debt service was 61 percent of export earnings (IMF, 1999), and the high debt repayments had an adverse impact on factors that are key for social and economic development. Poverty alleviation, gross national savings, domestic interest rates and gross revenue performance of the central government had declined as a consequence of debt obligations (World Bank, 2017). Throughout the 1990's all the years registered negative GDP growth with the exception of 1996 and 1997 which had positive growth rates of 6.6 percent and 3.3 percent respectively (IMF, 1999).

Zambia experienced several structural adjustment programmes aimed at increasing levels and allocation of investment during the 1990's. However, there were poor responses to these reforms due to the risks associated with investments in Africa (Andersson et al., 2000). Additionally, the country experienced one of the worst cases of economic decline and buildup of foreign debt as most of the resources were directed towards restoring the external balance (Andersson et al., 2000).

The debt burden was a serious threat to the economy and led to the acceptance of the HIPC program. In 1996 the HIPC initiative was launched where the IMF and World Bank decided that debt servicing capacity was to be judged by comparing the net present value of the debt with the level of exports (Sachs et al., 1999). According to Bigsten et al (2004) the total debt service relief stood at 62.6 percent of the total outstanding debt at the end of 1999 after the use of debt relief mechanisms. By the end of 1999 Zambia had a total foreign debt of \$6.5 billion. Zambia received its first relief from World Bank, IMF and African Development Bank in 2001. This resulted in Zambia lowering its debt service costs.

In the year 2000, fiscal deficits accounted for 2 percent of GDP and the GDP growth rate grew from 3.5 percent in 2000 to 4.9 percent in 2001 (Kemp, A D., et al , 2011). However, the draught of 2002 dampened the economy and food prices began to rise and the GDP growth rate fell to 2.7 percent (Kemp, A D., et al, 2011). At the end of 2003 Zambia's external debt stock reached \$US 7 billion with the official creditors being IDA accounting for 34 percent of the total debt, while 56 percent, 43 percent and 1 percent was owed to multinational creditors, bilateral creditors and commercial creditors respectively (IMF, 2005: Zulu, 2003). The government tried to achieve the HIPC completion by freezing salaries and increasing the number of taxes in the 2004 austerity budget (IMF, 2005)

In 2004, Zambia recorded its sixth consecutive year of experiencing positive growth (BOZ, 2004), during this period the domestic budget recorded a deficit of 1.3 percent of GDP mainly

as a result of lower domestic revenues meant to meet higher domestic expenditures. By March 2005 the IMF and IDA delivered their interim assistance of debt relief worth US\$ 452 million and US\$ 98 million of the initial commitments worth US\$ 602 million and US\$ 488 million that were made respectively (IMF, 2005).

Zambia reached the HIPC completion point in April 2005 (Fraser, 2008). After which, Zambia received a HIPC grant assistance from IMF amounting to US\$ 224.7 million (BOZ, 2005). The actual debt service amounted to US \$156 million (BOZ, 2005). During the same year the overall budget recorded a deficit of 3.2 percent (BOZ, 2005).

By 2006, China was the highest non-Paris club creditor to Zambia with claims that stood at \$217 million (Ofstad and Tjønneland, 2019). Zambia's public debt declined rapidly after the country qualified for the debt relief under the HIPC and MDRI initiative, falling from 261 percent of GDP in 2000 to 25 percent in 2006 (Liebenthal and Cheelo, 2018), this then is what the study characterized as the second period- the debt relief period.

The debt accumulation period was the third period in the debt cycle, after the 2008 global economic crisis, the Zambian economy was impacted mainly through external trade as the buying price of copper declined from a high record of US\$8,985/Mt in July 2008 to a low of US\$2,811/Mt in December 2008 (MOF, 2010). Additionally, the kwacha had depreciated against the dollar by 27.3 percent by December 2008 and tax revenues as a proportion of GDP were 19.2 percent in 2009, which created challenges in financing development programmes (MOF, 2010 and MOF, 2009).

In 2010, Zambia experienced an increase in domestic and foreign borrowing to fund public sector investments aimed at transforming the country into a middle-income country by 2030 (MOF, 2010). The increase in borrowing was driven by road construction projects, large maize and fuel subsidies, and increased wage bills for public servants (Whitworth, 2012). Thus, to bridge the gap between revenues and unsustainable expenditures Zambia like other African countries turned to massive external borrowing on international capital markets at commercial rates (Pamela and Nalishebo, 2018). In 2012, Zambia raised US \$750 million, to be serviced at an interest rate of 8.6 percent and matured in 2022. The proceeds of this bond were planned to be directed towards promoting infrastructural projects such as energy, transport, human capital and access to finance among others (MOF, 2013). The excessive spending on these projects in the face of low revenues saw Zambia's fiscal deficits reach 6.7 percent of GDP in 2013 (Pamela and Nalishebo, 2018).

In the first half of 2014, the supply of foreign exchange to the market from the mining sector declined and the Zambian kwacha depreciated rapidly against other major currencies. Monetary policy tightening by the central bank stabilized the exchange rate although it came at a cost of a rise in interest rates thereby constraining access to credit (MOF, 2015). Furthermore, a surplus of \$486 million in the balance of payments was registered which was attributed to improvements in the current and financial accounts and translated into an increase in international reserves of US\$3.2 billion. The US \$1 billion Eurobond was issued in 2014 as part of planned financing for the 2014 budget and whose maturity is in April 2024 (MOF, 2014). Zambia's external public debt stood at 24 percent of GDP at the end of 2014 compared to 15 percent in 2011, this was largely due to issuance of Eurobonds in 2012 and 2014 (MOF, 2015). Domestic public debt increased from 12 percent to 17 percent during the same period, 93 percent of which represented treasury bills and bonds (IMF, 2015 and MOF, 2015). At the end of the year, the economy grew at an average of 4.7 percent.

In 2015, the third Eurobond was issued worth US \$1.25 billion and is to be settled in three installments over the period 2025-2027 (MOF, 2016; Kalikeka et al 2019). After issuance of the last Eurobond Zambia's total Eurobond debt stood at 3 billion USD in arrears at commercial rates (Ofstad and Tjønneland, 2019). The World Bank (2017) noted that the resources from these Eurobonds were not linked to specific investments but were used largely to finance public consumption. Zambia's total public debt stock rose from 36 percent of GDP in 2014 to 62 percent in 2015 (Liebenthal and Cheelo, 2018). The year 2015 saw a decline in GDP growth rate from 4.7 percent in 2014 to 2.9 percent, this may have been as a result of a fall in international prices of copper and other non-traditional exports which led to a sharp fall in external trade (Republic of Zambia, 2018).

In 2017 the stock of public domestic debt in the form of government securities was at ZMW 44.6 billion which represented 18 percent of GDP while the external debt represented 29 percent of GDP (MOF, 2018). Furthermore, by the end of August 2017 Zambia's total public debt was US\$12.45 billion an equivalent of ZMW 114.9 billion representing 47 percent of GDP (MOF, 2018). During this year, GDP grew at a rate of 3.4 percent (Republic of Zambia, 2018).

By 2018, The Zambian economy experienced increases in real GDP growth rates from 3.4 percent in 2017 to 3.7 percent (BOZ, 2018). Although there was increase in economic activity, the country experienced fiscal deficits amounting to 7.6 percent of GDP which was above the targeted 6.1 percent, this was mainly because of higher spending on unplanned capital projects

as well as interest payments on external and domestic debt (BOZ, 2018). Government external debt service increased by 47 percent from US \$666.7 million in 2017 to US \$974.7 million in 2018 (BOZ, 2018). The total net budget financing of K21.1 billion in 2018 was 24 percent above the target of 16.9 billion, thus the deficit was financed through external borrowing (BOZ, 2018).

In 2019, the fiscal deficit was at 8.2 percent of GDP which was above the target of 6.5 percent, this reflected higher spending, interest payments and farmer input support programmes (BOZ, 2019). Furthermore, external debt stock as a percentage of GDP increased from 37.5 percent in 2018 to 50.2 percent in 2019. Government external debt service increased to US \$1,196.2 million, of which consisted of principle maturities of US\$ 170.4 million as well as interest and other charges of US \$485.8 million BOZ (2019). Additionally, the stock of government securities rose from K58.4 billion at the end of 2018 to K80.2 billion in 2019 due to private placements in order to meet government financing needs. To finance budget deficits Zambia has over the years continued to borrow from both external and domestic sources as such it has continued to amass huge public debt obligations. The World Bank in 2019, concluded that Zambia was facing a high risk of debt distress (World Bank, 2019).

CHAPTER THREE

LITERATURE REVIEW

3.0 Overview

This section highlights the theories and studies that were conducted on public debt servicing globally. The literature reviewed is not limited to public debt servicing but encompasses studies on public debt in general.

3.1 Theoretical Literature

The size of the budget deficit that a country amasses and how it is financed determines the changes in debt and fiscal constraints that a country experiences overtime. The focus of this study is public debt servicing and economic growth. There are several theories surrounding this relationship, but the emphasis will be on the following theories.

3.1.1 Debt Overhang Hypothesis

The most dominant paradigm used in explaining the negative effects of a heavy public debt burden in highly indebted poor countries is the debt overhang theory (Karagol, 2002). Debt overhang is a situation where the expected repayment of debt exceeds the country's repayment ability with some probability in the future (Krugman, 1988). Future output increments are transferred from the local economy to the foreign economy through debt servicing, interest payments, and repayments to creditors (Krugman, 1988).

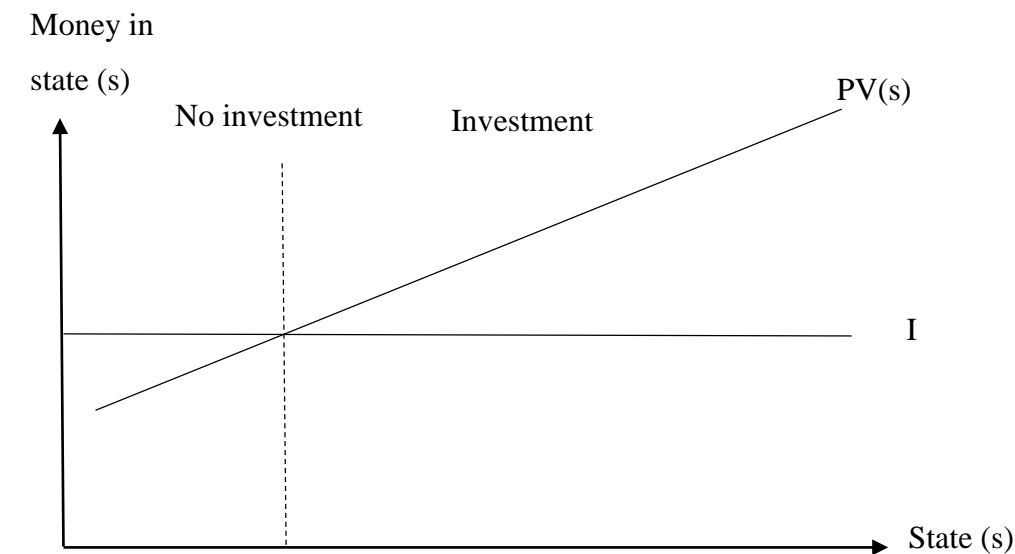
Krugman (1988) assumes that a country has a probability distribution of future national income and can only use a fraction of their national income to service their debt. This fraction of the national income represents the maximum debt service that a country can be induced to make.

