DEPARTMENT OF ECONOMICS

ANALYSIS OF THE IMPACT OF GOVERNMENT EXPENDITURE ON ECONOMIC GROWTH IN BOTSWANA

BY

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DECLARATION

I declare that this study is a true reflection of my own research work, except where referenced, and that it has not been submitted for the award of any degree or diploma to any other institution of higher learning.

Student Name :

Student Signature :

Date :

DEDICATION

To my family and friends.

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APPROVAL

This dissertation has been examined and approved as meeting the requirements for the partial fulfilment of Master of Arts degree in Economics.

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ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
BIDPA	Botswana Institute of Development Policy Analysis
BWP	Botswana Currency
CPI	Consumer Price Index
CUSUM	Cumulative Sum of recursive residuals
CUSUMQ	Cumulative Sum of recursive residuals of square
ECM	Error Correction Model
GDP	Gross Domestic Product
GMM	General Method of Moments
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LSDV	Least Squares Dummy Variables
NDP	National Development Plan
OLS	Ordinary Least Squares
PP	Phillips-Perron
SBC	Schwarz Bayesian Criterion
TOT	Terms of Trade
VECM	Vector Error Correction Model

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ABSTRACT

This study analysed the impact of government expenditure on economic growth in Botswana for the period 1981-2014. It focuses on sectoral expenditures on agriculture, education, health, and electricity and water supply using annual time series data from Bank of Botswana and World Bank databases. The study relies on the Autoregressive Distributed Lag (ARDL) bounds test for the empirical analysis. Results suggest expenditures on agriculture have a positive and significant impact on economic growth. This relationship is suggested in both the short run and long run models. The relationship is significant at 5 percent in the short run model and 1 percent in the long run model. Health expenditure has a positive and statistically significant impact at 1 percent level on economic growth in the long run model. Expenditures on water and electricity supply have a negative impact on economic growth at the 1 percent significance level. This suggests poor quality in spending on the sector. In terms of policy implications, the results of the study suggest the allocation of government resources towards the agriculture and heath sectors should be favoured in order to enhance economic growth.

CHAPTER ONE
INTRODUCTION

1.1 Background

The impact of government expenditures on economic growth has attracted considerable attention among researchers and policy makers. Two schools of thought have heavily influenced the debate. Classical economists such as Adam Smith (1776) and David Ricardo (1821) view increases in government spending as directing resources to less productive activities. They see the market as efficient without government intervention. Accordingly, increases in government expenditures are seen as likely to impede economic growth. Keynes (1936) argues for greater government intervention, stating that it can affect the growth process positively by supplying pure public goods that entail a huge aspect of aggregate demand.

Following Keynes (1936) pioneering work, the literature has grown to incorporate government sector in growth models. This literature is described in chapter three. Important to note is that several empirical studies have since been conducted to analyse the impact of government expenditure on economic growth. Results are often used to inform policy design to improve productivity of government expenditure. However, results of such studies tend to vary, highlighting the importance of country specific studies to avoid erroneous policy prescriptions. For example, using data on 43 developing countries, Devarajan *et al*. (1996) found that expenditures on health, education and transport & communication had either a negative or insignificant impact on growth. Baffes (1998) in his study of 25 developing and developed countries found expenditures on education, health and infrastructure to stimulate growth whereas military spending decreased it. Investigating the relationship for 30 European countries, Boldeanu (2015) found expenditures on agriculture, education, transport and communication to undermine growth while expenditure on defence had a positive and significant impact.

The broad objective of the current study is to analyse the impact of government expenditure on economic growth in Botswana, a resource-dependent developing country. The results of the analysis are used to draw policy implications for the design of policies to improve productivity of government expenditure in Botswana. As emphasized by the World Bank (2010), a crucial question for mineral dependent economies is whether mineral assets are transformed into productive sources of income rather than consumed by government and the current generation. Crucially, Botswana is expected to experience declining fiscal revenues,

owing to the expected decline of its resource sector (diamond mining) in the coming years, Botswana Institute of Development Policy Analysis (2015).Improving productivity of government expenditure is imperative for the economy. This study makes a contribution to the debate on the design of policies to improve productivity of government expenditures in Botswana.

1.2 Statement of the problem

Over the past four decades, Botswana's economy has been driven by mineral resources, especially diamonds. On the average, the mining sector has contributed about 38 percent to GDP, with at least 90 percent of total exports from mining being from diamonds, (Basdevant, 2008).Worth noting also is that about 30 percent of government revenues comprise of royalties and taxes from diamond mining, (BIDPA, 2015). However, diamonds are non-renewable resources, and it is expected that the country's diamond reserves will decline significantly over the next decade, along with diamond related fiscal revenues. According to Basdevant (2008), there is likelihood that Botswana's diamond reserves will be depleted by late 2020s. As diamond reserves decline, fiscal revenues are expected to contract significantly, with likely consequences on per capita government expenditure and development. Given the expected fiscal revenue contraction, it is imperative that the country assess its management of public finances, with a view to improving the quality or productivity of government expenditure. This was also emphasized in World Bank (2010). Through analysis of the impact of government expenditure on economic growth in Botswana, this study makes a contribution to the debate on this important policy issue.

1.3 Objectives of the study

Main objective

- To analyse the impact of government expenditure on economic growth in Botswana for the period 1981-2014.

Specific objectives

i. To analyse the impact of government expenditure on agriculture, education, health, transport and water & electricity supply on economic growth in Botswana.
ii. To derive policy implications for the design of policies to improve productivity of government spending from the empirical results.

Main research question:

- Is government expenditure productive in driving economic growth in Botswana?

Specific research questions

i. What is the impact of government expenditures on agriculture, education, health, transport and water & electricity on economic growth in Botswana?
ii. What policy implications can be derived from empirical results and be used in the design of policies to improve productivity of government spending?

1.4 Significance of the Study

This study makes a contribution to the debate on the design of policies to foster economic growth in Botswana. It focuses on the ways in which productivity of government expenditure can be improved with a view to promoting sustainable development. In addition, the study makes an empirical contribution to knowledge on the impact of government spending and economic growth from developing country context.

It is worth noting that the impact of government expenditure on economic growth in Botswana has been investigated before. For example, using ordinary least squares, Chepete (1997) examined the effect of government expenditure on economic growth for the period 1973/74 – 1995/96. It was found that health and education expenditures negatively affected economic growth. Botshelo (2010) used an Error Correction Model (ECM) to analyse the long run relationship between government expenditure and economic growth for the period 1974/75 to 2007/08. The study also found a negative relationship between health and education expenditures and economic growth in Botswana. Using development expenditure as a proxy for government size, Mogotsi and Mupimpila (2003) analysed the impact of government size on economic growth for the period 1978-1998. The study found that until 1995, government development expenditure enhanced growth and after 1995 it retarded it. Kalayakgosi (2015) tested for the existence of the Armey curve and optimal government size and found the optimal size to be 42.3 percent. The study also found no evidence of the existence of the Armey curve.

This study deviates from these studies in a number of ways. Firstly, the study considers more sectors. In particular, the study considers the effect of expenditures on agriculture, transport, electricity and water supply, in addition to health and education, which were considered in previous studies. The expenditures on these sectors have increased sharply since 2004/05.

Expenditure on agriculture has increased by 65.1 percent; while transport has increased by 228.34 percent (Bank of Botswana, 2014). Expenditures on education and health increased by 103.3 percent and 108.82 percent respectively (see Bank of Botswana, 2014). The increase in expenditures in these sectors was mostly developmental for only two sectors which are; transport, and electricity and water supply. Expenditures on agriculture, education and health were mostly recurrent.

Given this trend, it is not unreasonable to argue that government expenditures could outgrow revenues, particularly, given the expected fall in fiscal revenues in the coming years, which is likely to lead to large budget deficits and increasing external borrowing. The increase in government borrowing could in turn make it a growing competitor with the more productive private sector, with likely adverse effects on the economy. It is thus important to identify sectors that are effective in driving economic growth to improve efficiency in the allocation of public expenditure. Secondly, the study relies on the Autoregressive Distributive Lag (ARDL) approach by Pesaran *et al.* (2001) in the analysis of the impact of government expenditure on economic growth. The ARDL technique assimilates long-run and short-run dynamics without losing information about long-run relationship, (Oshota, 2014). In this regard, it recognises the outside lag inherent in fiscal policy; the time between policy action and its influence on the economy. According to Afonso (2008), public expenditure might induce a certain impact in the economy in the period in which they are actually realised and a different impact in subsequent periods. To the best of the knowledge of the researcher, this study is the first to apply this approach for Botswana.

1.5 Scope of the Study

The study covers the period 1981 - 2014. This period is important in that it is when the country experienced significant increases in government spending. An analysis of how productive these spendings have been is worthwhile, considering the expected fall in fiscal revenues in the coming years and the need to improve efficiency in the allocation of fiscal revenues.

1.6 Organisation of the dissertation

The purpose of this section is to provide a synopsis of the chapters contained in this dissertation. Chapter two provides an overview of government expenditure trends in Botswana during the study period. It also provides a description of the economy's performance during the study period. Chapter three describes theoretical and empirical

contributions to the literature on the impact of government expenditure on economic growth. This study builds on this literature. Chapter four describes the methodology used to carry out the objectives of the study. Results of the empirical analysis are described in chapter five while policy implications arising from the results are described in chapter six.

CHAPTER TWO

AN OVERVIEW OF GOVERNMENT EXPENDITURE TRENDS AND ECONOMIC GROWTH IN BOTSWANA

2.1Overview of Sectoral Expenditures and Economic growth in Botswana

This chapter presents an overview of the historical trends in government expenditure (development and recurrent) by sectors and economic growth in Botswana. The section begins with a discussion of each of the sectoral expenditures and economic growth.

2.2 Education Expenditure

Government expenditure on education comprises of recurrent and development expenditures. These are spending on schools (pre-primary, primary, junior secondary, senior secondary, vocational schools, and extension of existing learning programmes as well as sponsorship for post-secondary education), research and general administration. The government develops human resources by investing in education and training to raise productivity. As can be seen from figure 1, the education sector has been receiving the largest share of total expenditure in annual budgets over the years. Education expenditure averaged 23.25 percent of total expenditure in the ten years 2004-2013. Some of the initiatives taken to improve access to education in the period include the establishment of a medical university and introduction and implementation of Early Childhood Care in all urban and district councils in 2008/09. Furthermore, the number of primary schools has risen from just 25 in 1966 to 812 (753 district council schools and 59 private schools) in 2012. The number of secondary schools increased from only 9 in 1966 to 279 in 2012, (Statistics Botswana, 2014).

2.3 Health Expenditure

Government expenditure on health covers the provision of health services, family planning activities, nutrition activities and emergency services. Health expenditure averaged 10.44 percent of total expenditure in the ten years 2004-2013 (figure 1). The figure shows a rising trend in health expenditure with a more than 100 percent increase from BWP 2076 million in 2004 to BWP 4531 million in 2013. According to the Botswana Government (2007), this increase reflects in part the cost of coping with the HIV/AIDS epidemic, building of new hospitals and HIV/AIDS clinics across the country.

2.4 Agricultural Expenditure

Agricultural expenditure covers crops, livestock, forestry and fisheries. It also includes spending on research and extension, irrigation, vaccines, maintenance of fences for grazing areas, provision of subsidized animal feed to livestock holders in case of drought as well as emergency measures for disease control. Figure 1 shows a rise in public expenditure on the agricultural sector of more than 100 percent from BWP 536.8 million in 2004 to BWP 1749.70 million in 2013. This rise is attributable to programmes established by the government in its effort to diversify the economy by commercialising the agricultural sector as stated in the Botswana's tenth National Development Plan (Botswana Government, 2007).

