VISION: Journal of Indian Taxation
Vol. 5(1), Jan-Jun 2018, pp. 60-90
DOI: 10.17492/vision.v5i1.13274
www.journalpressindia.com/vjit

Government Size and Economic Growth in Botswana: An Application of Non-linear Armey Curve Analysis

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ABSTRACT

This study has investigated the impact of government size on economic growth in Botswana using annual time series data for the period 1973 to 2012. The study adopted a framework analysis based on a quadratic function/second degree polynomial regression employed by Herath (2012). Ordinary Least Squares (OLS) method was used for the regression analysis. The results obtained are not consistent with the empirical and theoretical views as small government size has a negative impact on economic growth while a large government size has a positive impact on economic growth. The results obtained in the study were opposite to the views of most of the studies conducted. Nominal Total government expenditure is used as a measure of government size and growth of nominal GDP is used to measure economic growth. The study also employed other control variables which affect growth like government revenue as a percentage of GDP, Gross capital formation (GCF) as a percentage of GDP as proxy for investment rate and growth of paid employees as a proxy for labor force growth. The results showed that government revenue and GCF had a negative impact on economic growth but GCF was insignificant. Growth of paid employees on the other hand had a positive impact on economic growth. The study aimed at investigating the existence of the Armey curve in a developing country like Botswana. Due to government size having a negative impact on economic growth and government size squared having a positive impact on economic growth the conclusion is that the Armey curve does not exist in Botswana.

Keywords: *Economic growth; Government size; Economic growth.*

1.0 Introduction

Relationship between government size (government expenditure as a share of GDP) and growth of the economy has been widely debated for decades with varying findings. There has been no consistent evidence on how government size affects economic

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growth. This inconsistency may be because of the fact that the possibility of a non-linear relationship between government size and economic growth has been mostly overlooked (Christie, 2012).

Government activities are said to both enhance and be detrimental to economic growth. Government has some core functions in the economy like protecting of property rights, legislation, promoting of investment by providing a proper investment environment as well as other functions like provision of public goods, infrastructure, education, health etc which could enhance growth. However, expanding government size means more spending which leads to increase in taxes and government borrowing to finance expenditure which will be detrimental to economic growth.

The majority of empirical studies on the relationship between government size and economic growth have generally investigated only the linear relationship and limited their analysis to a monotonic relationship between the two. Few studies have investigated the possibility of a nonlinear relationship between government size and growth. Armey (1995) investigated the nonlinear relationship between government size and economic growth. A nonlinear relationship is whereby the impact of government size on economic growth is positive and beyond a certain point (optimal government size) it becomes negative. Most of the studies on the Armey curve have been conducted for the developed countries and very few have been done for the developing countries.

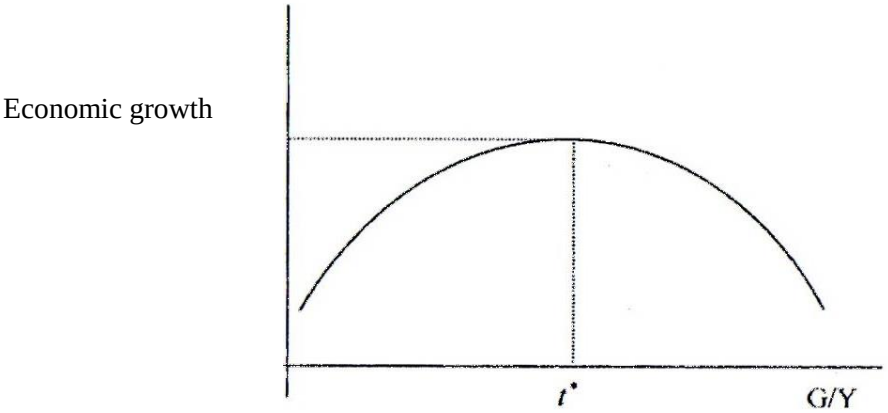
The aim of this study therefore, is to investigate the existence of the Armey curve in Botswana – middle income mineral based economy in Southern Africa. It also estimates the optimal government size which is the share of government spending that optimizes economic growth. This will also add to the existing little literature on developing countries. Section 2 provides a brief overview of Botswana economy, economic growth, trends in government spending as well as government revenue and economic growth indicators in Botswana. The theoretical background to government spending and economic growth, the empirical literature on the relationship and the concept of the Armey curve will be briefly reviewed in section 3 followed by the methodology used in the study in section 4, the estimation techniques as well as the sources of data. In section 5, the empirical results are interpreted and discussed and lastly section 6 provides a summary of the study.