According to Krugman (1988) three problems that may arise as a result of debt overhang are all explained in the context of a two time period model. Firstly, suppose that a country has inherited debt in the first period, to repay this debt the country will have to use a fraction of the national income plus new borrowing. The new borrowing will also have to be repaid with a fraction of the national income in the second period. If a country is unable to repay in full at the end of the period, there will be costs associated with defaulting repayment. In other instances, failure to repay debt in the second period may lead to making an assumption that creditors may simply share the fraction of the national income that the country is able to repay in the first period, thus the country will be unable to fully pay back in the second period as such risk facing a liquidity crisis.

Lastly, debt overhang is associated with the main problem of crowding out of private investments. The negative link between debt and investments follows from the debt servicing created by debt accumulation. The accumulation of debt leads to negative impacts on investments as future revenues will be used to service debt to outside creditors leading to the country not receiving the full benefits of their investments (this inefficiency is shown by the shaded area in figure 3.2 below).

Based on Myers (1977) construction, the following scenario was developed to explain the context of the impact of debt servicing for a country. Suppose that a country is without debt and faces an investment opportunity at the cost I that has a present value of $PV(s)$ where s is the general outcome of the investment. The country will decide to invest if $PV(s) \geq I$, an economy's output is expected to increase. This is so because an investment where the present value exceeds the cost would lead to an increase in output. This is shown in figure 3.1 below.

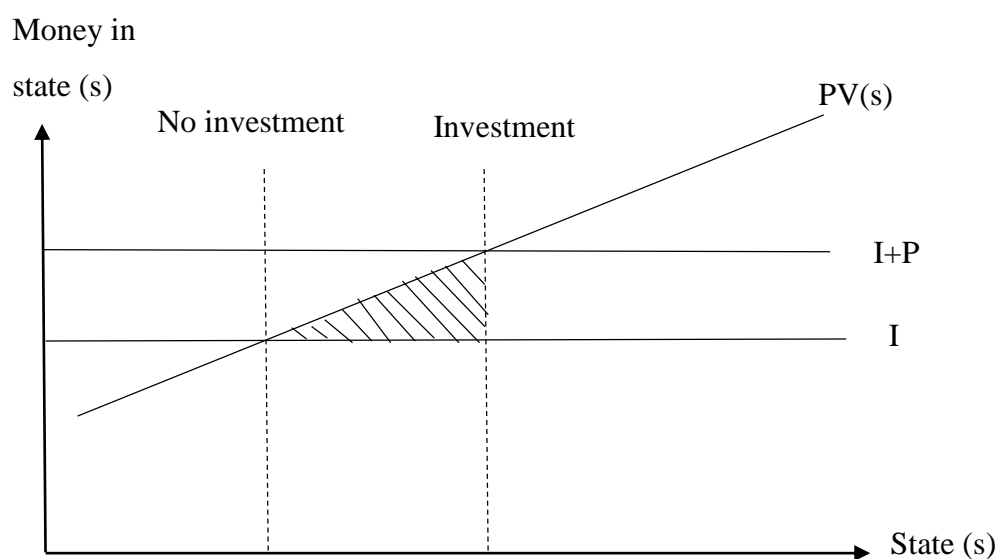
Figure 3. 1: A country's investment decision with no debt.



Source: Myers (1977)

On the other hand, Addition of debt to this model will generate a negative influence on investments as part of the future revenues from the investments will be used to repay debt to creditors. Let P denote debt servicing, the new investment decision would be to invest if the present value of an investment exceeds the costs of investments plus the debt servicing requirements given as: $PV(s) \geq I + P$.

Figure 3. 2: A country's investment decision with debt.



Source: Myers (1977)

Additionally, Sachs and Huizinga (1987) indicated that some of the potential losses associated with this problem other than high debt servicing costs are debt rescheduling negotiations that take a lot of time and are costly, this would in turn lead to disruptions in trade and investments for the debtor country. In other words, public debt is a tax on future output that discourages both local and foreign investments, thereby slowing economic growth and increasing dependence on foreign debt (Krugman, 1988). This theory implies that public debt servicing has a negative effect on economic growth.

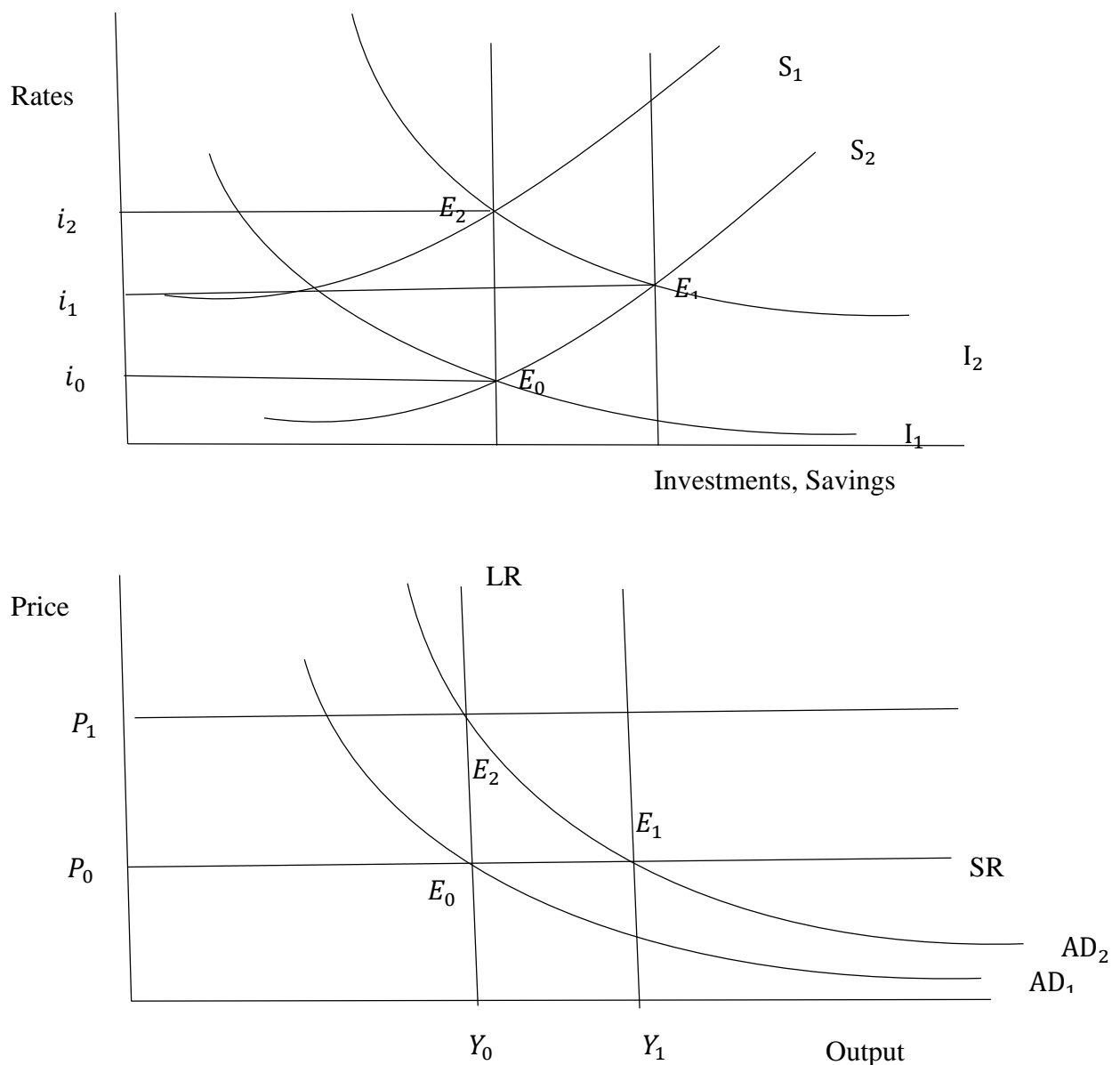
3.1.2 Traditional theories of government debt

The traditional view of the public debt servicing and economic growth relationship is explained on the basis of the Keynesian growth theory (Mankiw, 2010). The traditional theorists are of the view that an increase in government debt is a burden on the economy and that an increase in government spending will have an expansionary fiscal shock to the economy (Ntshakala, 2015; Mankiw, 2010). Furthermore, when government spending exceeds revenues government will contract public debt in order to meet the budget deficit. The debt that is contracted will have an immediate impact of increasing demand for goods and services, as more money will be in the economy chasing few goods and services (Mankiw, 2010). Since prices are assumed to be constant in the short run, the increased demand for goods and services will raise output and employment. Additionally, the marginal propensity to consume exceeds that of savings as

a result private savings fall short of government de-saving. Real interest rates rise thus encouraging capital flows from abroad and discouraging investments as investors compete for small flows of savings. The domestic currency would rise in value compared to other currencies and the country's firms would become less competitive in the world market.

The long run output on the other hand remains unchanged as it always reverts back to its natural rate. Prices and interest rates increase, the high interest rates crowd out private investments. As such, the long run burden of public debt is seen through reduced output, low consumption and reduced economic welfare (Ntshakala, 2015). This is illustrated using the figure 3.3 below;

Figure 3. 3: Burden of public debt in the Keynesian (traditional) theory



Based on figure 3.3 above, interest rates rose from i_0 to i_1 , in the short run while prices of commodities remain constant. Investments rise as more capital flows into the economy.

Increases in investment levels result in increased output. On the other hand, in the long run output remains constant, thus prices increase from P_0 to P_1 and interest rates increase even further to i_2 . High interest rates would discourage investments and crowd out private investments. As a result, output would be smaller and consumption would reduce Ntshakala (2015).

Further, Rode (2012) postulates that over time large deficits impair economic growth by reducing the national saving and capital formulation. A greater share of national output would be owned by foreigners thus the nation's output will be smaller. It also creates a vicious cycle of borrowing and higher debt service costs.

3.1.3 Ricardian view of government debt

The Ricardian view postulates that when government borrows to pay for current consumption, rational consumers are forward looking in that they anticipate higher taxes in the future that will be required to support this debt (Mankiw, 2009). Furthermore, it is assumed that individuals base their spending on their life time income. A debt financed tax cut therefore increases current consumption but leaves lifetime consumption unchanged.

According to (Leiderman and Blejer, 1988) the modeling of the Ricardian equivalence assumes a two-period model of an economy that consolidates the public and private sector inter-temporal budget constraints, where period 0, period 1 and period -1 represent the present, future and past periods respectively. Let the notations G , T , B' , I , C , B , Y and P represent government nominal spending on goods and services, government lump sum tax collection, government debt, nominal interest rate, nominal private sector consumption, private sector debt, non-assets income and price level. Let lower case letters of the above variables denote real values. Thus, the derivation of the Ricardian theory begins with the assuming a budget deficit being met by borrowing. Based on the derivation by Leiderman and Blejer (1988) it is written numerically as:

$$G_0 - T_0 + i_{-1}B'_{-1} = B'_0 - B'_{-1} \quad (1)$$

$$G_1 - T_1 + i_0B'_0 = -B'_0 \quad (2)$$

With the left-hand side being the government budget deficit that includes interest payments. To obtain the inter-temporal government budget constraint, equation 1 and 2 are divided by the price level P_0 and P_1 respectively and then consolidated, this yields the inter-temporal government budget constraint given by the equation 3 below, and it states that the value of

government spending plus initial government liabilities must equal the government tax collections.

$$g_0 + g_{01}(1 + r_0)^{-1} + (1 + r_{-1})b'_{-1} = \tau_0 + \tau_1(1 + r_0)^{-1} \quad (3)$$

Where;

$1 + r_0 = (1 + i_0) (P_0/P_1)$, $1 + r_{-1} = (1 + i_{-1}) (P_{-1}/P_0)$ and r denotes the real interest rate. The inter-temporal government budget constraint is the solvency requirement on the government in that private agents can only lend to government if it is able to raise enough revenue to cover both spending and debt repayment requirements.