2.5 Transport Expenditure

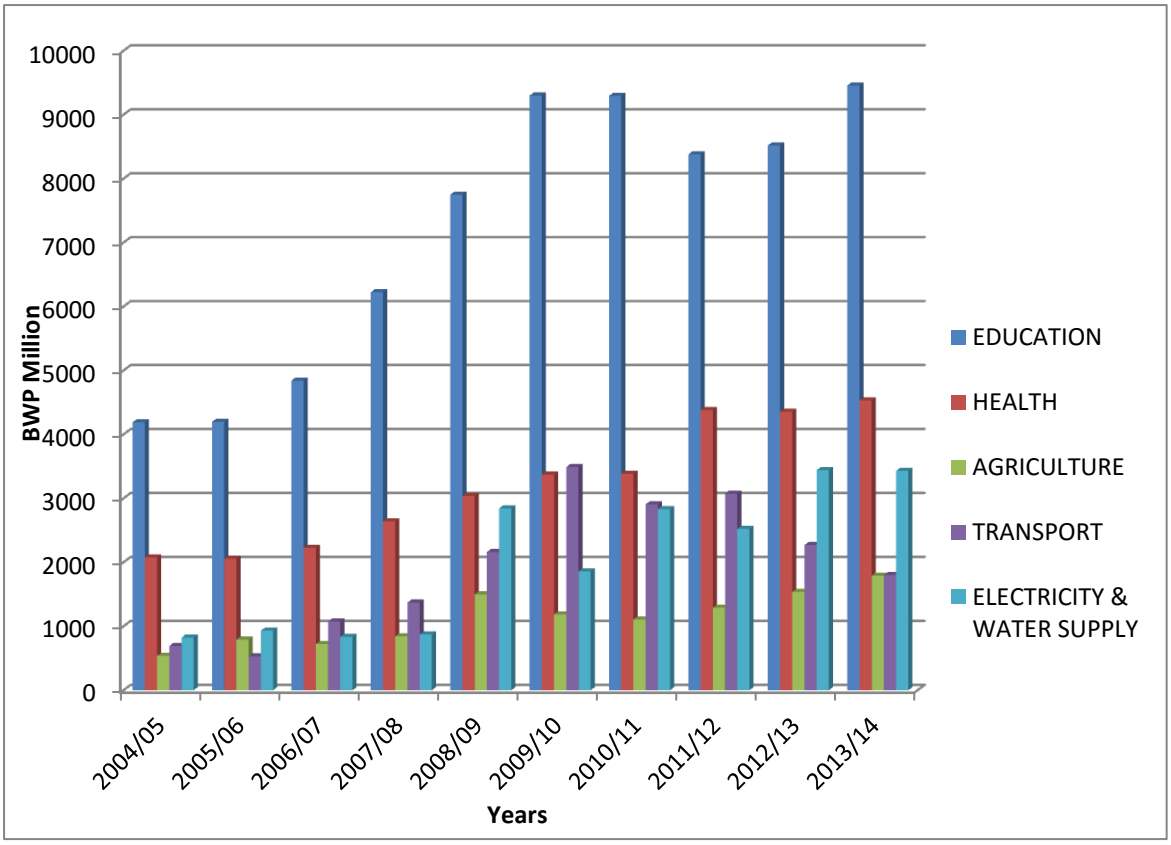
Expenditure on transport includes spending on road transport, railways and civil aviation. Transport gateways support trade in goods and the tourism industry. Consequently, National Development Plan (NDP) 10 also focused on transport sector to provide a well-developed and reliable system of infrastructure for the country consisting of roads, railways and buildings. Transport expenditure increased from [1]BWP 523.75 million in 2004 to BWP 3074.52 million in 2011, an increase by more than 100 percent. This covered ongoing and new projects such as roads, bridges as well as the expansion and refurbishment of local airports (Botswana Government, 2007).

[1] BWP represents Botswana Pula

2.6 Expenditure on Water and Electricity Sector

This involves the provision of water and electricity to the general public and for businesses. These are critical inputs for economic growth. The government strives to maintain adequate power supply in the country in spite of the high cost of providing it in its effort to transform from a net importer to self- sufficiency. This consists of maintaining the power infrastructure in place, putting up new transmission lines and facilitating the rural electrification programme for expansion of village network. Expenditure on water involves spending on improvement of water infrastructure such as water pipes and dams, effluent waste water management exploitation, rain water harvesting, grey water recycling as well as development of policies and strategies for efficient utilisation of water resources. The country has been experiencing shortages in the supply of water and electricity and to mitigate against these, spending on the sector has increased tremendously from BWP 823.73million to BWP 3429.20 million from the year 2004 to 2013. This is an increase of more than 100 percent within ten years and it is depicted in figure1.

Figure 1: Trends in Government Sectoral Expenditure



Source: Author's computations based on data from Bank of Botswana databases.

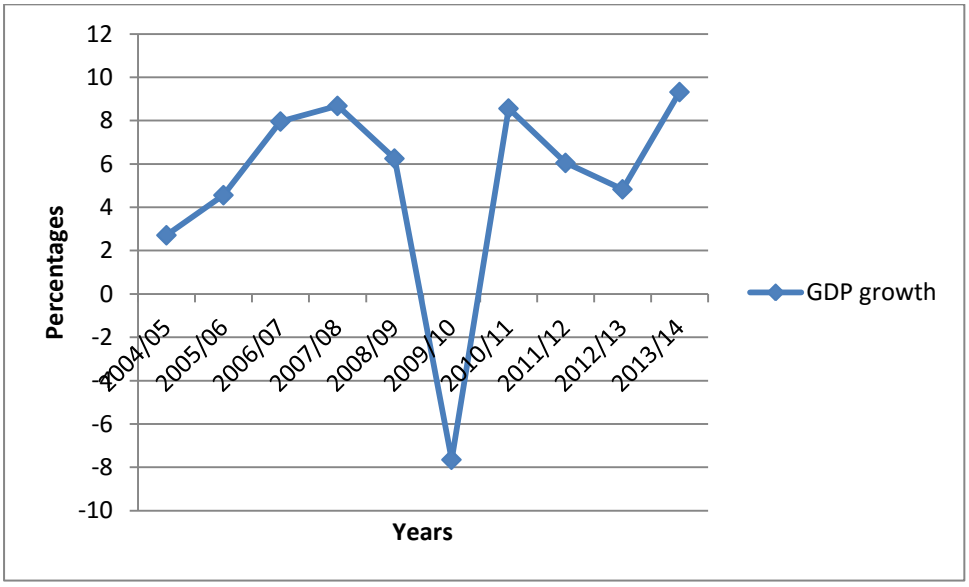
2.7 Economic Growth

Botswana has benefited from the fastest per capita income growth rates since independence. Economic growth averaged 9 percent annually from 1967-2006. However it contracted during the 2008-2009 world economic recession. Botswana's economic growth is driven largely by the mining sector, particularly diamond revenues since the discovery of diamonds in the 1970s. In 2014, diamond mining accounted for more than a third of Gross Domestic Product (GDP) and 70-80 percent of export earnings, [2]BIDPA (2015). Other key sectors are manufacturing, tourism, construction, financial services and agriculture. In 2009, the economy contracted by 7.65 percent as a result from the global economic crisis which lessened demand for diamonds. This is illustrated in figure 2. The economy did recover from the economic crisis, registering a robust growth of 9.32 percent in 2013 as a result of returned activity in the mining sector. However growth slowed down again in 2014 to about 4.3 percent GDP per capita growth due to a small overall growth in the non-mining activities.

[2] BIDPA is Botswana Institute of Development Policy Analysis

Particularly the water and electricity supply sector which declined sharply because of the supply challenges it experienced and measures taken to address them. Figure 2 below shows trends in economic growth for a period of ten years (2004-2013).

Figure 2: Trends in Economic Growth



Source: Author's computations based on data from World Bank databases.

CHAPTER THREE
LITERATURE REVIEW

3.1 Introduction

This chapter reviews theoretical and empirical literature on the relationship between government expenditure and economic growth. It is divided into three sections; the first part looks at the theoretical literature, the second part comprises of the empirical literature and the last section is an overview of the empirical literature.

3.2Theoretical literature

Adam Smith in his book 'Wealth of Nations' (1776) maintained that governments should restrict their actions to safekeeping of internal peace and order, defence against foreign aggression and public development. He considered all other functions besides these to be outside the scope of the government and as such spending on those areas wasteful. However over past years the functions of government have been expanding and thereby increasing public expenditure. This is explained by the contribution of scholars to literature on the subject.

Wagner (1893) pronounced his law of increasing growth of government activities. The law stated that there is a relationship between government expenditure and economic growth but the direction of causality runs from economic growth to government expenditure. Wagner proposes three main foundations for the increase in government expenditure. Industrialization led to the replacement of private sector by public sector activities as government functions like administrative and protective functions increase. Secondly, the need for governments to provide welfare services like public health, education, old age pension, food subsidy, natural disaster aid, environmental protection programs also led to an increase in government expenditure. The third motive is that increased industrialization brings out technological change and large firms that tend to monopolize. Consequently, governments will have to compensate for this outcome through the provision of social and merit goods from the budget. Wagner (1893) stated that government expenditure is an endogenous factor, influenced by the growth of national income. Therefore, it is national income that determines public expenditure. Wagner made his arguments by studying the economic growth of Germany which nevertheless applies to other countries, developing and developed.

The Keynesians, preferred government intervention to correct market failures. Keynes stated in his book "General Theory of Employment, Interest and Money" (1936) that during recession a policy of budgetary expansion should be undertaken to increase aggregate demand in the economy, thereby boosting output. Increasing government expenditure was seen as providing individuals with the purchasing power and producers to increase production, creating more employment. This is referred to as the multiplier effect and it reflects causality from government expenditure to national income. Keynes identified government spending as an exogenous variable instead of endogenous in generating growth. He considered public spending as a tool that increases aggregate demand and brings stability in the short run. The greatest limitation of this theory is that it fails to adequately consider the problem of inflation which could be instigated by a rise in government spending.

Peacock and Wiseman (1961) carried out a study based on Wagner's Law for the United Kingdom from 1891 to 1955. The results found that Wagner's Law was still valid. They stated that the increase in government expenditure depends significantly on the level of revenue collected. They found that economic growth heralded a considerable amount of revenue to governments (since tax revenue increases with the growth of the economy) which in turn facilitated a rise in public expenditure (a displacement effect). Peacock and Wiseman used the political stance instead of the organic state which postulates that government like to spend, people do not favour increase in taxes and that people will always choose increase in social services. Thus like Wagner's law, the Peacock-Wiseman hypothesis emphasizes the fact that government expenditure tends to increase overtime.

Musgrave (1969) asserted that the rise of government spending could be associated with the pattern of economic growth and development in societies. He stated that in the early development stage, substantial expenditure is essential for infrastructure and education; in the rapid growth phase there are huge increases in private saving but a fall in investment thus an increase in government expenditure (recurrent). Lastly high income countries have a high demand for private goods therefore; public investment is used to complement such. These factors and more, lead to an increase in government expenditure relative to output.

Romer (1989) developed endogenous growth models which distinguished between productive and non-productive expenditure. The categorisation implied that productive expenditure have a direct effect on the rate of economic growth but unproductive have

indirect or no effect. The level of human capital variable like education or scientific talent were found to be correlated with both the rate of growth of income per capita and the share of total output devoted to investment in physical capital.

Barro (1990) extended existing models of endogenous economic growth to incorporate a government sector in his empirical cross-country study of relationship among the size of government, growth and saving. The study found that government expenditure on productive and investment activities has a positive effect on economic growth whilst government consumption spending as growth retarding.

3.3 Review of Empirical Evidence

3.3.1 Results for studies in developed and developing countries

Aschauer (1989) studied the impact of government spending on economic growth in the united states of America and found that, expenditure on the main infrastructure (streets and highways, mass transit, water and sewage systems and electricity and gas supplies) had a great influence on economic growth, whereas infrastructure in police and fire stations, court houses office and buildings had a small positive impact on growth. Education infrastructure such as the construction of classrooms was insignificant in impacting growth.

Devarajan *et al*.(1996) examined the impact of the composition of public expenditure and economic growth in 43 developing countries for the period 1970-1990. The findings were contradictory to theory in the sense that all expenditures considered productive; Capital, health, education and transport and communication had either a negative or insignificant impact on economic growth. Current expenditure on the other hand had a positive influence. The study constructed public expenditure with a lag of five to Gross Domestic Product (GDP) per capita, due to the fact that expenditure takes some time to influence the economy.

Baffes *et al*. (1998) explored the relationship between public spending, sectoral allocation choices and economic growth. They examined time series data for a cross section of 25 countries for the period 1965-84. The paper concluded that labour, expenditures on education, health and infrastructure stimulate economic growth whilst military spending had a negative effect on economic growth for a considerable number of countries.