On the other hand, the private sector budget constraint for period 0 and 1 in nominal terms are given as:

$$C_0 = Y_0 + B_0 - (1 + i_{-1})B_{-1} - T_0 \quad (4)$$

$$C_1 = Y_1 - (1 + i_0)B_0 - T_1 \quad (5)$$

Expressing equation 4 and 5 in real terms and consolidating the equations yields the inter-temporal budget constraint faced by the private sector.

$$c_0 + c_1 (1 + r_0)^{-1} = y_0 + y_1(1 + r_0)^{-1} - \tau_0 - \tau_1(1 + r_0)^{-1} - (1 + r_{-1})b_{-1} \quad (6)$$

Thus, the optimal consumption(c_0, c_1) decision is based on maximizing the consumer's utility function $U(c_0, c_1)$ subject to the budget constraint. The ricardian equivalence is shown by substitution the inter-temporal government budget constraint into the private sector inter-temporal budget constraint to obtain:

$$c_0 + c_1 (1 + r_0)^{-1} = y_0 - g_0 + (y_1 - g_1)(1 + r_0)^{-1} \quad (7)$$

In a closed economy the debt terms dropout of the analysis since the debt position of the public sector is matched by the creditor position of the private sector, thus $b = -b$.

Equation 7 is the inter-temporal budget constraint of the private sector, it holds when the sector is assumed to fully internalize the budget constraints of the public sector. Therefore, equilibrium prices and quantities will be the same if government spending pattern (g_0, g_1) and any two debt tax patterns (b'_0, τ_0) and ($\hat{b}'_0, \hat{\tau}_0$) satisfy the government budget constraint. Then the two debt tax patterns are economically equivalent that is the size of government debt and the timing of taxes do not influence private sector behavior. The present value of government

spending is what matters in private sector consumption decisions obtained from equation 7 and is given by $g_0 + g_1(1 + r_0)^{-1}$. Thus for the Ricardian equivalence to hold, a current tax cut signals an increase in future taxes and is accompanied by no change in future government spending, as such the government's inter-temporal budget constraint is not satisfied. Thus the private sectors' perceived wealth and consumption changes to accommodate future tax payment requirements (Leiderman and Blejer, 1988).

Barro (1989) expanded the view by assuming that the most important decision-making unit in a family is not an individual but the family as a whole. This is so because an individual's life time is finite. This means that an individual bases their consumption on income of future members of the family. Therefore, a tax cut associated with government borrowing to finance a deficit may increase individual's income and not that of a family as a whole. Individuals will therefore not consume the additional income due to the tax cut but will instead save it and pass it on as a bequest for their children, who will incur the cost of a tax cut. As such consumption is not altered by redistribution of wealth among generations.

On a national level, if everyone believed that the national debt will eventually be paid off in the future this would imply that at some point in the future the government will have to run a surplus in order to pay back their debt. An increase in debt therefore increases individual's wealth at the present time while increasing their future taxes. The net effect on aggregate demand may therefore be zero (Dornbusch and Fischer, 1993).

Opponents to the Ricardian view argue that individuals are not always forward looking and will not anticipate that a tax cut today implies high taxes in future as such a debt financed tax cut alters consumption by redistributing wealth among generations (Mankiw, 2010).

3.2 Empirical Review

This section presents empirical evidence on the relationship between public debt servicing and economic growth. The review is structured around two subsections. The first provides evidence from advanced economies and the second reviews studies based on developing countries.

3.2.1 Public debt and economic growth in advanced economies

Studies in advanced economies on public debt have only focused on the public debt and economic growth relationship (see Balassone et al., 2011; Reinhart et al., 2012; Pannizza and Presbitero 2014; Mencinger et al., 2014; Woo and Kumar, 2015 among others). As such there is scarce literature on public debt servicing and economic growth relationship in developed

countries. Therefore, the study provides empirical evidence on advanced economies that focuses on the public debt and economic growth relationship.

Balassone et al (2011) explored the link between government debt to GDP ratio and real per capita income growth in Italy over the period 1981-2009 using a standard production function model and a framework described by Rao (2010) which involved joint consideration of both the endogenous and exogenous component of GDP growth (captured by the time trend). The study was split into two time periods 1880-1914 and 1995-2007, these periods shared features that were of particular interest in the analysis. In 1894 and 1994 there were peaks in the debt to GDP ratio and both periods coincided with expansionary cycles in the world GDP and trade. It was found that for the period 1880-1914 there exists a strong negative correlation between debt to GDP ratio and real per capita growth while for the period 1995-2007 the correlation appears to break down as both debt and per capita growth start declining. Over the whole period, their results supported the hypothesis of a negative relationship between public debt and growth, and that foreign debt had a stronger effect than domestic debt before the World War I.

Similar to Balassone et al (2011), Reinhart et al (2012) also used the public debt to GDP ratio as a proxy for public debt. Using cross sectional data they examined the association between growth, interest rates and prolonged periods of exceptionally high debt (where public debt to GDP ratio exceeded 90 percent for at least 5 years). The study found 26 episodes of high public debt over the period 1800-2011 across advanced economies. It was concluded that 23 out of these 26 coincided with substantially slower growth. Particularly, public debt to GDP levels above 90 percent are associated with an average annual growth rate that is 1.2 percent lower than in periods with debt to GDP levels below 90 percent. The average annual growth rate is 2.3 percent during exceptionally high debt periods and 3.5 percent for periods with debt to GDP levels below 90 percent. 11 out of 26 high debt years had interest rates that were either lower or the same as in lower debt to GDP years. Furthermore, the average duration for debt episodes was 23 years, thus a possibility of having periods with debt overhangs without interest rates rising was found.

Using an instrumental variable approach, Pannizza and presibitero (2014) examined the causal link between public debt and economic growth for a sample of 17 OECD countries with the exception of Greece, while Portugal's sample started in 1993 due to lack of data on currency decompositions of public debt before 1993. They addressed problems associated with

endogeneity when analyzing the relationship between public debt and economic growth using an instrumental variable approach and focused only on government debt. The instrument added to public debt was not linked directly or indirectly to economic growth and was used to capture the valuation effects associated with the interaction between foreign currency and exchange rates. It was found that the instrument contributed towards the disappearance of the relationship between debt and economic growth. In their baseline model, the OLS estimates found that a 10 percent increase in debt to GDP ratio led to an 18 percent reduction in the average growth rate at 1 percent level of significance. The second stage of the instrumental variable regression established that the coefficient of public debt changed sign and became insignificant. As such the study concluded that there exists a negative correlation between public debt and economic growth.

Mencinger et al (2014) explored the transmission mechanism of the short run impact of public debt on growth during the epicenter of debt crisis for a sample of 25 member states of the European Union. Similar to Balassone et al (2011), the sample was also split into two, except it was on the basis of length of membership in the European Union. The period of focus was 1980-2010 for old member states and for the new member states the period was 1995-2010. Using a generalized economic growth model augmented by the debt variable while taking into account endogeneity and heterogeneity, the study found a statistically significant nonlinear impact of public debt ratios on annual GDP per capita growth rates across all models. It also concluded that for old member states the turning point where the positive effect of accumulated public debt inverted into a negative effect was between 80 percent and 95 percent. While that of the new member states was lower and between 53 percent and 54 percent.

Woo and Kumar (2015) employed both growth regressions and growth accounting to explore the channels through which initial public debt may affect economic growth using a panel of emerging and advanced economies over the period 1970-2008. Specifically, the study used actual public debt to examine its impact on subsequent growth over the next 5 to 20 years to avoid reverse causality. The evidence suggested that there was a negative relationship between initial debt and subsequent growth, on average a 10 percent point increase in initial debt to GDP ratio was associated with a slowdown in real per capita GDP growth of around 0.2 percent points per year, the impact was found to be smaller for advanced economies compared to developing ones. Furthermore, the study explored nonlinearities, currency denominations and differences between advanced and emerging economies. It was found that high levels of initial debt (above 90 percent of GDP) had nonlinearities and had more significant effects on

economic growth, these results were similar to Mencinger et al (2014) who found a significant nonlinear link between public debt ratio and annual GDP per capita growth. The study also concluded that higher foreign currency debt portions increased the size of the negative effect of initial debt on subsequent growth than if it were low. The growth accounting on the other hand showed that the adverse effects were reflected in the slowdown of labor productivity growth as a result of reduced investment and slower growth of capital.

Overall, the studies reviewed above on the public debt and economic growth relationship in advanced economies concluded that there exists a negative relationship between public debt and economic growth irrespective of how public debt is measured.

3.2.2 Public debt servicing and economic growth in Developing countries

Empirical literature on the public debt servicing and economic growth relationship in developing countries have produced competing results over the years, some studies have found a negative relationship between public debt servicing and economic growth (Cunningham (1993); Cholifihani (2008); Kasidi and Said (2013); Baba (2020); Mera and Ryskulov (2012)). Conversely, other studies have found a positive relationship between public debt servicing and economic growth (Amaeteng and Amoako-Adu (2002); Orijinta (2016)). With a few studies having a neutral point of view that public debt servicing has neither a positive nor a negative effect on economic growth Wijeweera et al (2005).

Cunningham (1993) investigated the impact of public debt burden (with debt service as a proxy) on growth in sixteen highly indebted poor countries using an extension of a production function that was employed by other scholars to explore the relationship between export growth and output growth. The results of the study reviewed that there exists a negative relationship between the debt burden and economic growth in the highly indebted nations especially during the period 1971-1979. These finding supported the existence the debt overhang problem.

Barro (1999) investigated the determinants of economic growth in Chile, based on implications of global evidence for Chile and using a panel of 100 countries observed from 1960-1995. This came as a result of divergences in growth rates among economies. The study combined basic features of the neoclassical model putting more emphasis on convergence, which implied that poor countries tended to catch up to the rich ones. The study employed a three-stage least squares estimation which had instruments on two independent variables (schooling and terms of trade) and dummy variables for prior colonial statuses of countries. Cross country results revealed that the pattern of convergence was conditional in the sense that the growth rate of

per capita GDP was inversely related to the starting level of per capita GDP, holding government policies, institutions and population fixed. The implications of these results for Chile showed that Chile's GDP growth was 3.0 percent and exceeded the sample average of 1.6 percent. The high growth rate in Chile was a reflection of low consumption, high investments, rule of law and low fertility rate. Levels of schooling, inflation rates and the extent of international openness did not explain any growth differentials, as such Chile's convergence force was found to be negative because it is relatively rich compared to the broad sample that was used.

Using a co-integration analysis model and time series data for the period 1980 to 2005, Cholifihani (2008) investigated the relationship between public debt servicing and GDP in Indonesia. The study employed an extended production function model that measured GDP as a function of debt service, capital stock and human capital, similar to the formulation in Cunningham (1993)'s study. A conclusion similar to Cunningham (1993)'s study was drawn, thus Indonesia was found to face a debt overhang problem in the long run because economic growth slows down with an increase in external debt servicing. Particularly, if debt service increased by 1 percent, the elasticity of GDP would decrease by 0.13 percent. However, it was concluded that in the short run, Indonesia may not face the debt overhang problem, as the variable of external debt repayment showed an insignificant impact on GDP.

Siddiqui and Malik (2001) examined the impact of external debt on economic growth in south Asian countries and tested the hypothesis of the presence of nonlinearities in the relationship. The study was fueled by increasing rates of debt accumulation and the increase in debt servicing which were seen to be affecting the growth rate of output and led to loss of international competitiveness. It was concluded that the signs of the conditioning variables like investment to GDP ratio, openness, population growth and lagged GDP per capita had expected signs and were statistically significant. The positive coefficient of the investment to GDP ratio was an indication that capital formulation was the main source of economic growth. Foreign debt was found to have a positive and statistically significant impact on economic growth, on the other hand other indicators of debt burden such as debt servicing to exports was found to affect the contribution of investment to economic growth.