In Lebanon, Saad (2009) examined the effects of public expenditure by sector for the period 1962-2007. The study focused on key sectors such as agriculture, defence, education and health using Error Correction Model and Johansen cointegration procedures. The study found that in the long run, education has a positive impact on growth whereas defence has a negative one and agriculture and health insignificant in explaining growth. In the short run, health and education impacted Lebanon growth negatively whilst defence and agriculture had no impact.

According to Ebiringa and Charles (2012) it is critical to evaluate the impact of some priority sectors' expenditures on economic growth. In this regard, the paper investigated the impact of government sectoral expenditure on the economic growth of Nigeria. They used the Ordinary Least Squares (OLS) and Error Correction Model (ECM) to estimate the variables. The findings specified a negative effect of expenditures on Transportation and Agriculture on economic growth. Expenditures on defence, telecommunications, health and education sectors had a positive impact on economic growth in Nigeria.

Kapunda and Topera (2013) investigated the impact of sectoral expenditure, capital and recurrent expenditures on economic growth in Tanzania using the ordinary least squares approach for the period 1965 to 2010. The results showed that expenditures in agriculture, health and infrastructure had a positive and significant impact on growth. Education had a negative but insignificant influence on growth.

Musaba *et al.* (2013) investigated the impact of sectoral expenditure on economic growth in Malawi using time series data for the period 1980-2007 and cointegration analysis in the form of Vector Error Correction Model (VECM) techniques. The study categorised public expenditure in terms of the United Nation Classification of the Functions of Government (COFOG), a standard for categorising government activities. The results showed that there was no significant relationship between government sectoral expenditure and economic growth in the short run. In the long run there was a positive effect of expenditure on defence and agriculture on growth and a negative impact from expenditures on, social protection, education, health and transport and communication.

Muthui *et al.* (2013) studied the relationship between government expenditure components and economic growth in Kenya using VECM for the period 1964 to 2011. They found that

defence expenditure negatively affected economic growth whereas health, transport and communication as well as public order and security influenced growth positively.

Aschenke (2014) investigated the impact of government expenditure on economic growth in Ethiopia during the period 1975 - 2013 with a particular focus on sectoral expenditure in agriculture, defence, education and health sectors. The study used the vector error correction model and found a negative relationship between defence expenditure and growth in the short run. In the long- run, education had a positive and significant impact on growth whereas expenditures on agriculture and defence had a negative and significant impact.

Adu and Ackah (2015) investigated the relationship between disaggregated government spending and economic growth in Ghana for the period 1970 to 2010 using Autoregressive Distributed Lag (ARDL) approach. They found that capital expenditure had a negative and significant impact on growth both in the short run and long run. Recurrent expenditure had a positive impact. Capital and labour also had a positive significant impact on economic growth. The terms of trade were found to have a positive significant effect and inflation impeded economic growth.

Aremu *et al.*(2015) determined the extent to which government expenditures in sectors such as; agriculture, defence, education and transport and communications were contributing to the achievement of growth objective in Nigeria for the period 1984-2013. The study employed ARDL cointegration approach to determine both long-run and short-run impacts. The findings indicated that agriculture promoted growth, whilst defence retarded it and other sectors had no impact in the short-run. In the long-run, expenditure on the sectors had no impact on economic growth except for defence expenditure which had a negative effect.

Boldeanu (2015) analysed the relationship between public expenditure and economic growth for 30 European countries for the period 1991 - 2012. The paper employed Ordinary Least squares (OLS), Least Squares Dummy Variables (LSDV) and General Methods of Moments (GMM) methods. The study found a negative impact of public expenditures in education, social protection, agriculture and transport and communication on economic growth. Defence had a positive and significant explanatory power on economic growth and health expenditure was insignificant in determining economic growth.

Salimi (2016) examined the relationship between government sectoral expenditure and economic growth in Malaysia for the period 1970-2012 using ARDL approach to cointegration. The study found a positive and significant impact of capital formation, labour force and health expenditure on economic growth. Education expenditure was found to be growth debilitating.

3.3.2Current Research on Botswana

In Botswana studies on the relationship between government expenditure and economic growth have generally focused on the components of government expenditure in aggregate and disaggregated forms. Chepete (1997) studied the effects of the composition of government expenditure on growth in Botswana. The study analysed the relationship for the period from 1973/74 to 1995/96 using Ordinary least squares. The variables under study included expenditures on capital, recurrent, health, education, economic services and defence as well as terms of trade, consumer price index and drought. The study found a negative and significant impact of expenditures of health and education on growth whereas expenditure on defence was positive but insignificant. Terms of trade and inflation were also found to have a positive and significant impact on economic growth.

Mogotsi and Mupimpila (2003) used development expenditure as a proxy for government size and analysed the impact of government size on economic growth for the period 1978-1998. The study found government size to enhance growth for the period 1978-1995, but adversely affected growth for the period after 1995.

Botshelo (2010) employed ordinary least squares and ECM to determine the relationship between public expenditure and the long run economic performance of Botswana for the period 1974/75 to 2007/08. The study focused on variables such as; total expenditure, recurrent expenditures, development expenditures, Consumer Price Index, terms of trade, tax revenue, other expenditures, and specific public expenditure components (expenditures incurred in ministries and sectors for functioning of economy e.g. health, education, skills and development, defence, economic services and housing, urban and regional development). Results showed a negative relationship between total government expenditure and economic growth. The results indicated a negative effect of expenditures on health, housing, urban and regional development as well as education, skills and development on growth. Defence expenditures had a positive and significant impact and economic services had a positive but

insignificant impact. Consumer price index and Terms of Trade also had a positive influence on growth. Tax Revenue however had an insignificant and negative impact on growth.

Kalayakgosi (2015) tested the existence of Armey curve and a government size that optimized growth. The study found an optimal size of 42.3 percent, and no evidence of the existence of the Armey curve in Botswana.

While this study relies on these studies as a departure point, it deviates from the studies in two of ways. Firstly, the study disaggregates government expenditures into different sectors of the economy and analyses the extent to which these sectoral government expenditures contribute to economic growth. Secondly, it employs a different methodology from those employed in previous studies. The study employs the Autoregressive distributed lag (ARDL) model approach to cointegration due to Pesaran *et al*. (2001) which has been shown to be superior to the methods used in previous studies. For example, the technique permits analysis of variables of different integration order which avoids volatile results, and is suitable for small samples such as in this study. Details of the technique are provided in chapter four.

CHAPTER FOUR
METHODOLOGY

4.1 Introduction

This chapter describes the methodology employed to address the research questions.

4.2Theoretical and Empirical Methodology

This study follows Barro (1990) who extends existing endogenous growth models to incorporate government sector (government purchases of goods and services) into an economy's production function. This is done by adding public spending to Romer (1986)'s AK model. This means government spending is an input in the production function and it is this role which creates a potential positive relationship between the government and growth. The production function is specified below;

$$\boldsymbol{Y_{(t)} = f\left(K_{(t),} L_{(t),} G_{(t)}\right)}(1)$$

Where, Y is the output (Gross Domestic Product (GDP)), K is capital, L is labour and G is government sector. This production function states that output (GDP) is a function of capital, labour and government spending.

4.3 Model specification

Empirically, the study adopts the model of Aschenke (2014);

$$\boldsymbol{Y_t = f(L_t, K_t, G_t, X_t)} \quad (2)$$

In the model, output (Y) is a function of two factors of production, capital (K), and Labour (L) as well as components of government expenditure (G). X represents a vector including other factors affecting economic growth. These could be terms of trade, consumer price index, trade openness, real exchange rate, life expectancy and tax revenue which have been included as determinants of economic growth in studies of Chepete (1997), Botshelo (2010), Kapunda and Topera (2013), Aschenke (2014) and Adu and Ackah (2015).

This study modifies it to represent Botswana economy as follows;:

$$\boldsymbol{lnGDP = \beta_0 + \beta_1 lnK_t + \beta_2 lnL_t + \sum_{i=1}^{m} \beta_{3i}\, lnG_{it} + \sum_{i=1}^{m} \beta_{4i}\, lnX_{it} + u_t} \,(3)$$

Where: log GDP denotes economic growth, K is capital, L represents labour and $X_{it}$is a vector of the other factors which influence growth in Botswana.

In this model, X is a vector comprised of consumer price index, terms of trade and tax revenue are included to control for internal market distortions, trade and impact of revenue on

economic growth. G is a vector representing the sectoral expenditures; agriculture, education, health, transport and electricity & water supply. u_t is the error term, β_0 is the constant and $\beta_1, \beta_2, \beta_3, \beta_4$ are growth elasticities. K, L and G are capital, labour and government expenditure respectively. Government expenditure is then disaggregated into sectoral expenditures due to the washing out effect; for example, a 10 percent increase in growth due to expenditure in agriculture and a decline in growth of same amount due to expenditure in education may be interpreted as no growth influenced by the expenditures in aggregate form. Thus economic growth can be written as a function of disaggregated sectoral expenditures, capital, labour, tax revenue and CPI;

$$GDP=f(K, L, Agr, Edu, Hea, Tra, CPI, Tot, Tr) \quad (4)$$

Where**;** GDP represents Gross domestic product, K is capital, L is labour, Edu signify education expenditure, Agr denote agriculture expenditure, Tra stands for transport expenditure, Hea means health expenditure, CPI is the consumer price index as a measure of inflation, tot stands for terms of trade and tr denotes tax revenue. The model will be testing the short-run and long-run impacts of government expenditures on agriculture, education, health, transport and electricity &water supply sectors on economic growth.

4.4 Justification and expected signs of Variables

This section involves definition of the variables included in the model and the expected signs of their coefficients from estimation.

4.4.1 Economic Growth

This is the dependent variable in the model and represented by the gross domestic product per capita growth. This is a measure of total output of a country that takes GDP and divides it by the total population. A rise in per capita GDP implies growth in the economy and also signals an increase in productivity.

4.4.2Education Expenditure

It is the share of expenditure in education from GDP. It includes the expenditure the government incurs to fund basic education, by paying salaries for teachers and lecturers, creation of infrastructure such as construction of classrooms, lecture halls, offices and purchase of learning equipment. It also includes expenses on scholarships whether local or abroad. Economic theory suggests that an increase in education expenditure will increase growth in the economy since it means the development of human capital making it productive. Keynes (1936), states that education expenditure raises productivity of labour and

increases the growth of national output. Barro and Sala-i-Martin (1992) as well as Kneller (1998) also classified education expenditure as a productive spending which has a direct positive impact on the rate of economic growth. Therefore, a positive sign is expected for this variable.

4.4.3 Health Expenditure

This is measured as the share of public expenditure on health from GDP. It is the amount that the government spends in construction of hospitals building structures, equipping the hospital institutions. Health expenditure is treated as an investment because of the addition to human capital it entails. Keynes (1936) considers health spending to raise economic growth by increasing productivity of labour. Consequently, this variable is expected to have a positive sign.

4.4.4 Agriculture Expenditure

This is the share of expenditure in agriculture from GDP. It includes expenses such as buying modern agricultural equipment, agricultural inputs such as improved seeds, training and hiring a number of agricultural development agents as well as research and development. Barro (1990) considers all investment expenditures as productive expenditures and thus resulting in economic growth. Therefore, this variable is expected to have a positive sign.

4.4.5 Transport Expenditure

This is the share of government expenditure in transport sector from GDP. It is used to improve the transportation in Botswana like road, air, and rail transport. According to Keynes (1936), expenditure in infrastructure such as transport reduces production costs, increase private sector investment and profitability of firms and thereby promoting economic growth. The transport is regarded as important in facilitating private domestic investment, by reducing the cost of business which in turn raises growth. Kneller (1998) also classifies this spending as a productive expenditure, which implies a positive relationship with economic growth. Therefore, this variable is expected to have a positive sign.

4.4.6 Expenditure on Electricity and Water supply

This is expected to have a positive influence on economic growth. This sector is necessary for the promotion of stable supply of electricity and water. Spending on infrastructure like electricity and water supply is also considered to foster economic growth by reducing production costs, raising private sector investment and profitability of firms, Keynes

(1936).Therefore, the expenditure on electricity and water supply variable is expected to have a positive sign.

The study recognises that there are some factors other than government expenditure that influence growth of the economy. In an attempt to control for these, the below variables have been included in the model;

4.4.7 Capital

This is an input in the production function. It is measured using gross fixed capital formation as a percentage of GDP, proxy for capital stock. Romer (1986) and Barro (1990) consider capital as an input in the production function and having a positive relationship with the growth of an economy. An increase in capital means more production which raises output. Thus this variable is expected to have a positive sign.

4.4.8 Labour

This is measured as the labour force employed in production of goods and services. This is also considered an input in the production function and thus having a positive impact on economic growth by theory of Romer (1986). An increase in Labour is expected to enhance economic growth and consequently the variable is expected to have a positive sign.

4.4.9 Consumer Price Index

This is the consumer price index. It is included in the model to control for internal market distortions. The consumer prices indicate the movements in retail prices of consumable goods and services and these movements in prices help government in formulating policies. A rise in the level of inflation is expected to increase the cost of borrowing leading to a fall in private investment and in turn a decrease in the growth of the economy. Therefore the CPI variable is expected to have a negative impact on growth.

4.4.10 Tax Revenue

This is income that the government receives from tax. It can be from individuals, corporations, imports as well as the purchase of goods and services. Harberger (1962) postulates that tax policy can influence the marginal productivity of capital by distorting investment from heavily taxed sectors into more lightly taxed sectors with lower overall productivity and this retards economic growth. Tax revenue is expected to have a negative sign.

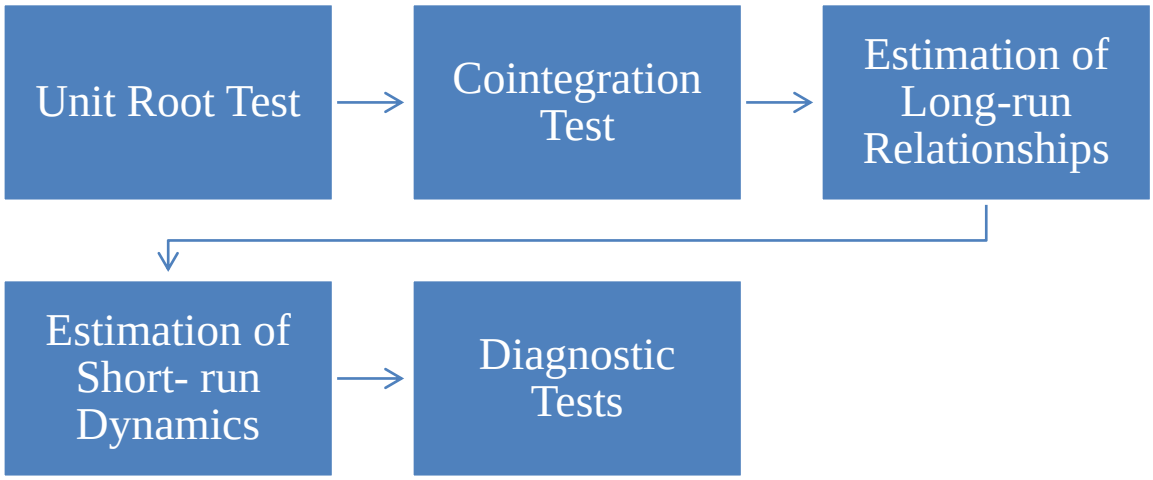
4.4.11 Terms of Trade

This is measured as the net barter terms of trade. It is a comparison of domestic exports with prevailing international imports. Theory by Mendoza (1997) postulates that an increase in price of the commodity export increases the expected rate of return on investment in that sector thus augmenting capital accumulation and economic growth. This implies that an improvement in the terms of trade increases economic growth and deterioration declines it. Consequently, either a positive or negative sign is expected for this variable.

4.5 Techniques of Data Analysis

This study uses Eviews 7 to analyse the impact of sectoral expenditures on growth. The first step is to test for unit root to ascertain properties of the time series data used, then selection of the conditional Autoregressive Distributed Lag (ARDL) model to be used in testing for cointegration. Next is the cointegration test to determine if there exists a long-run relationship between the variables. If this relationship exists then an Autoregressive Distributed Lag approach is used to estimate the long- run relationships of the variables with growth and short- run dynamics of the series. Lastly diagnostic tests are run to test validity of the model for policy inferences. Figure 3 shows a summary of the steps followed in the analysis;

Figure 3: Summary of tests to be taken in analysis



These tests are described in full below;

4.5.1Unit Root Tests

The study uses time series data which generally may inherently exhibit some strong trends. Time series data is considered stationary if its properties are independent of time (Hamilton, 1994). A variable that is stationary has the same mean and variance in each period of time and is also not dependent on the time lag. If data has a unit root, it cannot be used for forecasting as the regression would produce spurious results. The test statistics and the adjusted R-squares may be overestimated and therefore, regression processes may present incorrect inferences. This shows the importance of conducting unit root tests to determine the order of integration of the variables before estimation. This involves testing a null hypothesis of unit root against an alternative hypothesis of no unit. The tests are done on variables at levels and differenced forms. If series are stationary at levels, they are said to be integrated of order zero, that is, I (0), if they are stationary after first differences, they are integrated of order one, that is, I (1). Similarly, if series are stationary after second differences, then they are integrated of order two I (2). There are a number of tests such as the Augmented Dickey fuller (ADF), Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) used to test for stationarity of time series data. This study employs the Phillips-Perron (PP) procedure and KPSS to test for stationarity of variables. The Phillips-Peron advanced by Phillips-Perron (1988) is advantageous over the ADF test in that it has a robust power in test and one does not need to specify a lag length for the test regression. This means that there is no problem of misspecification of the lag length. If the lag length is too small, then the remaining serial correlation in the errors will bias the test. If the lag length is too large, then the power of the test will suffer (Kwiatkowski *et al.,*1992). However, according to De Jong and Whiteman (1991), the KPSS stationarity test should be used in conjunction with either the Phillips-Perron or ADF tests to overcome their tendency of having low power tests if the process is stationary but with a root close to the non- stationary boundary. Therefore in this analysis, the KPSS test proposed by Kwiatkowski *et al.*,(1992) is used to support the Phillips-Perron test.

4.5.2 Cointegration tests

The Autoregressive Distributed Lag (ARDL) analysis requires that variables used in the model be cointegrated. Therefore, after unit root tests the next step is to test for the existence of a long run relationship among the variables. The cointegration test is done using bounds testing approach proposed by Pesaran *et al.* (2001). This involves conducting a wald test and comparing the estimated F-statistic with the critical lower and upper bound values appropriate for the sample size taken from Narayan (2005). The critical bounds values are

generated for small sample sizes from 30 to 80 observations. The F-statistic tests the significance of the lagged levels of the variables. This test for cointegration investigates whether per capita GDP growth has a long run relationship with government expenditures in agriculture, health, education, transport and electricity & water supply as well as terms of trade, CPI, and tax revenue. This approach is preferred over other conventional techniques since it is efficient in small samples and allows estimation of cointegration through ordinary least squares, Adu and Ackah (2015). Moreover, it is does not require variables to be integrated of the same order, Oshota (2014). This means that the model can be applied for variables integrated of both I (0) and I (1).Furthermore, according to Pesaran *et al.* (2001), the ARDL model is applicable even when variable show signs of endogenous properties and makes corrections for any residual serial correlations. The sample size of this study is 34 implying that this test will be appropriate. Information criterion such as Akaike's information criterion (AIC) and Schwarz's Bayesian criterion (SBC) are used to select the appropriate lag to use in determining the ARDL model.

The ARDL equation for regression of order (P, q1, q2, q3, q4, q5, q6, q7, q8,q9, q10) is;

$$\begin{aligned}\Delta lnGDP_t = {} & \alpha_0 + \beta_1 lnGDP_{t-1} + \beta_2 lnK_{t-1} + \beta_3 lnL_{t-1} + \beta_4 lnAgr_{t-1} + \beta_5 lnEdu_{t-1} \\ & + \beta_6 lnHea_{t-1} + \beta_7 lnTra_{t-1} + \beta_8 lnEWs_{t-1} + \beta_9 lnCPI_{t-1} + \beta_{10} lnTOT_{t-1} \\ & + \beta_{11} lntr_{t-1} + \sum_{i=1}^{p} \alpha_{1i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{q1} \alpha_{2i}\, \Delta lnK_{t-i} \\ & + \sum_{i=1}^{q2} \alpha_{3i}\, \Delta lnL_{t-i} + \sum_{i=1}^{q3} \alpha_{4i}\, \Delta lnAgr_{t-i} + \sum_{i=1}^{q4} \alpha_{5i}\, \Delta lnEdu_{t-i} \\ & + \sum_{i=1}^{q5} \alpha_{6i}\, \Delta lnHea_{t-i} + \sum_{i=1}^{q6} \alpha_{7i}\, \Delta lnTra_{t-i} + \sum_{i=1}^{q7} \alpha_{8i}\, \Delta lnEWs_{t-i} \\ & + \sum_{i=1}^{q8} \alpha_{9i}\, \Delta lnCPI_{t-i} + \sum_{i=1}^{q9} \alpha_{10i}\, \Delta lnTOT_{t-i} + \sum_{i=1}^{q10} \alpha_{11i}\, \Delta lntr_{t-i} + \varepsilon_t \end{aligned} \quad (5)$$

Where: Δ is first difference operator, p is lag order of dependent variable and q_i is the lag orders of independent variables. The expressions with the summation sign ($\alpha_1 - \alpha_{11}$) signify the short run dynamics of the model while the long run multipliers are given by the coefficients of the lagged-levels variables ($\beta_{1-}\beta_{11}$), $\varepsilon_t$is the error term and all the other terms are as defined before.

HYPOTHESES

The following hypothesis will be tested in order to achieve stated objectives;

Ho: $\boldsymbol{\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = 0}$; No long-run relationship exists

H1: $\boldsymbol{\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 = \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq 0}$; long-run relationship exists

There is cointegration among variables if computed value of F-statistic is greater than the upper critical bound value. If the lower critical bound value is greater than computed F-statistic then we fail to reject the null hypothesis. This implies that there is no long run relationship among the variables. . If the calculated F-statistic value is between lower and upper critical bounds values then decision about cointegration is inconclusive. Given the existence of cointegration among the variables, the next step is to estimate that long –run relationship.

4.5.3 Estimation of Long-run Relationships

After establishing that a long-run relationship exists between economic growth and the independent variables in the model, the next step is to estimate the coefficients the long-run relationships. This investigates the impact of each of the independent variables on growth and this is done using ARDL model specified as follows;

$$lnGDP_t = \alpha_0 + \beta_1 lnK_{t-1} + \beta_2 lnL_{t-1} + \beta_3 lnAgr_{t-i} + \beta_4 lnEdu_{t-i} + \beta_5 lnHea_{t-1} + \beta_6 lnTra_{t-1} + \beta_7 lnEWs_{t-1} + \beta_8 lnCPI_{t-1} + \beta_9 lnTOT_{t-1} + \beta_{10} lntr_{t-1} + \varepsilon_t (6)$$

These are long run elasticities for capital, labour, agriculture expenditure, education expenditure, health expenditure, transport expenditure, electricity & water supply expenditure, CPI, terms of trade and tax revenue respectively.

4.5.4 Estimation of Short-run dynamics

The unrestricted error correction representation of the ARDL model is then used to estimate the short-run coefficients and is specified as follows;

$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta lnGDP_{t-i} + \sum_{i=1}^{q1} \alpha_{2i} \Delta lnK_{t-i} + \sum_{i=1}^{q2} \alpha_{3i} \Delta lnL_{t-i} + \sum_{i=1}^{q3} \alpha_{4i} lnAgr_{t-i} + \sum_{i=1}^{q4} \alpha_{5i} \Delta lnEdu_{t-i} + \sum_{i=1}^{q5} \alpha_{6i} \Delta lnHea_{t-i} + \sum_{i=1}^{q6} \alpha_{7i} \Delta lnTra_{t-i} + \sum_{i=1}^{q7} \alpha_{8i} \Delta lnEWs_{t-i} + \sum_{i=1}^{q8} \alpha_{9i} \Delta lnCPI_{t-i} + \sum_{t-i}^{q9} \alpha_{10i} \Delta lnTOT_{t-i} + \sum_{t-i}^{q10} \alpha_{11i} \Delta lntr_{t-i} +$$

$$\delta ECT_{t-1} + \varepsilon_t \quad (7)$$

Where; ECT_{t-1} is the error correction term, δ is the coefficient of adjustment to equilibrium, α_0 is the intercept, α_i are short-run dynamics coefficients and other terms are as defined before.