Adesola (2009) used the ordinary least squares multiple regression method to analyze the effect of external debt servicing on sustainable economic growth and development in Nigeria for the period 1981-2004. They employed debt repayment to multilateral financial creditors, Paris club

creditor, London club creditors, promissory notes holders and other creditors as variables to determine their relationship with gross domestic product and gross fixed capital formulation (GFCF) at current prices. The study found that debt repayment to Paris club creditors and promissory notes holders were positively related to GDP and GFCF. Particularly, a 1% percent increase in debt payment to Paris club creditors and promissory note holders, gross domestic product would increase by 1.15 percent and 25.21 percent respectively and gross fixed capital formulation would increase by 0.05 percent and 1.87 percent respectively. On the other hand, debt repayment to London club creditors and other creditors showed a negative significant relation to GDP and GFCF, particularly, a 1 percent increase in debt repayment to London club creditors and other creditors, would reduce economic growth by 20.92 percent and 52.32 percent respectively. Finally, debt payment to multilateral financial creditors had a positive but insignificant relationship with both GDP and GFCF.

Using Ordinary Least Squares (OLS) technique Sheikh et al (2010) investigated the impacts of domestic debt, domestic debt servicing on economic growth in Pakistan for the period 1972 to 2009. The study indicated that the stock of domestic debt affects the economic growth of Pakistan positively. The study went further and analyzed the relationship between domestic debt servicing and economic growth, it was observed that there is an inverse relationship between domestic debt servicing and economic growth. A 1 percent increase in domestic debt servicing lowers growth of GDP by 6.78 percent. They attributed the inverse relationship to the existence of huge burden of non-development expenditures that impedes growth. It was concluded that the negative effect associated with domestic debt servicing on economic growth was stronger than that of domestic debt on economic growth.

Kasidi and Said (2013) investigated the impact of external debt and external debt servicing on economic growth in Tanzania for the period 1990-2010 using a growth model proposed by Malik et al.(2010) .The study reviewed that there is a significant impact of external debt and external debt servicing on GDP growth. External debt was found to have a positive impact of about 0.36939, this shows that when external debt is increased by 1 percent GDP is expected to increase by 36.939 percent. While debt service payment had a negative effect of about 28.517 meaning that a 1 percent increase in external debt service decreases GDP by 2851.7 percent. No long run relationship was found between external debt and economic growth.

Mathew and Mordecai (2016) examined the impact of public debt on economic development in Nigeria by assessing the individual effects of the country's domestic and external debt stocks

and service payments on economic development using data spanning from 1986-2014. The study revealed that external debt stock and external debt servicing had an insignificant negative relationship with gross domestic product per capita in Nigeria. Domestic debt on the other hand was found to have a positive and highly significant relationship with gross domestic product per capita. Domestic debt service payment was negatively related to gross domestic product per capita, a 1 percent increase in domestic debt service payment will cause gross product per capita to decrease by 0.000222 units, the impact although negative was not statistically different from zero. It was further concluded that domestic debt is superior to external debt in terms of overall economic growth and development, as it contributes to the development process in a nation.

Baba (2020) examined the relationship between external debt servicing and economic growth using data spanning from 1965-2017 using an estimation technique similar to the one used by Sheikh et al (2010) who analyzed the domestic debt servicing- growth relationship. The study concluded that there exists a negative relationship between external debt servicing and economic growth in Kenya. Particularly, a 1 percent increase in external debt servicing would lead to a 0.01 percent reduction in economic growth. The study concluded that government channeling funds from its revenues towards debt repayment significantly hurts the economy and that the contribution of external debt servicing to economic growth in Kenya is 56 percent.

Amaeteng and Amoako-Adu (2002) in their empirical study declared the existence of a unidirectional and positive causal relationship between foreign debt service and GDP growth after excluding export revenue growth for South Saharan countries during the period 1983-1990. The study employed the framework of Granger and used six measures of indebtedness as proxies for the multiple mechanisms. They argued that indebtedness affects the economic activity of developing countries by either leading to development if foreign loans are converted into capital and other necessary inputs. On the other hand, if borrowing countries misallocate resources or divert them to consumption, the economic development is negatively affected.

Orjinta (2016) examined the effect of public debt and debt service on real gross domestic product for Nigeria using time series data spanning over the period 1996-2015. The results revealed that external debt and external debt servicing have positive impacts on economic growth, more specifically, a 1 percent increase in external debt and external debt service would result in an increase in real gross domestic product by 19 percent and 11 percent respectively.

Using data for the Albanian economy for the period 1991-2010, Mera and Ryskulov (2012) used a linear regression model to study the impact of government debt and external debt service on economic growth. The study concluded that there is a positive effect of internal debt and external debt on economic growth in Albania. This meant that a one unit increase in internal debt would increase the nominal GDP by 0.223 units and a one unit increase in external debt would increase nominal GDP by 0.987 units. In contrast, a negative relationship is found between external debt service and economic growth meaning that a one unit increase in external debt service decreases the nominal GDP by 0.199 units. Thus the study concluded that funds raised from internal and external debt are invested within the Albanian economy, although economic growth is affected by external debt repayment as money flows out of the country instead of being invested in the economy.

Wijeweera et al (2005) finds no relationship between public debt servicing and economic growth. In their study, they investigated the existence of a debt overhang problem in Sri Lanka over the period 1952-2002 using a co- integration analysis and an error correction model for long run and short run estimates respectively. This was because after a 2004 Boxing Day tsunami disaster many of Sri Lanka's creditors granted debt write-offs and interest free periods on loans to allow for the process of reconstruction. As such the study assessed whether the move by creditors would lead to debt overhang and credit rationing problems through analyzing the relationship between economic growth and external debt servicing. Consistent with Barro (1974) and Ricardo (1820), the findings showed that Sri Lanka does not have a debt overhang problem, the results were consistent with the Barro Ricardian view of public debt. This may be attributed to Sri Lanka not having too high levels of indebtedness. While as far as the other variables were concerned only capital exerted a positive impact on economic growth in both the short run and the long run. Although debt service payments were not found to be significant, explanatory variables jointly shared a long run relationship with GNP and the adjustment parameter suggested that a little more than 34 percent of deviations to the long run equilibrium will be corrected within one year.

3.2.3 Public debt servicing and economic growth in Zambia

Similar studies have been carried out in Zambia with mixed results as the studies in other developing and advanced economies reviewed so far.

Saungweme and Ohdiambo (2019) explored the causal relationship between public debt and economic growth, and between public debt servicing and economic growth in Zambia over the

period 1970-2017 using a dynamic multivariate ARDL-bounds testing approach. The study employed two intermittent variables, fiscal balance and savings as intermittent variables to avoid omitted variable bias. The results of the co-integration and causality tests reveal that in both the short run and long run there exists unidirectional granger causality from economic growth to public debt, in line with the hypothesis that suggests that the pace of economic growth has a serious role to play in determining the level of public sector debt. On the other hand, it was concluded that there is no causality between public debt servicing and economic growth in Zambia.

For the same period and using the same model as Saungweme and Ohdiamo (2019), Saungweme and Ohdiamo (2020) examined the impact of public debt service on economic growth and estimated both the long run and short run parameters. The results revealed that the impact of government debt service on economic growth in Zambia is time-variant. It was concluded that in the long run the coefficient of public debt service is statistically insignificant inferring that public debt servicing has a neutral impact on economic growth. However, the long run estimates of the other variables indicate that the coefficients of investment, labor and savings are positive while that of trade openness was negative and statistically significant at 1 percent level of significance. A negative and statistically significant relationship was found between public debt servicing and economic growth in the short run, inferring that an increase in public debt service in Zambia by one unit in the current period would lead to an economic decline by 0.098 units in the short run. Additionally, investment, fiscal balance and trade openness in the past period were found to have a positive impact on economic growth in the short run.

Few studies in Zambia have focused on the debt servicing and economic growth relationship, this coupled with the inconsistency in the findings where one study finds no causality between public debt servicing and economic growth Saungweme and Ohdiamo (2019) and the other study finds a negative relationship in the short run Saungweme and Ohdiamo (2020) using the same data and model, have triggered the need for further inquiry into the relationship between public debt servicing and economic growth. Furthermore, the studies undertaken by Saungweme and Ohdiamo (2019, 2020) did not take into account the individual effects of external debt servicing on economic growth and the impact of domestic debt servicing on economic growth. This study fills this gap by analyzing the effects on domestic debt servicing on economic growth, the effects of external debt servicing on economic growth and their overall effects on economic growth.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0 Overview

This chapter sets out the research methodology of the study by first outlining a theoretical framework that builds on existing theories. This is then followed by a specification of the estimation techniques and the models that were used in the study to examine the effect of public debt servicing on economic growth in Zambia. Thereafter, data sources and proxies for the variables used in the study are outlined.

4.1 Theoretical framework

This study was guided by a theoretical framework governing the traditional growth theory. The traditional growth theory was considered by Cunningham (1993) to develop a production function that included a debt servicing component. The central theme surrounding the traditional growth theory is the Cobb-Douglas production function. It takes a functional form that is generally used to represent the technical relationship between inputs and output. Specified as:

$$Y = AK^{\alpha}L^{\beta} \quad (1)$$

The theory predicts that economic growth is driven by capital, labor and other variables denoted in the equation as K, L and A respectively.

Cunningham (1993) modelled a production function that classified debt servicing as a primary factor of production and used the following specification of a production function.

$$Y = (K, L, DB) \quad (2)$$

Where Y, K, L and DB denote output, capital, Labor and Debt burden respectively. Cunningham argued that when a country is significantly indebted it creates a need to service the debt, which in turn influences how labor and capital will be used in the production process. Particularly, improvements in labor or capital productivity are gains to foreign creditors and not to domestic ones, which implies that there is little incentive to increase productivity.

4.2 Estimation Techniques and model specification.

This research on the public debt servicing and economic growth relationship in Zambia employs an ARDL model proposed by Pesaran, et al (2001).

4.2.1 Empirical model specification

The empirical model used in the study is based on Cunningham (1993) and extended by Romer (1996) who included human capital (H) which consists of abilities, skills and knowledge of particular workers as a factor of production. Doing so raised the effects on output due to changes in the resources devoted to capital accumulation. Thus the study employed Romer's (1996) advancement of Cunningham's production function and specified the model as follows:

$$Y = (K, L, H, DS, TO) \quad (3)$$

The logarithm form of the above specification is specified as follows:

$$\ln Y_t = \beta + \beta_1 \ln K_t + \beta_2 \ln L_t + \beta_3 \ln H_t + \beta_4 \ln DS_t + \beta_5 \ln TO_t + \varepsilon \quad (4)$$

The study employed the above approach.

Furthermore, to analyze the separate effects of public domestic, external and total debt servicing the study specifies three models, similar to the emphasis made by Shah and Pervin (2012) who in their analysis of the relationship between external public debt and economic growth emphasized that domestic and external debt affect the economy in different ways and used the debt service payment burden to capture the crowding out effects. Thus the models that were specified in this study captured the debt overhang and crowding out effects.

4.2.2 Unit root tests

Standard economic procedure requires that variables be checked for unit roots. If variables are found to be non-stationary, the resulting regressions will have large R^2 and t-statistics thereby leading to spurious regressions (Wijeweera et al, 2005). The presence of unit roots mean that variables require differencing to make them stationary. A stationary time series is one whose mean does not change and whose variance is constant overtime. The Augmented Dickey-Fuller (ADF) test and the Philips-Peron unit root test were employed to test whether the variables were stationary or non-stationary.