4.5.5 Diagnostic Tests

The last step is to test the validity of the ARDL model and this is done by carrying out diagnostic tests. The Cumulative Sum of Recursive residuals (CUSUM) and Cumulative sum of squared recursive residuals (CUSUMQ) are applied to examine stability of parameters. The parameters are considered stable if the plot of both the CUSUM and CUSUMQ statistics lie within the 5 percent critical band confidence interval. The model is also verified by residual tests such as serial correlation test, Heteroskedasticity tests and Jarque Bera test for normality. If the probabilities of the test statistics are insignificant, then we fail to reject the null hypotheses of no serial correlation, no heteroskedasticity and non-normality respectively. This means that the residuals in the model are free from serial correlation, are homoskedastic and normally distributed. The model is also tested for multicollinearity among variables. If there is a problem of multicollinearity, this means that it will be difficult to get separate individual impacts of the independent variables on growth. The diagnostic tests are carried out for the selected ARDL model and the short run model.

4.6 Data type and Sources

The study uses annual time series data for the period 1981 - 2014 .Government expenditure data by sector, macroeconomic variables and data on per capita GDP is collected from Bank of Botswana and the World Bank databases. The data is analyzed using E-views software.

CHAPTER FIVE
ESTIMATION AND ANALYSIS OF RESULTS

5.1 Introduction

This chapter provides results obtained from estimating model in chapter four. The application of the Autoregressive Distributed Lag (ARDL) bound test approach requires that variables in the model be integrated of order zero, I(0) and/or one I(1) and none to be of order two I(2) as such data will invalidate methodology. Thus this chapter begins with an examination of the time series properties of variables in the model, followed by a test for equilibrium relationships, results from unrestricted ARDL model and its error correction as well as results from diagnostic tests.

5.2 Stationary/Unit root test

To test for stationarity of the data, the Phillips- Perron (PP) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests were utilised. The PP test developed by Phillips and Perron (1988) uses non parametric statistical methods to take care of the possible serial correlation of the error terms without adding lagged difference terms and as such is believed to be more reliable. The test is also suitable for small samples such as the one used in this study with 34 observations. Furthermore, this prevents problems of lag length misspecifications. The KPSS advanced by Kwiatkowski *et al.,* (1992) complements the PP unit root test. According to De Jong and Whiteman (1991), the KPSS is powerful in situations whereby the process is stationary but with a root close to the non-stationary boundary. The objective of undertaking these tests is to ensure that the variables are stationary but not integrated of order two to avoid spurious results.

Table 1: Phillips-Perron Unit Root Test Results

Phillips -Perron (PP)					
Variable	**Levels**		**First Difference**		**Integrated order**
	Constant	**Constant and trend**	**Constant**	**Constant and trend**	**I (d)**
	t-statistic	**t-statistic**	**t-statistic**	t-statistic	
lnGDP	-4.845212	-3.895124	-2.946834***		I(1)
lnL	0.5247	-3.4572***			I(0)
lnK	-3.0275**				I(0)
lnAgr	-2.3521	-2.2326	-7.0043*		I(1)
lnEdu	-0.6949	-4.0235**			I(0)
lnHea	0.1337	-3.1101	-6.2646*		I(1)
lnTra	-2.4663	-2.3454	-5.5430*		I(1)
lnEws	-1.9414	-3.28401***			I(0)
lnCpi	-3.6826*				I(0)
lnTot	-1.9397	-1.8158	-4.6493*		I(1)
lnTr	7.0699	2.2049	-2.4295	-4.2540**	I(1)

Note: Computed by author using Eviews 9 and (*,**,***) implies significant at 1%, 5% and 10% levels respectively.

I(0) means the variable is stationary at levels i.e. integrated of order zero, I(1) means the variable is stationary at first difference i.e. integrated of order one and I(2) means variable is stationary after differencing it twice.

The Phillips-Perron unit root test results indicate that Labour, capital, Consumer Price Index (CPI), log of expenditures in education and electricity and water supply are stationary at levels, some with constant only and others with constant and trend. The dependent variable per capita Gross Domestic Product (GDP) growth (represented by GDP), terms of trade, and expenditures in agriculture, health and transport are found to be stationary after first difference with only a constant. Thus we reject the null hypothesis of unit root for all the variables at levels and first difference. The series are stationary.

Table 2: KPSS Unit Root Test Results

KPSS							
Variable	**Levels**		**First Difference**		**Second Difference**		**Integrated order**
	Constant	**Constant and trend**	**Constant**	**Constant and trend**	**Constant**	**Constant and trend**	**I (d)**
	LM-statistic	**LM-statistic**	**LM-statistics**		**LM-statistics**		
lnGDP	0.1838	0.1299***					I(0)
lnL	0.6454**						I(0)
lnK	0.1878	0.1282***					I(0)
lnAgr	0.4890**						I(0)
lnEdu	0.6830**						I(0)
lnHea	0.5862**						I(0)
lnEWs	0.5072**						I(0)
Lntra	0.1205	0.1163	0.1650	0.0445	0.0231	0.0173	N/A
lnTot	0.2116	0.1642**					I(0)
lnTr	0.7218**						I(0)

Note: Computed by author using Eviews 9 and (*,**,***) implies significant at 1%, 5% and 10% levels respectively.

The results from the KPSS unit root test show that logs of; capital, labour, terms of trade, tax revenue, expenditures in agriculture, education, health and electricity and water supply are stationary at levels. These variables are all stationary with a constant only save for capital and terms of trade which are stationary with constant and a trend. The log of expenditure in transport contains a unit root; it is not stationary in levels, after differencing once and twice. Therefore we fail to reject the null hypothesis of unit root for only the transport variable.

In conclusion, the PP and KPSS tests show that the variables are stationary and integrated of orders zero I(0) and order one I(1) except for transport which was found to be non-stationary by the KPSS. To avoid spurious regression and following ARDL bounds requirement that series be integrated of order zero and or order one, the transport variable is removed before testing for cointegration.

5.3 Cointegration

Subsequent to the stationarity tests, variables which are found to be stationary at levels and after first difference are then tested for the long-run equilibrium relationship. In this case, the

first step is to estimate equation 5 and select the optimal lag length of the variables in the model and this was done using Akaike Information Criteria (AIC). A model ARDL (1,1,0,1,1,1,1,1) with the minimum AIC was selected. The numbers show the optimal lag lengths of the variables in the model. Tax revenue and Labour are not included in the model because of their high collinearity with one another. Tax revenue is also highly correlated with expenditures on education, health and agriculture. Labour is also highly correlated with expenditures on health, education and electricity and water supply as shown in appendix A 4.

Table 3: ARDL (1, 1, 0, 1, 1, 1, 1, 1)

Dependent Variable: D(LNGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42.44195	15.26537	2.780276	0.0156
D(LNGDP(-1))	0.195997	0.186639	1.050139	0.3128
D(LNAGR(-1))	-1.954768	1.697181	-1.151773	0.2702
D(LNHEA(-1))	-2.168359	1.484104	-1.461056	0.1677
D(LNEWS(-1))	2.104371	1.092774	1.925714	0.0763
D(LNK(-1))	5.052634	2.920307	1.730172	0.1073
D(LNCPI(-1))	2.338160	1.473850	1.586429	0.1367
D(LNTOT(-1))	12.45484	6.272000	1.985785	0.0686
LNGDP(-1)	-1.707973	0.340381	-5.017820	0.0002
LNAGR(-1)	5.767546	1.685209	3.422452	0.0045
LNEDU(-1)	3.676014	2.319790	1.584632	0.1371
LNHEA(-1)	3.014502	1.003610	3.003657	0.0102
LNEWS(-1)	-5.152391	1.577601	-3.265966	0.0061
LNK(-1)	-3.601329	2.656552	-1.355640	0.1983
LNCPI(-1)	-3.261279	1.507400	-2.163512	0.0497
LNTOT(-1)	-7.157676	3.310061	-2.162400	0.0498

R-squared	0.862160	Mean dependent var	-0.040569
Adjusted R-squared	0.703115	S.D. dependent var	1.535585
F-statistic	5.420830	Akaike info criterion	2.782393
Prob(F-statistic)	0.001993	Schwarz criterion	3.536763
		Hannan-Quinn criter.	3.018652
		Durbin-Watson stat	2.351030

This is a good model as indicated by an R-squared of 0.86, which implies that about 86 percent of the variation in economic growth is explained by the variation in the independent variables in the model. The adjusted R- square is about 0.70. The F-statistic of 5.42 with

probability of 0.0019 confirms the joint significance of all independent variables at 1 percent significant level.

Diagnostic tests were also undertaken to ensure for reliability of the model for policy deductions. The results are shown in table 4.

Table 4: Diagnostic tests

Diagnostic Test	Test statistic	Probability
Breusch-Godfrey Serial Correlation LM test	2.286	0.147
Breusch-Pagan-Godfrey Heteroskedasticity test	0.955	0.538
Ramsey RESET Test	2.554	0.136
Normality test	0.225	0.893
Stability test: CUSUM test	Stable	
CUSUM of squares test	Stable	

The Breusch-Godfrey LM test was used to test for serial correlation and it showed an F-statistic with probability value of 0.147 which is insignificant; consequently we fail to reject the null hypothesis of no serial correlation in the model. This means that the model does not suffer from the problem of autocorrelation. The Breusch –Pagan-Godfrey test for Heteroskedasticity has an F-statistic with a probability value of 0.538, hence we also fail to reject the null hypothesis of heteroskedasticity and conclude that the model does not suffer from the problem of heteroskedasticity. The Ramsey RESET test results show an F-statistic with a probability value of 0.136 which is insignificant and therefore imply that the model is well specified. The normality results which are also presented in appendix A 1 in the appendices show that the Jarque Bera statistic is 0.225 with a probability of 0.893; consequently we fail to reject the null hypothesis of normality. This implies that the residuals are normally distributed. The results of the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMQ) tests indicate stability of the coefficients in the model. This is shown by the plot of the CUSUM and CUSUMQ which lie within the critical bands of the 5 percent confidence interval of the parameter stability as illustrated in appendices A2 and A3 respectively. In addition, the correlation matrix shown in appendix A5 of the appendices suggests that multicollinearity is not a problem for the model.

5.3.1 Wald Test for Cointegration

From the ARDL (1, 1, 0, 1, 1, 1, 1, 1) model, a Wald test is taken to determine the existence of a long-run relationship between the variables. This involves comparing the estimated F-statistic with the critical lower and upper bound values by Narayan (2005). If the F- statistic value is larger than the upper critical bound value then we can conclude that there is cointegration in the model. If however the F-statistic value is smaller than the lower bound critical value then there is no cointegration. An F- statistic that is between the lower and upper bound critical values produces inconclusive results for cointegration. The results of the bounds test are presented in table 5.

Table 5: Wald Test results

Wald Test:

Test Statistic	Value	Df	Probability
F-statistic	3.798870	(8, 13)	0.0163
Chi-square	30.39096	8	0.0002

Source: Estimated and generated from Eviews 7 by author.

The F-statistic from the Wald test is 3.79 which exceeds the lower bound critical value (2.21) and the upper bound critical value (3.39) at 10 percent level of significance. The critical values are obtained from case II in Narayan (2005) table presented in the appendix A 10 of the appendices. Accordingly the null hypothesis of no long run relationship is rejected. There is cointegration among the variables. This means that the independent variables in the model; expenditures on agriculture, education, health, electricity & water supply as well as CPI, capital, and terms of trade and have an impact on economic growth in the long run. The long run relationships can then be estimated to validate this and obtain individual impacts of the independent variables in the model on growth.

5.3.2 Long-run Relationships

Subsequent to ascertaining cointegration between economic growth and the independent variables in the model (capital, labour, CPI, terms of trade as well expenditures on agriculture, education, health and electricity and water supply sectors), the next action is to estimate those long run relationships. This involves the analysis of the impact of each of the independent variables on the growth of the economy. This analysis is based on equation six in chapter four.