4.2.3 Autoregressive distributed lag model (ARDL)

Once the results of the augmented dickey fuller test and the Philips perron test revealed that the model included a mixture of I (0) and I (1) variables. The most appropriate method of estimation in these circumstances was the autoregressive distributed lag model proposed by pesaran, et al (2001).

To examine the relationship between public debt servicing and economic growth, Three ARDL models were estimated. Particularly, equation 5 represents the model used to determine the relationship between public domestic debt servicing and economic growth, equation 6 captures the public external debt servicing and economic growth relationship model and equation 7 represents the total public debt servicing and economic growth relationship model as shown below. The separate systems of equations were specified as follows:

Model 1: Public domestic debt servicing and economic growth.

$$\begin{aligned}
 \ln RGDP_t = & \alpha_1 + \sum_{j=1}^K \beta_{1j} \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{1j} \ln K_{t-j} + \sum_{j=0}^Q \delta_{1j} L_{t-j} \\
 & + \sum_{j=0}^Q \rho_{1j} \ln AYS_{t-j} + \sum_{j=0}^Q \varrho_{1j} \ln EE_{t-j} + \sum_{j=0}^Q v_{1j} \ln PER_{t-j} \\
 & + \sum_{j=0}^Q \eta_{1j} \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{1j} \ln DDS_{t-j} + \varepsilon_{1t}
 \end{aligned} \tag{5}$$

Model 2: Public external debt servicing and economic growth.

$$\begin{aligned}
 \ln RGDP_t = & \alpha_2 + \sum_{j=1}^K \beta_{2j} \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{2j} \ln K_{t-j} + \sum_{j=0}^Q \delta_{2j} L_{t-j} \\
 & + \sum_{j=0}^Q \rho_{2j} \ln AYS_{t-j} + \sum_{j=0}^Q \varrho_{2j} \ln EE_{t-j} + \sum_{j=0}^Q v_{2j} \ln PER_{t-j} \\
 & + \sum_{j=0}^Q \eta_{2j} \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{2j} \ln EDS_{t-j} + \varepsilon_{2t}
 \end{aligned} \tag{6}$$

Model 3: Total public debt servicing and economic growth.

$$\begin{aligned}
\ln RGDP_t = & \alpha_3 + \sum_{j=1}^K \beta_{3j} \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{3j} \ln K_{t-j} + \sum_{j=0}^Q \delta_{3j} L_{t-j} \\
& + \sum_{j=0}^Q \rho_{3j} \ln AYS_{t-j} + \sum_{j=0}^Q \varrho_{3j} \ln EE_{t-j} + \sum_{j=0}^Q \nu_{3j} \ln PER_{t-j} \\
& + \sum_{j=0}^Q \eta_{3j} \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{3j} \ln TDS_{t-j} + \varepsilon_{3t}
\end{aligned} \quad (7)$$

Where k is the maximum lag associated with the dependent variable and q is the maximum lags for the independent variables in the model. \ln is the logarithm operator, $RGDP$ is real gross domestic product as a proxy for economic growth, K is physical capital, L is labor, TO is trade openness, DDS is public domestic debt servicing, EDS is public external debt servicing, TDS is total public debt servicing, α is the intercept and ε_t is the white noise error term. Three proxies of human capital were used this study because human capital is mostly poorly proxied and its data is not readily available Wößmann (2003).

The study used average years of schooling (AYS), primary school enrolment rate (PER) and government expenditure on education (EE) as human capital proxies, similar to Out and Adenuga (2006) who used more than three proxies of human capital (primary, secondary and tertiary school enrolment rates) in their study on economic growth and human capital development. Similarly, Cooray (2009) also used primary school enrolment ratio, secondary school enrolment ratio, schooling life expectancy and education expenditure as proxies for human capital.

Three separate models were specified with the difference being associated with the variable specified as DS (public debt servicing) as it is replaced with public domestic debt servicing in the first model, in the second model public external debt servicing is used and the last one used total public debt servicing. This is done to avoid the multicollinearity problem. Therefore from equation 5 and 6 the study tested the hypothesis that public domestic debt servicing has a negative impact on economic growth, external debt servicing has a negative impact on economic growth. Equation 7 also hypothesized that total debt servicing has a negative impact on economic growth when both domestic debt servicing and external debt servicing have a negative impact. Alternatively, equation 7 is a summary of the net effect of the impact of public domestic and external debt servicing on economic growth, thus if both are negative it means

that they reinforce each other and total public debt servicing is expected to be negative. If they have opposite signs, the net effect will depend on the magnitude of the impact of the individual variables and is likely to take the sign of the one whose magnitude is bigger.

4.2.4 Bounds Test for co-integration

The bounds test for co-integration was used to test for the existence of a long-run relationship among variables in the model. The null hypothesis of the bounds test is that there is no long-run relationship. The decision criterion states that the null hypothesis is rejected if the F-statistic is greater than the upper bound critical values by Pesaran, Shin and Smith (2001). The null hypothesis is not rejected if the F statistic is less than the lower bound and if the F-statistic lies between the two bounds it means the test is inconclusive.

Some of the advantages that the bounds test has over other tests for co-integration are: it can be used irrespective of whether the explanatory variables are purely I(0) or I(1), the method is robust for small sample sizes and it can be used to estimate both the long run co-integrating equation and the corresponding error correction model.

4.2.5 Long-run and short-run coefficients

The bounds test found the existence of co-integration as such, the long run and error correction models corresponding to the three ARDL models in equations 5, 6 and 7 are written as follows:

Model 1: Long-run and error correction form

$$Ec_{1t} = RGDP_t - (\alpha_1 + \beta_1 \ln RGDP_{t-j} + \tau_1 \ln K_{t-j} + \delta_1 \ln L_{t-j} + \rho_1 \ln AYS_{t-j} + \varrho_1 \ln EE_{t-j} + \nu_1 \ln PER_{t-j} + \eta_1 \ln TO_{t-j} + \gamma_1 \ln DDS_{t-j}) \quad (8)$$

Where (Ec_{1t}) is the co-integrating equation for model 1.

$$\begin{aligned}
\Delta \ln RGDP_t = & \alpha_{11} + \sum_{j=1}^K \beta_{1j} \Delta \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{1j} \Delta \ln K_{t-j} + \sum_{j=0}^Q \delta_{1j} \Delta \ln L_{t-j} \\
& + \sum_{j=0}^Q \rho_{1j} \Delta \ln AYS_{t-j} + \sum_{j=0}^Q \varrho_{1j} \Delta \ln EE_{t-j} + \sum_{j=0}^Q \nu_{1j} \Delta \ln PER_{t-j} \\
& + \sum_{j=0}^Q \eta_{1j} \Delta \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{1j} \Delta \ln DDS_{t-j} + \varphi_{11} Ec_{1t-1} + e_{1t}
\end{aligned} \tag{9}$$

Model 2: Long-run and error correction form

$$\begin{aligned}
Ec_{2t} = & RGDP_t - (\alpha_2 + \beta_2 \ln RGDP_{t-j} + \tau_2 \ln K_{t-j} + \delta_2 \ln L_{t-j} + \rho_2 \ln AYS_{t-j} + \\
& \varrho_2 \ln EE_{t-j} + \nu_2 \ln PER_{t-j} + \eta_2 \ln TO_{t-j} + \gamma_2 \ln EDS_{t-j})
\end{aligned} \tag{10}$$

Where Ec_{2t} is the co-integrating equation for model 2.

$$\begin{aligned}
\Delta \ln RGDP_t = & \alpha_{22} + \sum_{j=1}^K \beta_{2j} \Delta \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{2j} \Delta \ln K_{t-j} + \sum_{j=0}^Q \delta_{2j} \Delta \ln L_{t-j} \\
& + \sum_{j=0}^Q \rho_{2j} \Delta \ln AYS_{t-j} + \sum_{j=0}^Q \varrho_{2j} \Delta \ln EE_{t-j} + \sum_{j=0}^Q \nu_{2j} \Delta \ln PER_{t-j} \\
& + \sum_{j=0}^Q \eta_{2j} \Delta \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{2j} \Delta \ln EDS_{t-j} + \varphi_{21} Ec_{2t-1} + e_{2t}
\end{aligned} \tag{11}$$

Model 3: Long-run and error correction form

$$\begin{aligned}
Ec_{3t} = & RGDP_t - (\alpha_3 + \beta_3 \ln RGDP_{t-j} + \tau_3 \ln K_{t-j} + \delta_3 \ln L_{t-j} + \rho_3 \ln AYS_{t-j} + \\
& \varrho_3 \ln EE_{t-j} + \nu_3 \ln PER_{t-j} + \eta_3 \ln TO_{t-j} + \gamma_3 \ln TDS_{t-j})
\end{aligned} \tag{12}$$

Where Ec_{3t} is the co-integrating equation for model 3.

$$\begin{aligned}
\Delta \ln RGDP_t = & \alpha_{33} + \sum_{j=1}^K \beta_{3j} \Delta \ln RGDP_{t-j} + \sum_{j=0}^Q \tau_{3j} \Delta \ln K_{t-j} + \sum_{j=0}^Q \delta_{3j} \Delta \ln L_{t-j} \\
& + \sum_{j=0}^Q \rho_{3j} \Delta \ln AYS_{t-j} + \sum_{j=0}^Q \varphi_{3j} \Delta \ln EE_{t-j} + \sum_{j=0}^Q \nu_{3j} \Delta \ln PER_{t-j} \\
& + \sum_{j=0}^Q \eta_{3j} \Delta \ln TO_{t-j} + \sum_{j=0}^Q \gamma_{3j} \Delta \ln TDS_{t-j} + \varphi_{31} Ec_{3t-1} + e_{3t-1}
\end{aligned} \tag{13}$$

The error correction term (Ec_t) in each of the three models is the residual from the co-integration equation. It allows for adjustment back to the long-term equilibrium after a deviation in the previous period. In the Ec_t equation the parameters α , β , τ , δ , ρ , φ , ν , γ and η are long run coefficients. The expected signs of the parameters α , β , τ , δ , ρ , φ , ν and η are positive while those of γ and φ are expected to be negative.

The short run or error correction models are represented by equations 9, 11 and 13. They contain the short run coefficients. Where Δ is the difference operator, e_t is the white noise error term and Ec_{t-1} is the lagged residual from the co-integration equation.

4.3 Post Diagnostic Tests

To check for adequacy of the models, the following tests were carried out.

4.3.1 Test for non-serial correlation

The Breusch-Godfrey Serial correlation LM test was used to test for serial correlation. The presence of serial correlation implies that there are relevant variables that have been omitted in a time series regression that are correlated across periods. Presence of serial correlation leads to inefficient estimates.

4.3.2 Test for Heteroscedasticity

Presence of heteroscedasticity poses problems of inference, as such the Breusch-Pagan test for heteroscedasticity was carried out to ensure that ordinary least squares estimators are consistent. Consistency means that there is no heteroscedasticity among residuals (Green, 2012)

4.3.3 Test for normality

To check if the sample data comes from a normally distributed population a Jarque-Bera test was carried out. It examines if the data matches the skewness and kurtosis of a normal distribution.

4.3.4 Test for Omitted Variables

To check whether the model omitted relevant variables the Ramsey Reset test was used.

4.3.5 Stability Test

In order to ensure robustness of the model, stability tests were carried out to evaluate stability of estimated parameters of the ARDL model. The Ramsey reset test and the CUSUM of square test were used to evaluate stability of estimated parameters of the model.