Table 6: Estimation of Long run Relationships

Variable	long run elasticity	t-statistic	std error	probability
Intercept	24.84	2.832	8.772	0.0141
Lnagr	3.376	4.982	0.677	0.0003
Lnedu	2.152	1.676	1.283	0.1175
Lnhea	1.764	3.551	0.496	0.0035
Lnews	-3.016	-4.054	0.743	0.0014
Lnk	-2.108	-1.324	1.592	0.2082
Lncpi	-1.909	-2.581	0.755	0.0252
Lntot	-4.190	-2.245	1.866	0.0428

Source: Authors computation, estimated and generated using Eviews 7

The results in Table 6 indicate that in the long-run, government expenditure in agriculture (lnagr) has a significant positive impact on economic growth. They show that a 1 percent increase in the expenditure in agriculture leads to a rise in economic growth by 3.37 percent. This verifies the long run equilibrium relationship between expenditure in agriculture and economic growth. Agriculture is a very labour intensive sector which provides sustenance and employment and hence an increase in output. The findings conform to the expected signs and support studies in developing countries by Aremu *et al. (*2015), Musaba *et al*. (2013) and Chidoko (2012) which considered agriculture expenditure to stimulate growth.

Similarly, results also suggest that an increase in health expenditure (lnhea) by 1 percent will raise growth by 1.76 percent. This indicates that in the long run, health expenditure has a positive effect on the growth of the economy in Botswana. This is synonymous with the aforementioned expectations and conforms to findings of Baffes (1998), Ebiringa and Charles (2012), Muthui (2013) and Salimi (2016). They do however differ from previous studies in Botswana by Chepete (1997) and Botshelo (2010) who found health expenditure to impede growth.

Furthermore, the results also suggest that in the long run, expenditure on the Electricity and water supply sector (lnews) causes a decline in the growth of the economy. A rise of 1 percent in the expenditure on electricity and water supply reduces growth by 3.01 percent. This is contrary to theory and findings of Aschuer (1988). It indicates that government expenditure in this sector has not been productive.

The terms of trade (lntot) were found to have a negative and significant impact on economic growth. Deterioration in the terms of trade by 1 percent reduces the growth of the economy by 4.19 percent. This result is synonymous with previous expectations. It is however contrary to results of Botshelo (2010) in Botswana. This is because the country's main export diamonds were not doing well internationally as a result of the economic recession of 2008-2009 and Botshelo (2010) study covered a period when there was an improvement in terms of trade (1974 to 2007).

Moreover, the consumer price index (lncpi) was found to have a negative impact on economic growth. This matches with our previous expectations and the results from a study by Adu and Ackah (2015) in Ghana.

In addition, Education expenditure (lnedu), and capital (lnK) were found to have insignificant impacts on growth.

5.3.3 Short run Dynamics

The existence of long run relationships among the variables makes it possible to estimate the error correction model. The error correction model illustrates the short run dynamics of the model and its coefficient measures the speed of adjustment to reach equilibrium in the event of shocks. Table 7 presents the results of the short run growth equation;

Table 7: Estimation of Short Run Dynamics

Dependent Variable: D(LNGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.081630	0.214510	0.380543	0.7083
D(LNGDP(-1))	-0.258033	0.160876	-1.603925	0.1271
D(LNAGR(-1))	3.031672	1.173779	2.582831	0.0194
D(LNEDU(-1))	-2.231552	2.728019	-0.818012	0.4247
D(LNHEA(-1))	1.897388	1.530284	1.239893	0.2319
D(LNEWS(-1))	-1.032177	0.742880	-1.389427	0.1826
D(LNK(-1))	2.242602	2.503418	0.895816	0.3829
D(LNCPI(-1))	-1.264587	0.996738	-1.268726	0.2216
D(LNTOT(-1))	-1.238053	3.867866	-0.320087	0.7528
ECT(-1)	-1.400526	0.420691	-3.329111	0.0040
R-squared	0.739064	Mean dependent var		-0.034326
Adjusted R-squared	0.600921	S.D. dependent var		1.591927
F-statistic	5.350001	Akaike info criterion		3.127288
Prob(F-statistic)	0.001501	Schwarz criterion		3.607228
		Hannan-Quinn criter.		3.269999
		Durbin-Watson stat		2.287344

Source: Computed by Author using Eviews 7.

The error correction term ECT (-1) is highly significant at 1 percent level, its coefficient is negative which means that the feedback mechanism is effective. After shock, the speed of adjustment back to long run equilibrium is 1.40.This indicates that when a shock or disequilibrium occurs 140 percent of the deviation from the long run equilibrium is corrected in the following year. In essence, full long run equilibrium is achievable within a year.

In the short run, only expenditure on agriculture has a positive and significant influence on growth. A 1 percent increase in the expenditure on agriculture raises growth by 3.03 percent. This implies that agriculture in Botswana is productive and very important for the growth of the economy.

The results in table 7 indicate that in the short run, expenditures in education, health, electricity and water supply as well as capital, terms of trade and CPI have an insignificant influence in explaining the growth of the economy.

The model was estimated with an R-squared of 0.73, this indicates that about 73 percent of the variation in economic growth is explained by the variation in the independent variables in the model. The adjusted R- square is about 0.60. The F-statistic of 5.35 with probability of 0.0015 confirms the joint significance of all independent variables at 1 percent significant level.

5.3.4 Diagnostic tests

To ensure for reliability of the results from the model for inferences, diagnostic tests are carried out. The table 8 show the results from the Breusch-Godfrey LM test for serial correlation, Breusch-Pagan-Godfrey test for heteroscedasticity, and Jarque Bera test for normality.

Table 8: Diagnostics Tests

Diagnostic Test	Test statistic	Probability
Breusch-Godfrey Serial Correlation LM test	1.085	0.363
Breusch-Pagan-Godfrey Heteroskedasticity test	1.020	0.462
Ramsey RESET Test	0.312	0.583
Normality test	0.414	0.812
Stability test: CUSUM test	Stable	
CUSUM of squares test	Stable	

The Breusch-Godfrey LM test for serial correlation shows an F-statistic with probability value of 0.363 which is insignificant; therefore we fail to reject the null hypothesis of no serial correlation in the model. This suggests that the model does not suffer from the problem of autocorrelation. The Breusch –Pagan-Godfrey test for Heteroskedasticity has an F-statistic with a probability value of 0.462, hence we also fail to reject the null hypothesis of heteroskedasticity and conclude that the model is homoskedastic. The Ramsey RESET test results shows an F-statistic with a probability value of 0.312 which is insignificant and therefore suggests that the model is well specified. The normality results which are presented in appendix A 6 in the appendices show that the Jarque Bera statistic is 0.414 with a probability of 0.812; subsequently we fail to reject the null hypothesis of normality. This implies that the residuals are normally distributed. The results of the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMQ) tests indicate stability of the coefficients in the. This is shown by the plot of the CUSUM and CUSUMQ which lie

within the critical bands of the 5 percent confidence interval of the parameter stability as illustrated in appendices A7 and A 8 respectively. In addition, the correlation matrix shown in appendix A 9 of the appendices suggests that multicollinearity is not a problem for the model.

CHAPTER SIX
CONCLUSIONS AND POLICY IMPLICATIONS

6.1 Introduction

This chapter presents the conclusion of major findings, policy implications, limitations of the study and suggestions on areas of further research.

6.2 Conclusion

The major objective of this study was to investigate the impact of government expenditure on economic growth in Botswana. The specific objectives were to analyse the impact of government expenditures on agriculture, education, health, transport and electricity and water supply on economic growth in Botswana. Annual time series data for the period 1981 to 2014 and the Autoregressive Distributed Lag (ARDL) technique was used to carry out the empirical analysis. The unit root tests of Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) were conducted to test stationary level of the data. The variables were found to be stationary and integrated of order zero and order one except for transport expenditure which was found to be non-stationary and thus removed from the model to avoid spurious results. This also allowed for the ARDL bounds test approach to cointegration to be performed as it requires that variables be stationary at either level, after first differencing or both. An ARDL model is dynamic and thereby allows for estimation of long run and short run relationships. It is also applicable in small samples such as the one under study. The cointegration test revealed the existence of a long run relationship between economic growth and the independent variables in the model. This means that government expenditures in agriculture, education, health, electricity and water supply as well as control variables of Consumer Price Index (CPI), terms of trade and capital have a long run relationship with growth in Botswana. The findings from estimation of this relationship indicate for a negative and significant impact of electricity and water supply expenditure on growth both in the long run and the short run. This means that spending in electricity and water supply is not productive. This is due to poor quality of spending on projects that result in supply challenges. The consumer price index and the terms of trade also have a negative relationship with economic growth. Agricultural expenditure and health expenditure were also found to have a positive and significant impact on growth. This suggests that agriculture and health expenditures are productive in the growth process of Botswana economy. However,

education expenditure and capital were found to have an insignificant impact on economic growth.

6.3 Policy Suggestions

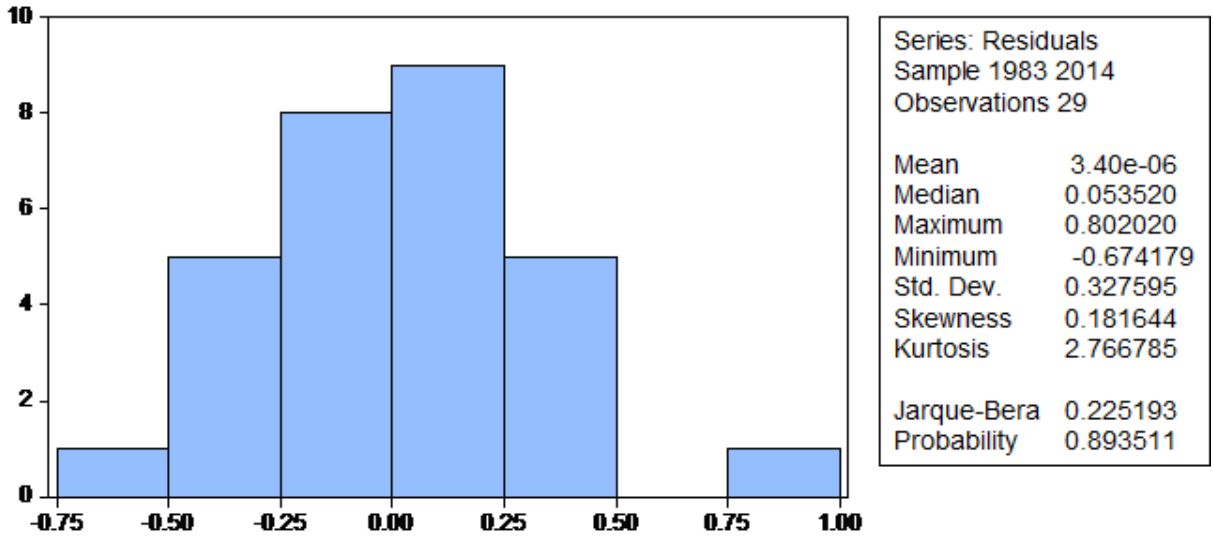
The present analysis shows that spending on agriculture and health are the only government expenditures that are positively related to economic growth and have a significant impact in the long run. This means that these expenditures are productive in effecting economic growth. Therefore, policies favouring allocation of resources to the agriculture and health sectors are recommended to stimulate the growth of the economy for sustainable development. This can be done by improving on current policies in place and a formulation of better ones for commercialisation of agriculture and to promote productivity of the sector to increase its share in exports. It also supports an increase in investment in health sector as a form of human capital. According to the findings of this study, expenditure on electricity and water supply affects growth adversely. This is attributed to poor quality of spending on projects that went past their lives and resulted in supply challenges. The study recommends that government put in place policies for better management of projects and their transparency to improve the efficiency and effectiveness of the expenditure and thereby economic growth.The result of an insignificant impact of education expenditure on growth is unexpected and contrary to findings of Chepete (1997) and Botshelo (2010). These results could be due to data or methodological issues. Consequently, a further investigation of the relationship is recommended.

6.4 Limitations of study and areas of further research

The major drawback in this study was the insufficient data. Expenditure data has not been disaggregated into sectors except for education and health for periods before 1981 and the data for 2015 were not available at the time the study was undertaken. Growth from government expenditure may take longer periods of time to materialise and more data would enable for higher lag lengths to be used in estimation to capture this. As such, studies with more observations might reveal different results. The other limitation was that transport expenditure was found to be non- stationary and therefore could not be included in the model. In this study education expenditure was found to be insignificant in explaining growth, a further investigation on this variable is recommended.

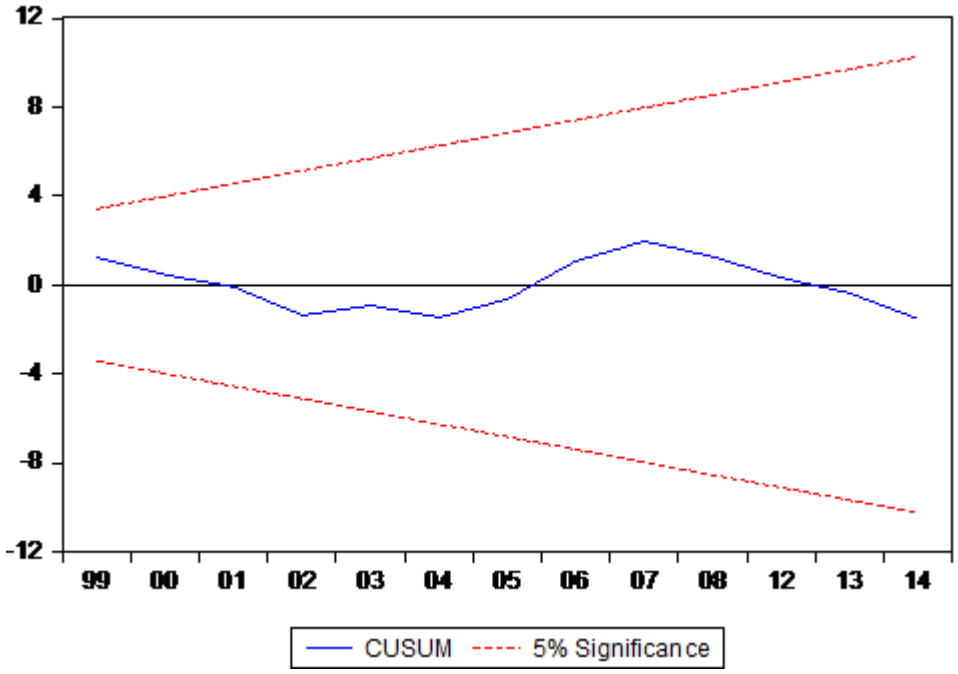
APPENDICES

Appendix A 1 : ARDL Model Normality test

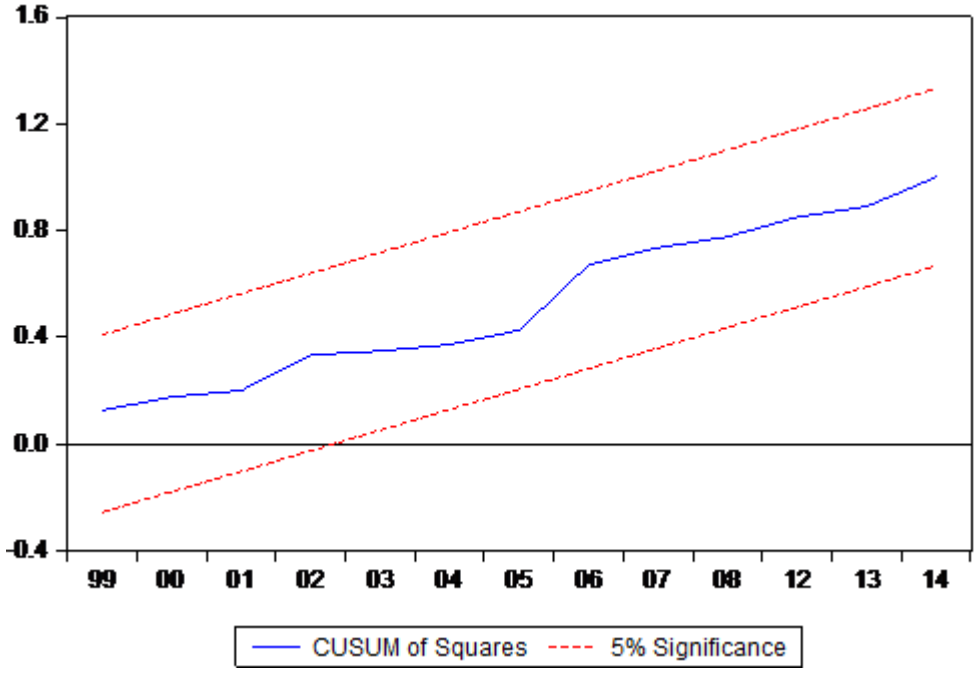


Source: Computed by author from Eviews 7

Appendix A 2: ARDL Model CUSUM test for Stability



Appendix A 3 : ARDL Model CUSUM of Squares test for stability



Source: Computed by author from Eviews 7

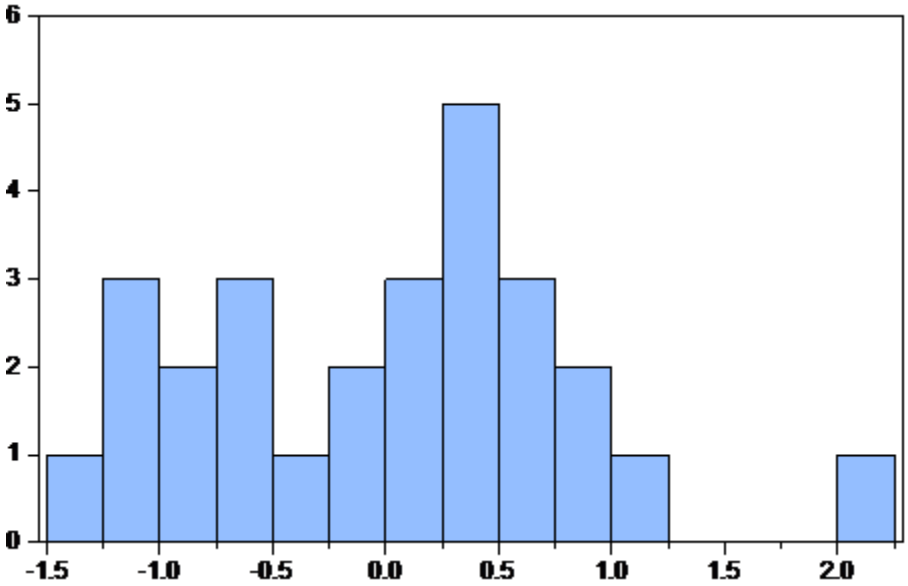
Appendix A 4: Matrix Correlations Prior to Regressions

	LNL	LNK	LNAGR	LNEDU	LNHEA	LNEWS	LNTRA	LNCPI	LNTOT	LNTR
LNL	1									
LNK	0.270197	1								
LNAGR	-0.59665	0.065193	1							
LNEDU	0.907033	0.452846	-0.43178	1						
LNHEA	0.909664	0.435928	-0.3897	0.836762	1					
LNEWS	0.633065	0.227623	0.007553	0.637784	0.656211	1				
LNTRA	0.13121	0.651336	0.253393	0.378616	0.217951	0.351245	1			
LNCPI	-0.56408	0.046731	0.284029	-0.44673	-0.47502	-0.52186	-0.01516	1		
LNTOT	0.164273	-0.21159	-0.4375	0.145524	-0.03534	-0.20451	-0.39176	-0.20918	1	
LNTR	0.926848	0.154863	-0.65503	0.820335	0.801016	0.553499	-0.01085	-0.54943	0.423362	1

Appendix A 5: Matrix Correlations For The ARDL Model

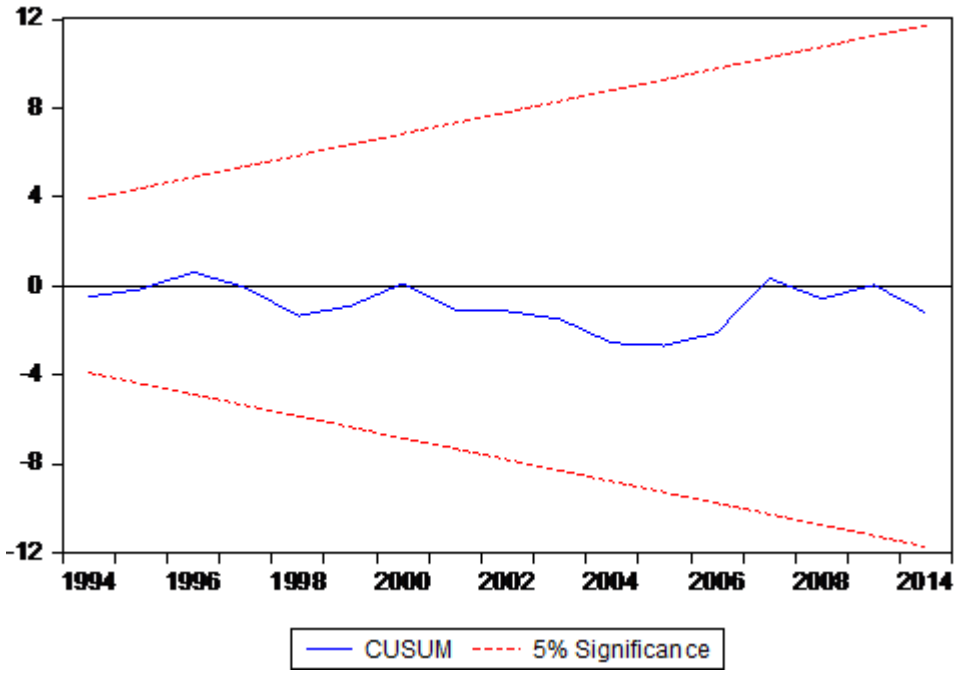
	D(LNGDP(-1))	D(LNAGR(-1))	D(LNHEA(-1))	D(LNEWS(-1))	D(LNK(-1))	D(LNCPI(-1))	D(LNTOT(-1))	LNGDP(-1)	LNAGR(-1)	LNEDU(-1)	LNHEA(-1)	LNEWS(-1)	LNK(-1)	LNCPI(-1)	LNTOT(-1)
D(LNGDP(-1))	1.000														
D(LNAGR(-1))	-0.025	1.0000													
D(LNHEA(-1))	-0.027	0.1156	1.0000												
D(LNEWS(-1))	0.327	0.2485	0.2480	1.0000											
D(LNK(-1))	0.032	-0.1125	0.2745	0.1647	1.000										
D(LNCPI(-1))	-0.042	0.3029	0.2697	0.2991	0.016	1.0000									
D(LNTOT(-1))	0.123	-0.1974	-0.1972	-0.3948	0.098	-0.4006	1.0000								
LNGDP(-1)	0.632	-0.1621	-0.2463	0.1422	0.121	-0.0046	0.1829	1.0000							
LNAGR(-1)	0.073	0.2813	-0.1664	0.0772	-0.043	-0.0099	0.1771	0.3618	1.000						
LNEDU(-1)	0.009	0.2288	0.3455	0.1586	0.202	0.0628	-0.4184	-0.2080	-0.532	1.000					
LNHEA(-1)	0.081	0.2357	0.3178	0.1225	0.223	0.0989	-0.3120	0.0476	-0.450	0.787	1.000				
LNEWS(-1)	0.233	0.3167	0.2372	0.5456	0.176	0.1098	-0.0953	0.1415	0.055	0.529	0.559	1.0000			
LNK(-1)	-0.074	-0.1330	-0.1616	0.0825	0.297	-0.0308	-0.4395	0.1464	-0.000	0.337	0.373	0.1682	1.00		
LNCPI(-1)	-0.074	0.0871	0.0225	0.2865	-0.148	0.4885	-0.3569	-0.0756	0.270	-0.345	-0.371	-0.3356	0.04	1.000	
LNTOT(-1)	-0.008	-0.1711	0.2050	-0.2807	0.458	0.0833	0.2466	-0.1732	-0.407	0.282	0.021	-0.2218	-0.09	-0.220	1.000