4.4 Data

The study used annual data for the period 1990-2019. Real Gross domestic product (RGDP) was used as a proxy for economic growth. Total public debt service comprised of public domestic and public external debt servicing calculated as the total authorized debt repayments at the end of the year which will includes both long term and short term interest and principle payments. Gross Fixed capital formulation was used as a proxy for the capital stock. Employment rate was used as a proxy for employed labor force. Human capital was represented by three proxies; Average years of schooling, government expenditure on education calculated based on public expenditure on education to GDP ratio and primary school enrolment rate. Exports plus imports to GDP ratio was the proxy for trade openness.

Data on Real Gross domestic product was obtained from the central statistical office (CSO), that of public debt servicing (domestic, external and total) from estimates of revenues and expenditures yellow books and ministry of finance. Penn world tables was the source for trade openness and labor force data. Gross fixed capital formulation, primary enrolment rate and education expenditure data was obtained from World Bank world development indicators. Average years of schooling data was obtained from United Nations development programme (UNDP) and our world data.

CHAPTER FIVE

ANALYSIS AND DISCUSSION OF RESULTS

5.0 Overview

This chapter provides the main findings of this research and corresponding discussions. The statistical properties of the variables are highlighted in the descriptive statistics there after a correlation analysis is carried out. This is then followed by the empirical analysis, the results section and finally the chapter is concluded by discussing the results of the empirical analysis.

5.1 Descriptive statistics

The study's variables of interest are in their logarithm form as the analysis requires the use variables expressed in logarithm form. The following are the variables that were used in this study; log of real gross domestic product (LRGDP), log of physical capital (LK), log of employed labor force (LL), log of education expenditure (LEE), log of average years of schooling (LAYS), log of Primary school enrolment rate (LPER), log of public domestic debt servicing (LDDS), log of public external debt servicing (LEDS), log of total public debt servicing (LTDS) and log of trade openness (LTO). Table 5.1 below presents the summary statistics of these variables.

Table 5. 1 Descriptive statistics on logged values of the variables

Variable	LRGDP	LK	LL	LEE	LAYS	LPER	LDDS	LEDS	LTDS	LTO
Statistics										
Mean	24.96	22.64	15.26	21.12	1.83	4.56	19.90	19.70	20.58	4.24
Median	24.85	23.03	15.24	20.81	1.83	4.59	20.39	19.72	20.82	4.22
Maximum	25.68	25.44	15.70	23.31	1.97	4.75	25.19	23.43	25.34	4.62
Minimum	24.38	17.84	14.85	18.31	1.54	4.36	14.28	15.79	15.99	4.03
Std. Dev.	0.46	2.11	0.26	1.42	0.10	0.14	2.25	1.76	1.96	0.14
Skewness	0.31	-0.65	-0.04	-0.25	-0.87	-0.13	-0.46	0.06	-0.14	0.60
Kurtosis	1.51	2.64	1.90	2.47	3.56	1.46	3.69	2.90	3.48	3.03
Jarque-Bera	3.23	2.24	1.56	0.67	4.22	3.06	1.64	0.032	0.38	1.80

J-Bera Probability	0.19	0.33	0.46	0.72	0.12	0.22	0.44	0.98	0.83	0.41
Observations	30	30	30	30	30	30	30	30	30	30

The summary statistics in table 5.1 reveal key characteristics of the variables in their logarithm form. All variables have 30 observations. There is asymmetry as skewness values are mostly negative and around zero except for three out of the ten variables that are positively skewed. The kurtosis ranges between one and four. Based on the Jarque-Bera test for normality all the variables are normally distributed.

More specifically, the kurtosis for LRGDP and LEDS was less than 3, an indication that its distribution would tend to produce fewer and less extreme outliers than the normal distribution. The value of the skewness on the other had showed that both variables were positively skewed. LDDS and LTDS both had a kurtosis greater than 3 and indication that their distributions were more prone to outliers. Both variables were negatively skewed.

5.2 Correlation Analysis

Table 5. 2 Pairwise Correlation results

Variable	LRGDP	LK	LL	LEE	LAYS	LPER	LDDS	LEDS	LTDS	LTO
LRGDP	1									
LK	0.89 (0.00)	1								
LL	0.96 (0.00)	0.97 (0.00)	1							
LEE	0.88 (0.00)	0.78 (0.00)	0.82 (0.00)	1						
LAYS	0.85 (0.00)	0.98 (0.00)	0.94 (0.00)	0.75 (0.00)	1					
LPER	0.75 (0.00)	0.65 (0.00)	0.69 (0.00)	0.64 (0.00)	0.60 (0.00)	1				
LDDS	0.83 (0.00)	0.97 (0.00)	0.93 (0.00)	0.76 (0.00)	0.95 (0.0000)	0.58 (0.00)	1			
LEDS	0.83 (0.00)	0.90 (0.00)	0.90 (0.00)	0.76 (0.00)	0.90 (0.00)	0.44 (0.01)	0.93 (0.00)	1		
LTDS	0.85 (0.00)	0.95 (0.00)	0.94 (0.00)	0.78 (0.00)	0.94 (0.00)	0.55 (0.00)	0.99 (0.00)	0.97 (0.00)	1	
LTO	0.18 (0.33)	-0.20 (0.29)	-0.06 (0.77)	0.17 (0.37)	-0.25 (0.19)	0.06 (0.74)	-0.24 (0.21)	-0.06 (0.76)	-0.17 (0.38)	1

Based on the above pairwise correlation table, there exists high and statistically significant correlation between LRGDP and all other independent variables included in the model except for trade openness which shows the lowest correlation and is statistically insignificant. The highest correlation is between LRGDP and LL. Correlations between LRGDP and LEE are almost as high as that of LRGDP and LK. TO has very low negative correlations with five of the other independent variables, although all its pairwise correlations are insignificant. The rest of the variables have highly significant correlations with the other independent variables, with the exceptions being the correlation between LPER with the rest of the variables which is moderate but significant.

5.3 Empirical analysis and Results

5.3.1 Optimal lag selection

Before determining the time series properties of the variables, it is important to determine the optimal lag of each variable. The optimal lags can then be used when checking whether the variables are stationary or non-stationary. Using the Akaike information criterion (AIC) the optimal lag length for each variable was determined. The AIC test was used because it does not depend directly on the sample size and is the most useful when using a small data set for analysis Acquah (2010). Additionally, the results from the selection using AIC are an efficient representation of time series data. The optimal lags selected for each variable are shown in table 5.3 below.

Table 5. 3 Optimal lag selection

Variable	LRGDP	LK	LL	LEE	LAYS	LPER	LDDS	LEDS	LTDS	LTO
Optimal lag(AIC)	2	2	1	1	2	1	1	1	1	1

As shown in table 5.3 above, three of the variables were found to have an optimal lag of 2 with the rest of the variables having optimal lags of 1.

5.3.2 Unit root tests

Time series analysis requires that variables are tested for stationarity before analysis is done, as such this study used the Augmented Dickey Fuller (ADF) test and confirmed the results of the ADF test using the Philips perron (PP) test proposed by Philips and Perron (1998). The unit root test is used to determine the order of integration of variables, to ensure that none of the

variables are integrated of order I (2) as these variables led to spurious results. Since annual data was used, optimal lags that were found for each variable were used in the unit root test.

Table 5. 4 Augmented Dickey Fuller test on log values of variables.

variable	Level				First difference			
	Intercept		Trend and intercept		Intercept		Trend and intercept	
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value
LRGDP	0.32	0.98	-2.72	0.24	-3.33**	0.02	-3.42*	0.07
LK	-3.68**	0.01	-6.28***	0.00	-3.66**	0.01	-4.60**	0.01
LL	-0.64	0.85	-3.79**	0.03	-4.36***	0.00	-4.27**	0.01
LEE	-1.96	0.30	-3.53*	0.05	-5.10***	0.00	-5.11***	0.00
LAYS	-1.34	0.60	-3.59*	0.05	-3.50**	0.02	-3.18	0.1
LPER	-0.81	0.80	-2.21	0.46	-4.19***	0.00	-4.17**	0.01
LTO	-3.28**	0.03	-3.28*	0.09	-7.12***	0.00	-7.05***	0.00
LDDS	-1.09	0.71	-2.80	0.21	-3.28**	0.03	-2.93	0.17
LEDS	-1.17	0.67	-2.56	0.30	-6.28***	0.00	-6.14***	0.00
LTDS	-0.58	0.86	-2.16	0.50	-3.41**	0.02	-3.13	0.12

P-values of coefficients: *P<0.1, ***p<0.01 and **p<0.05

The results from the Augmented Dickey Fuller test indicated that all the variables were integrated of order I (1) except the LK and LL which were integrated of order I(0). Philips Perron as indicated in appendix A confirmed the results of LK being integrated of order I(0) but also found the LAYS to be integrated of order I (0). The order of integration based on both tests are shown in Appendix B. Therefore, all the variables except LK, LL and LAYS were found to be I(1) and since LK, LL and LAYS fed into all the three models that were specified, they all had a combination of I(1) and I(0) variables as such three Autoregressive distributed lag (ARDL) model were estimated.

5.3.3 ARDL Model Estimation

Table 5. 5 ARDL results for domestic debt servicing, external debt servicing and total debt servicing models and their relationship with economic growth.

	Model 1: Domestic debt servicing and economic growth.	Model 2: External debt servicing and economic growth.	Model 3: Total debt servicing and economic growth.
LRGDP(-1)	0.71***	0.67***	0.79***
LK	0.08**	0.04*	0.06**
LK(-1)	-0.07*	-0.07**	-0.08***
LK(-2)	0.09**		0.07**
LL	-0.62*	-0.67*	-0.69**
LL(-1)	0.83**	1.41***	0.95***
LAYS	0.06	0.04	0.19
LAYS (-1)		0.65	
LEE	-0.02*	-0.02*	-0.02**
LEE(-1)	0.01		
LPER	0.20***	0.22***	0.16***
LDDS	-0.01		
LDDS(-1)	-0.03*		
LDDS(-2)	-0.03		
LEDS		-0.01	
LEDS(-1)		-0.01	
LTDS			0.00
LTDS(-1)			-0.04**
LTO	0.16**	0.26***	0.19***
Constant	1.56	-4.91	-0.24
R-Squared	0.99	0.99	0.99
Adjusted R-Squared	0.99	0.99	0.99
F-statistic	1029.12	1005.20	1372.97
Prob (F-statistic)	0.00	0.00	0.00

P-values of coefficients: *P<0.1, **p<0.05 and ***p<0.01

All the estimated ARDL models are significant as shown by the statistically significant F-statistics.

5.3.4 ARDL Co-integration test

Table 5. 6 Bounds test for co-integration results

	F-statistic	Decision
Model 1	4.410723	Co-integration present
Model 2	6.842440	Co-integration present
Model 3	7.262541	Co-integration present
Critical value bounds (Significance)	Lower bound	Upper bound
10%	2.03	3.13
5%	2.32	3.5
2.5%	2.6	3.84
1%	2.96	4.26

The bounds test for co-integration results indicates that in all three models the F-statistic was greater than the I(1) bound critical values thus the null hypothesis of no long run relationship is rejected at all levels of significance. Therefore, the variables in the models possess long run and short run relationships.

5.3.5 The ARDL Co-integration form (Short-Run) and Long-Run form

Table 5. 7 Co-integration form (short-run)

Dependent Variable LRGDP			
	Model 1	Model 2	Model 3
Constant	1.56***	-4.91***	-0.24***
D(LK)	0.08***	0.04**	0.06***
D(LK(-1))	-0.10***		-0.07***
D(LL)	-0.62***	-0.67***	-0.69***
D(LEE)	-0.02***		
D(LDDS)	-0.01		
D(LDDS(-1))	- 0.03**		
D(LAYS)		0.04	
D(LEDS)		-0.01*	
D(LTDS)			0.00
CointEq(-1)*	-0.29***	-0.33***	-0.21***

P-values of coefficients: *P<0.1, **p<0.05 and ***p<0.01

The results of the co-integration form across all the three models reveal that the error correction terms all carry the expected negative sign, are highly statistically significant and lie between 0 and -1. An indication that Zambia's economic growth has a stable and long run relationship. Further, as expected, the coefficient of LDDS and LEDS were found to be negative and significant while that of LTDS was positive and insignificant in the short run. LL and LEE

were found to have negative coefficients in the domestic debt servicing and economic growth model in the short run. LK in the current period showed a positive and significant coefficient across all three models in the short run.

Table 5. 8 Long run form

Dependent Variable LRGDP			
Independent Variables	Model 1	Model 2	Model 3
LK	0.35	-0.08	0.22
LL	0.74	2.24***	1.19
LAYS	0.22	2.08**	0.87
LEE	-0.03	-0.05	-0.08
LPE	0.70***	0.66**	0.76**
LTO	0.55**	0.77***	0.89**
LDDS	-0.23**		
LEDS		-0.07**	
LTDS			-0.19**

P-values of coefficients: *P<0.1, **p<0.05 and ***p<0.01

The long run results show a negative and significant relationship between LRGDP and all the three debt servicing proxies in all the three models. LPER and LTO were found to have positive and significant coefficients across all three models in the long run. LL and LAYS only indicated a positive relationship with economic growth in the public external debt servicing and economic growth model in the long run.

5.3.6 Post Diagnostic tests

Table 5. 9 Diagnostic Test Results

Test for	Diagnostic test	Model 1 Test Statistics	Model 2 Test statistics	Model 3 Test statistic	Conclusion
Correlation	Breusch-Godfrey LM	2.84 (0.10)	0.12 (0.74)	1.14 (0.35)	No autocorrelation
Heteroscedasticity	Breusch-Pagan Godfrey test	0.44 (0.93)	1.71 (0.16)	0.55 (0.85)	No Heteroscedasticity
Omitted Variables	Ramsey Reset test	1.53 (0.24)	1.66 (0.22)	0.58 (0.70)	No omitted variables
Normality	Jarque-Bera Test	0.18 (0.19)	1.42 (0.49)	1.47 (0.48)	Residuals are normal

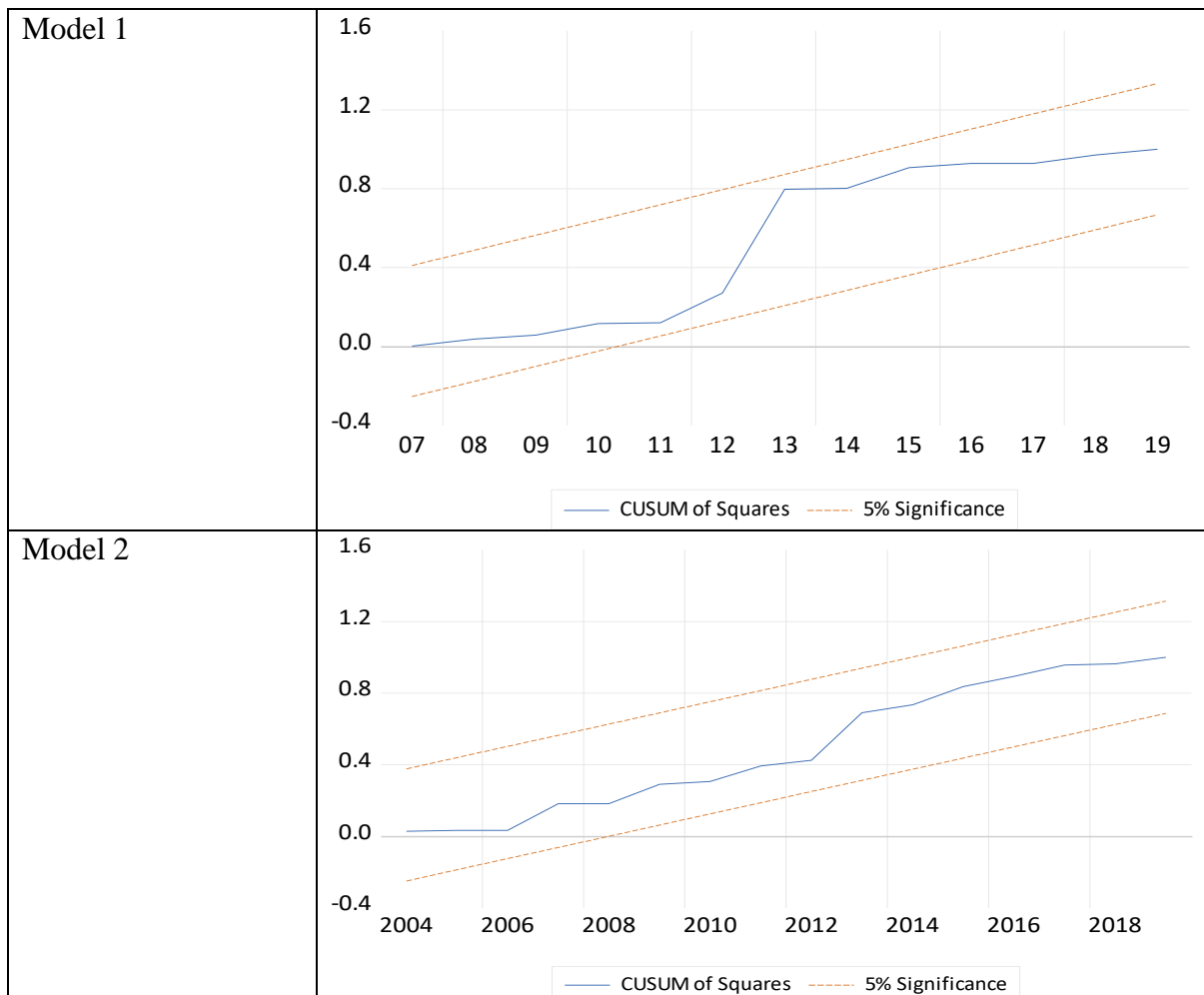
Note: P-values in brackets

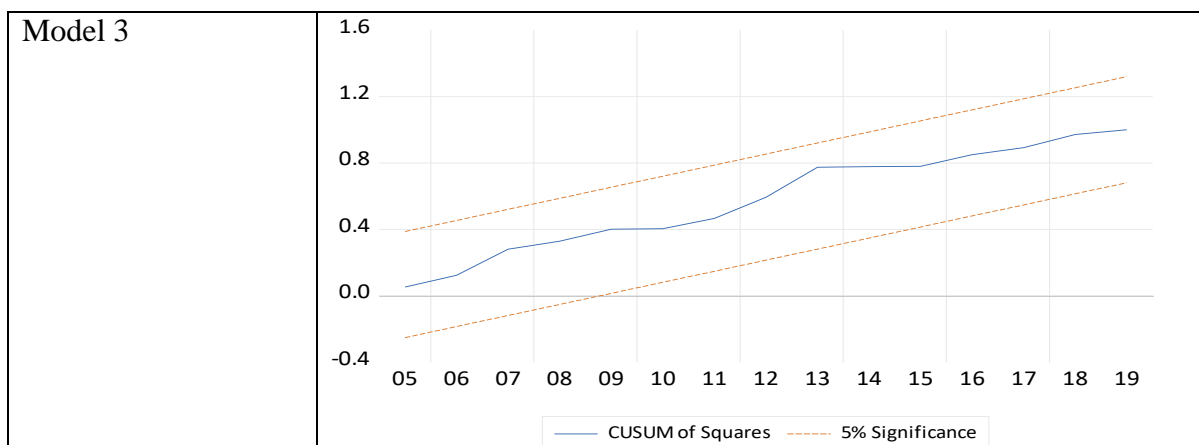
Based on the results of the post diagnostics test, the models do not suffer from any heteroscedasticity and autocorrelation problems, this is based on the results of the Breusch Godfrey Lm and the Breusch pagan Godfrey test. The models have no omitted variables and the data fits well as shown by the Ramsey reset test. The residuals are normally distributed in this model.

5.3.7 Stability test (CUSUM of square test)

To examine the stability of the long run coefficients and short run dynamics, the CUSUMSQ test proposed by Brown et al (1975) was used. The test was applied to the residuals in all three models in table 5.6. The CUSUM of square test is based on the squared recursive residuals and it is plotted against break points. If the plot of the CUSUM statistic lies within the critical bounds of 5% level of significance, then the null hypothesis that coefficients are stable cannot be rejected. If either lines are crossed then the null hypothesis is rejected at 5% level of significance.

Table 5. 10 CUSUM of square test results





The results of the CUSUM tests shows that across all models the CUSUMSQ does not cross the critical bounds, indicating no evidence of any significant structural instability.

5.4 Discussion of results

5.4.1 Economic growth dynamics

The results from the error correction models show that across all three models the coefficient of the error correction term (ECT_{t-1}) is negative and statistically significant as expected. The significance of the error correction term implies that Zambia's economic growth is stable and has a long run equilibrium.

In the public domestic debt servicing and economic growth model, the coefficient of the error correction term is -0.29 which indicates that around 29 percent of disequilibrium in economic growth in the short run is corrected to equilibrium in the long-run.

The public external debt servicing and economic growth model found an error correction term of -0.33 an indication that when economic growth deviates from its long run equilibrium path by 33 percent a correction mechanism corrects the growth path back to equilibrium.

The total public debt servicing and economic growth model has an error correction term of -0.21, it can be inferred that, when economic growth deviates from its long run equilibrium path by 21 percent, there exists an error correction mechanism that corrects the growth path back to its equilibrium within one year. Thus, the speed at which the short run equations converge to equilibrium across all three models is low.

5.4.2 Debt servicing and economic growth models

5.4.2.1 Domestic debt servicing and economic growth model

In the short run, the regression coefficient of the log of domestic debt servicing with a lag of 1 is -0.03 and is significant at 5 percent level of significance. Holding all other factors constant, if Zambia's public domestic debt servicing increased by 1 percent, economic growth would reduce by 0.03 percent in the short run. The long run results also conclude existence of a negative relationship between public domestic debt servicing and economic growth in Zambia at 5 percent level of significance. Other things equal, an increase in Zambia's domestic debt servicing by 1 percent would reduce annual economic growth by 0.23 percent in the long run.

Thus domestic debt servicing affects economic growth negatively in both the short run and the long run. The negative relationship may possibly come as a result directing borrowed funds towards non-productive investments which in turn reduces the country's economic capacity to repay the debt while lowering the growth of the economy. Alternatively, high public domestic debt servicing imposes a burden on the Zambian people as social expenditures reduce. These results are consistent with existing empirical work, Sheikh et al (2010) found an inverse relationship between public domestic debt servicing and economic growth in Pakistan, however, the magnitude of the impact in their study of -6.76 is higher than that of this study. Mathew and Mordecai (2016) also found that increased domestic debt servicing leads to slower economic growth in Nigeria.

Other determinants of economic growth in this model are statistically significant except average years of schooling which shows no relationship with economic growth in the short run. The current value of physical capital indicates a positive and significant relationship with economic growth, particularly, holding other things constant, a 1percent increase in physical capital increases economic growth by 0.08 percent in the short run. Cholifihani (2008) finds that capital stock positively affects economic growth in the short run. Although statistically significant the rest of the variables have signs that are opposite to the apriori expectations. The lagged value of capital has a negative relationship with economic growth that is an increase in the lagged value of physical capital would reduce economic growth by 0.095 percent.