Appendix A 6: Short Run Model Normality Test

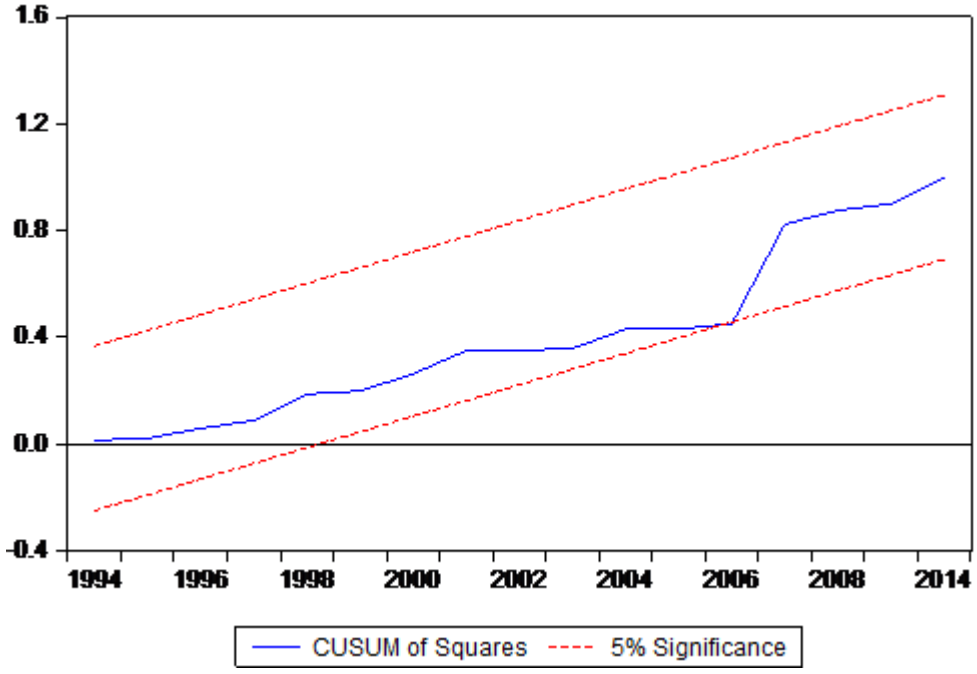


Series: Residuals	
Sample 1984 2014	
Observations 27	
Mean	8.22e-17
Median	0.111865
Maximum	2.000839
Minimum	-1.287435
Std. Dev.	0.811042
Skewness	0.218416
Kurtosis	2.651530
Jarque-Bera	0.351285
Probability	0.838918

Appendix A 7: Short Run Model CUSUM Test for Stability



Appendix A 8: Short Run Model CUSUM of Squares Test for Stability



Appendix A 9: Matrix Correlations For The Short Run Model

	D(LNGDP(-1))	D(LNAGR(-1))	D(LNEDU(-1))	D(LNHEA(-1))	D(LNEWS(-1))	D(LNK(-1))	D(LNCPI(-1))	D(LNTOT(-1))	ECT(-1)
D(LNGDP(-1))	1								
D(LNAGR(-1))	-0.017608418	1							
D(LNEDU(-1))	-0.137838353	0.375835214	1						
D(LNHEA(-1))	0.000631824	0.093278467	0.525794771	1					
D(LNEWS(-1))	0.329043529	0.257033063	0.093367552	0.262734145	1				
D(LNK(-1))	-0.037864036	-0.115373377	0.309830449	0.261078359	0.1396089	1			
D(LNCPI(-1))	-0.016567054	0.293926155	0.123159796	0.178816495	0.3135488	-0.0244824	1		
D(LNTOT(-1))	-0.137728509	-0.210183728	-0.21805385	-0.280023348	-0.4438165	0.03534133	-0.50314009	1	
ECT(-1)	0.350338925	-0.33423046	-0.17111101	-0.140464848	-0.1411159	-0.0318546	-0.06738247	0.0936092	1

Appendix A 10 Critical values for the Bounds test: restricted intercept and no trend 10 percent level

N	*k=0*		*k=1*		*k=2*		*k=3*		*k=4*		*k=5*		*k=6*		*k=7*	
	I(0)	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*
30	4.025	4.025	3.303	3.797	2.915	3.695	2.676	3.586	2.525	3.560	2.407	3.517	2.334	3.515	2.277	3.498
31	4.020	4.020	3.273	3.800	2.890	3.680	2.662	3.578	2.518	3.513	2.386	3.479	2.303	3.483	2.256	3.454
32	4.030	4.030	3.273	3.780	2.885	3.670	2.646	3.566	2.493	3.497	2.384	3.469	2.293	3.448	2.238	3.443
33	4.025	4.025	3.260	3.780	2.880	3.653	2.644	3.548	2.482	3.472	2.367	3.447	2.284	3.428	2.229	3.399
34	4.005	4.005	3.240	3.767	2.868	3.633	2.626	3.550	2.465	3.472	2.361	3.433	2.274	3.399	2.216	3.392
35	3.980	3.980	3.223	3.757	2.845	3.623	2.618	3.532	2.460	3.460	2.331	3.417	2.254	3.388	2.196	3.370
36	3.995	3.995	3.247	3.773	2.863	3.610	2.618	3.502	2.460	3.435	2.346	3.384	2.264	3.369	2.206	3.360
37	3.980	3.980	3.253	3.747	2.865	3.608	2.622	3.506	2.458	3.432	2.339	3.396	2.240	3.361	2.187	3.336
38	3.995	3.995	3.243	3.730	2.838	3.590	2.598	3.484	2.448	3.418	2.323	3.376	2.233	3.354	2.172	3.321
39	3.985	3.985	3.230	3.727	2.833	3.570	2.596	3.474	2.442	3.400	2.316	3.371	2.224	3.339	2.169	3.306
40	3.955	3.955	3.210	3.730	2.835	3.585	2.592	3.454	2.427	3.395	2.306	3.353	2.218	3.314	2.152	3.296
45	3.950	3.950	3.190	3.730	2.788	3.540	2.560	3.428	2.402	3.345	2.276	3.297	2.188	3.254	2.131	3.223
50	3.935	3.935	3.177	3.653	2.788	3.513	2.538	3.398	2.372	3.320	2.259	3.264	2.170	3.220	2.099	3.181
55	3.900	3.900	3.143	3.670	2.748	3.495	2.508	3.356	2.345	3.280	2.226	3.241	2.139	3.204	2.069	3.148
60	3.880	3.880	3.127	3.650	2.738	3.465	2.496	3.346	2.323	3.273	2.204	3.210	2.114	3.153	2.044	3.104
65	3.880	3.880	3.143	3.623	2.740	3.455	2.492	3.350	2.335	3.252	2.209	3.201	2.120	3.145	2.043	3.094
70	3.875	3.875	3.120	3.623	2.730	3.445	2.482	3.310	2.320	3.232	2.193	3.161	2.100	3.121	2.024	3.079
75	3.895	3.895	3.133	3.597	2.725	3.455	2.482	3.334	2.313	3.228	2.196	3.166	2.103	3.111	2.023	3.068
80	3.807	3.870	3.113	3.610	2.713	3.453	2.474	3.312	2.303	3.220	2.303	3.154	2.088	3.103	2.017	3.052

Appendix A 11: Overview of Empirical Literature

Authors	Objective	Approach	Key Variables (dependent variable first)	Findings	Gap/Weaknesses
Aschauer (1988)	Find the relationship between aggregate productivity and government spending variables.	OLS	GDP per capita growth, spending on infrastructure for Hospitals, education, roads and highways and electricity and water &sewage systems.	Hospitals and education; positive but insignificant Roads and highways, electricity and water; positive and significant.	
Devarajan et al. (1996)	Derive conditions under which a change in composition of government expenditure leads to a higher growth rate in developing countries.	OLS and fixed effects using 5 year forward moving average.	GDP per capita growth, Total expenditure, current expenditure, capital expenditure, defence, health, transport and education expenditures.	All standard candidates for productive Expenditures i.e. on capital, transport, health and education had either a negative or insignificant impact on growth. current expenditure had a positive impact	The magnitudes of estimated impacts of the expenditures are sensitive to the process of 5 year averaging of data. Should seek to identify magnitudes more reliably.
Baffes (1998)	Examine the relationship between different components of public investment and the rate of economic growth.	Pooled OLS	GDP per capita, Labour, private capital stocks, spending on infrastructure, health, education and military	Military spending was negative. Spending on health, education, infrastructure and Labour were positive.	
Chepete (1997)	Investigate the effects of the composition of government expenditure on growth in Botswana, 1973/4-1995/6.	OLS	Real GDP and Non-mining GDP, development expenditure, expenditures on economic services, health, education, defence, inflation and TOT.	Expenditures on development, defence, economic services and inflation had a positive effect. Expenditures on health, education, recurrent and TOT had an insignificant impact.	Study does not take into account the nature of government expenditures to have time lag in their relationship with growth.
Saad (2009)	Examine the effects of Public expenditure by sector in Lebanon.1962-2007	Johansen cointegration and ECM	GDP, expenditures on health, education, agriculture defence and a dummy for peace and war.	In long run defence impedes growth whilst education drives it. In short run; Health and education impedes growth, defence and agriculture have an insignificant impact. Z, dummy for peace & war had a positive sign.	Has not considered other macroeconomic variables that affect economic growth including capital and labour.
Botshelo (2010)	Determine the relationship between public expenditure and long run economic	OLS and ECM	Real GDP per capita, total government expenditure, development expenditure,	Expenditures on health, education, housing, total government expenditure and tax revenue had a negative impact on growth.	Impact of expenditure on components of economic services may have washed out

	performance of Botswana.		recurrent expenditure,TOT, CPI, tax revenue and specific public expenditure components;education, health,economic services, Defence and housing.	Development expenditure, defence, tot and CPI had a positive and significant impact.economic services had a positive but insignificant impact	in its aggregation. impacts of labour and capital on growth have not been considered.
Ebiringa& Charles (2012)	investigated the impact of government sectoral expenditure on the economic growth of Nigeria	OLS and ECM	Real GDP, Expenditures in transport, agriculture, education, health, defence and telecommunications	Transport, Agriculture ; negative Defence, telecomm, health, education; positive	Has not considered other macroeconomic variables that affect economic growth including capital and labour.
Kapunda &Topera (2013)	Analyse the impact of sectoral expenditure, capital expenditure, current expenditure and control variables on economic growth in Tanzania	OLS	GDP per capita growth, capital expenditure, current expenditure, expenditures on agriculture, defence, education, health and transport & communication. TOT, RER, population growth and dummy for liberation of economy.	Total government expenditure, recurrent and education; negative & insignificant. Agriculture, TOT and health; positive and significant. Defence, infrastructure, RER, dummy; positive and insignificant. Population growth; negative.	
Musaba et al.(2013)	Examine the impact of government sectoral expenditure on economic growth in Malawi, 1980-2007	VECM	Real GDP, Expenditures on agriculture, education, health, defence, social protection and transport & communication.	No relationship in short run. In long run agriculture and defence drive growth whilst expenditures on health, social protection, transport and communication had a negative impact.	Did not include other macroeconomic factors that influence growth.
Muthui et al. (2013)	Investigate the relationship between government expenditure components and economic growth in Kenya 1964-2011	VECM	Real GDP, Expenditures on education, infrastructure, public order, health and defence.	Defence ;negative Health ; positive Transport &Communication ; positive Public order ; positive	Did not take into account the impact of other macroeconomic factors other than expenditure on growth.
Aschenke (2014)	Investigated the impact of government expenditure on economic growth in Ethiopia, 1975-2013.	VECM	Real GDP and Expenditures on agriculture, defence, education, health and the cpi.	Short run: defence negative and others insignificant. Long run: education positive, agriculture and defence negative and others insignificant.	
Adu & Ackah (2015)	Investigate the relationship between economic growth and government spending at disaggregate level	ARDL	Real GDP, Capital, labour, capital expenditure, recurrent expenditure, trade openness, inflation and life expectancy.	Capital expenditure; negative Recurrent expenditure; positive Capital and labour; positive Trade openness; positive Inflation: negative	

				Life expectancy	
Aremu et al. (2015)	To determine the extent to which government expenditure on critical sectors contribute to growth, 1984-2013	ARDL	GDP per capita, Capital, Expenditure on education, agriculture, defence & security and transport & communication.	Expenditure on critical sectors has no impact on growth in short run save for transport and communication. In long run defence has a negative impact and other variables are insignificant.	Did not take into account the impact of other macroeconomic factors other than expenditure on growth.
Boldeanu (2015)	Analyse the relationship between public expenditure and economic growth for European countries, 1991-2012	OLS, LSDV and GMM	GDP per capita, Defence, Health, Education, Social protection, agriculture and transport and communication.	Education, social protection, agriculture and transport and communication; negative. Defence; positive and health insignificant.	
Salimi (2016)	To examine the relationship between government sectoral expenditure and economic growth.	ARDL	Real GDP, Capital, labour, health expenditure and education expenditure.	Capital; positive Labour ; positive Health expenditure; positive Education expenditure ; negative	

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