The coefficient of labor is negative, thus indicating that other things equal, a 1 percent increase in the labor input would reduce economic growth by 0.6 percent in the short run. This finding is contrary to the hypothesized outcome of the coefficient of labor being positive in this study. Ali and Mustafa (2012) also established that labor had a negative impact on Pakistan's

economic growth, they attributed this to majority of Pakistan's labor force being unskilled thus may have led to low productivity and lower contribution to output. However, the results of the study contradict with those of Saungweme (2020) who found labor to have a positive impact on economic growth in Zambia.

Education expenditure also shows an inverse link, other things equal, increasing expenditure on education would reduce economic growth by 0.02 percent in the short run. These findings are contrary to those of Cooray (2009) who finds a positive link between public expenditure on education and economic growth. The coefficient of Primary school enrolment rate is 0.69 and is statistically significant which implies that holding all other things constant, a 1 percent increase in primary school enrolment rate will lead to 0.69 percent increase in economic growth in the long run. Cooray (2009) found that increases in primary school enrolment ratios are associated with increases in per capita GDP in the long run.

Trade openness also has a positive coefficient of 0.55 and is statistically significant which implies that, *ceteris Paribas*, a 1 percent increase in trade openness will lead to 0.55% improvements in economic growth in the long run. The positive long run impact of trade openness is consistent with the finding of Siddiqui and Malik (2001)'s study among south Asian countries that concluded that trade openness had a positive and statistically significant impact on economic growth. The rest of the determinants of economic growth (physical capital, labor, and average years of schooling and education expenditure) are found to be statistically insignificant in the long run.

5.4.2.2 Public External debt servicing and economic growth model

The results of the short run public external debt servicing and economic growth model shows that external debt servicing negatively influences Zambia's economic growth at only 10% level of significance. *Ceteris Paribas*, a 1 percent increase in external debt servicing in the short run decreases economic growth by 0.01 percent in Zambia.

In the long run, External debt servicing also negatively impacts economic growth at 5 percent level of significance. Other things equal, an increase in external debt servicing by 1 percent would reduce Zambia's economic growth by 0.07 percent in the long run. The negative relationship in the long run is plausible because in as much as funds from external sources enhance output through physical capital and human capital improvements, it is expected that the revenues raised will be channeled towards repayment of external debt obligations in the long run a situation that affects the economy significantly. Research work by Cholifihani

(2008) confirms these findings as the study found existence of the debt overhang problem in the long run in Indonesia with a coefficient of -0.13, implying that this study's magnitude of effect is slightly lower than that Cholifihani (2008). Baba (2020) provides empirical evidence that higher external debt repayment leads to lower economic growth, a finding that is consistent with the short run and long run effect of external debt servicing on economic growth in Zambia found in this study.

The short run results of the public external debt servicing and economic growth model finds that only two explanatory variables other than external debt servicing have a significant link to economic growth. Physical capital is found to have a positive and significant link with economic growth, holding all other factors constant a 1 percent increase in physical capital increases economic growth by 0.04 percent in the short run. Labor on the other hand has a negative relationship with economic growth, similar to the findings in the domestic debt servicing and economic growth model.

Unlike the results found in the first model, Labor, average years of schooling, primary school enrolment rate and trade openness have positive and significant effects on economic growth in the long run. The coefficient of labor and average years of schooling are both positive and statistically significant. That is, holding all other things constant, a 1 percent increase in labor and average years of schooling would increase economic growth by 2.24 percent and 2.08 percent respectively in the long run. Primary school enrolment rate had a statistically significant positive coefficient of 0.66, other thing equal, a 1 percent increase in primary school enrolment rate would increase economic growth by 0.66 percent in the long run. Johnes and Johnes (2007) in their study concluded that increases in primary school enrolment ratios are associated with increases in per capita GDP in the long run. Trade openness also has a positive coefficient of 0.77 and is statistically significant which implies that a 1 percent increase in trade openness will lead to 0.77 percent improvements in economic growth in the long run. This is consistent with the argument that trade openness if well developed in developing countries may significantly increase GDP and thus promote to economic growth, a conclusion made by Zafar., et al (2015) who found trade openness have positive and significant effect. Paudel and Perera (2009) also concluded that trade openness has a significant contribution to economic growth shown by a coefficient of 0.29 which is slightly lower than that of this study.

5.4.2.3 Total public debt servicing and economic growth model

The total public debt servicing and economic growth model shows that the coefficient of total debt servicing is positive but insignificant in the short run. The fact that total debt servicing is not a short run determinant of economic growth does not imply that it does not affect growth in the short run, but that it has a neutral effect. The possible reason for this neutral effect is that debt servicing requirements are usually made in lump sum amounts and over a period of time, as such over a short period the impact may not be observed.

Thus making conclusions on the impact of public debt servicing on economic growth on the basis of aggregate effects may not always be a true representation, as the individual effects of domestic debt servicing and external debt servicing on economic growth may have opposite results. As in the case of this analysis, both domestic and external debt servicing have a negative relationship with economic growth in the short run whereas the aggregate debt servicing shows an insignificant positive relationship.

In the long run, however, total debt servicing has a negative and significant effect on Zambia's economic growth at 5 percent level of significance. Holding all other things equal, a 1 percent increase in total debt servicing would result in a 0.19 percent reduction in Zambia's economic growth. It is therefore apparent that in the long run, individual effects of domestic debt servicing and external debt servicing propel each other as a result, and the total effect of debt servicing on economic growth remains negative.

These findings differ with those of Saungweme and Ohdiambo (2020) who concludes that the long run coefficient of total public debt servicing is insignificant but finds that in the short run total public debt servicing has a negative and statistically significant relationship with economic growth in Zambia. As such these study's findings are proof that there are still contradictions into the public debt servicing and economic growth relationship in Zambia and thus there is need for further insight into this relationship to ensure that the correct public debt servicing policies are adopted to improve the country's economic growth prospects.

The other determinants of economic growth that are significant are capital, the lagged value of capital and labor in the short run. Physical capital is found to have a positive link with economic growth, *ceteris Paribus*, a 1 percent increase in physical capital is expected to increase economic growth by 0.057 percent in the short run. The past value of physical capital has a negative link with economic growth, holding all other things equal, a 1 percent increase in the lagged value of physical capital would reduce economic growth by 0.073 percent in the short

run. Labor also has a negative impact on economic growth in the short run, other things equal, increasing labor by 1 percent would reduce economic growth by 0.69 percent in the short run.

The coefficient of Primary school enrolment rate is 0.76 and is statistically significant which implies that, holding all other factors constant, a 1 percent increase in primary school enrolment rate will lead to 0.76 percent increase in economic growth in the long run. Bratti et al (2004) also concluded that increases in primary school education contribute to increases in economic growth. Trade openness also has a positive coefficient of 0.89 and is statistically significant which implies that a 1 percent increase in trade openness will lead to 0.89 percent improvements in economic growth in the long run.

CHAPTER SIX

POLICY IMPLICATIONS, CONCLUSION AND RECOMMENDATIONS

6.0 Overview

This chapter highlights the findings of the study and policy implications. Thereafter, a conclusion is provided and suggestions of some areas of further study are given.

6.1 Policy implications

Public domestic debt servicing was found to have a significant negative impact on economic growth in both the short-run and the long-run. The negative relationship is an indication of an increased burden on the economy as both public and private investments decrease due to the high debt servicing obligations. Thus, the Zambian government should ensure that the borrowed funds from the domestic economy are directed towards productive investments which would in turn increase the country's economic capacity to repay its public domestic debt.

Public external debt servicing had a significant negative effect on economic growth in both the short run and the long run. The negative impact of external debt servicing and economic growth implies that there is more to be done as it relates to policies surrounding external debt and its repayment. As such the government of Zambia needs to adopt prudent policies when borrowing from external sources. Some of these prudent policies would be borrowing at low interest rates with long periods of repayment and better repayment plans, this would help minimize the long run debt accumulation. Because currently some of Zambia's Eurobonds are required to be paid in lump sum amounts which puts pressure of the economy.

Additionally, the negative long run effect of total debt servicing on economic growth is a depiction of the need for policy makers to ensure that borrowed funds are used for investment projects that contribute to the growth of the economy and not towards consumption, this can be done by ensuring transparency in utilization of borrowed resources. Lastly, government should not rely solely on external sources of financing and should ensure that they meet their debt obligations, this gives an opportunity for Zambia to show that it can manage its borrowings in a credible way.

6.2 Conclusion

This study investigated the effect of public domestic debt servicing on economic growth, the impact of public external debt servicing on economic growth and the effect of total public debt servicing and economic growth in Zambia over the period 1990 to 2019 using an autoregressive

distributed lag (ARDL) model, the bounds test for co-integration and the error correction mechanism. The estimated coefficients showed that in the long run, domestic debt servicing, external debt servicing and total debt servicing had a negative impact on economic growth. In the short run, the effects were negative and significant only for domestic debt servicing and external debt servicing, that of total debt servicing was positive but insignificant. The significant negative relationship of all three variables of debt servicing with real GDP are an indication of acceptance of the debt overhang hypothesis.

6.4 suggestions of areas of future research

The study focused on analyzing the impacts of public domestic, external and total debt servicing on economic growth. After establishing their negative relationships in a general way, these findings cannot specify exactly which aspect of domestic or external debt contributes to the negative impact. Therefore, there is need for further studies involving the specific compositions of debt servicing and how they are effect growth. I recommend the following areas for future research:

1. Examining the relationship between servicing concessional public debt and economic growth and servicing non-concessional public debt on economic growth in Zambia.
2. Investigating the impact of servicing treasury bills, arrears that government owes to public suppliers and other domestic debt entities on economic growth in Zambia.

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APPENDICES

Appendix A: Philips perron (Pp) unit root test on the log of variables

Variable	Level				First difference			
	Intercept		Trend and intercept		Intercept		Trend and intercept	
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value
LRGDP	0.82	0.99	-2.90	0.18	-3.31**	0.02	-3.42*	0.07
LK	-4.44***	0.00	-9.64***	0.00	-3.68**	0.01	-4.63**	0.01
LL	0.96	0.99	-2.99	0.15	-6.65***	0.00	-6.85	0.00
LEE	-1.99	0.29	-3.66**	0.04	-10.90***	0.00	-12.61***	0.00
LAYS	-3.34**	0.02	-5.57***	0.00	-3.90**	0.01	-3.12	0.12
LPER	-1.10	0.70	-2.07	0.54	-4.21***	0.00	-4.21**	0.01
LTO	-3.29	0.03	-3.30*	0.09	-6.99***	0.00	-7.09***	0.00
LDDS	-1.10	0.70	-2.80	0.21	-3.07**	0.04	-2.62	0.27
LEDS	-1.17	0.67	-2.67	0.28	-6.29***	0.00	-6.15***	0.00
LTDS	-0.6	0.85	-2.31	0.41	-3.42**	0.02	-3.13	0.12

P-values of coefficients: *P<0.1, ***p<0.01 and **p<0.05

Appendix B: Order of integration based on the ADF test and Pp unit root tests.

Variable	Order of integration based on ADF test	Order of integration based on Pp test
LRGDP	I(1)	I(1)
LK	I(0)	I(0)
LL	I(1)	I(1)
LEE	I(1)	I(1)
LAYS	I(1)	I(0)
LPER	I(1)	I(1)
LTO	I(1)	I(1)
LDDS	I(1)	I(1)
LEDS	I(1)	I(1)
LTDS	I(1)	I(1)