1.1 The Armey curve and government expenditure

An inverted U - shaped curve relationship between government expenditure and economic growth is conceived by Armey (1995) who argued that government provides public goods like infrastructure, roads, education etc. therefore creating an environment conducive to economic growth. Initially the increase in government spending leads to

increase in output up to a certain point beyond which it becomes detrimental to economic growth. The Armey curve (Figure 1) sets a limit to government involvement in the economy or cutting down of government size. When the marginal benefits from expanding government size reaches zero that is the point (say t*) where increase in government spending has to stop or it leads to decline on the growth of output (Herath, 2012).

Figure 1: The Armey Curve



Beyond the point t^*, government spending is directed more towards non-productive spending thereby affecting economic growth adversely (De Witte and Moesen, 2010). Although *the government involvement is necessary in the economy, beyond a point it may lead to a diminished economic growth. When there is a mix of both the government and the private sector in decision making about resource allocation in the economy, output is expected to be high.*

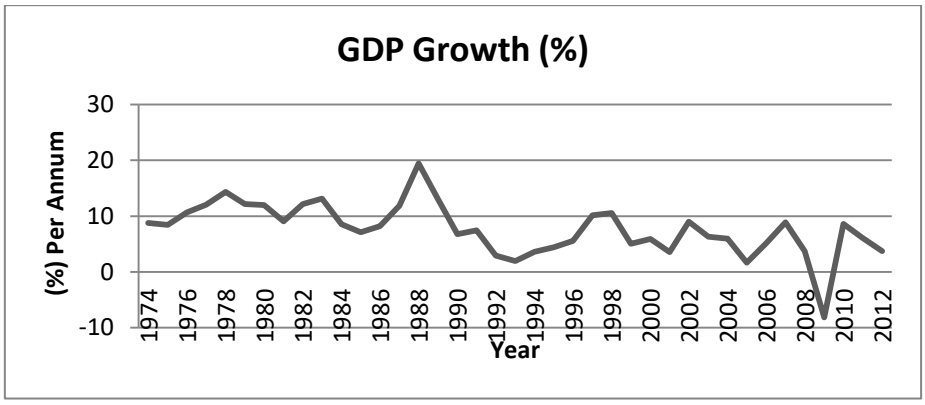
In the last 35 years Botswana has been one of the countries with the highest per capita growth around the world (Clover, 2003) mainly because of discovery of diamonds in the late 1960's and early 1970's which has since been the biggest contributor to government revenue and GDP. Economic growth has averaged more than 7 percent a year thereby elevating the country to its current status as an upper middle-income country. During the global financial crisis of 2008 the economic growth declined averaging between 4 and 5 percent a year, yet government expenditure continued to increase (Bank of Botswana, 2012). This growth is way below the growth rate of 8 percent that the Botswana vision 2016 calls for. The main concern of this study though

has been the growth of government expenditure as a percentage of GDP in Botswana considered to be one of the largest in Africa (Fan and Rao, 2003). From 1993/4 Government expenditure in Botswana has been fluctuating with average of over 30 percent (Bank of Botswana, 2012). Despite the global financial crisis government expenditure has been rising and the main interest of the study is to find out how government size has affected economic growth and what optimal size of government will maximize growth in Botswana.

1.2 Government expenditure and economic growth in Botswana

Credited with political stability, excellent governance and its effective macroeconomic management, Botswana has been one of the fastest growing economies placing it on par with some of the best performers in the world mainly driven by the mineral income (Clover, 2003) considering the largest producer of diamonds by value in the world. However production of diamonds has reduced due to the low demand emanating from the weak financial conditions especially during 2007 – 2009 causing a negative GDP growth rate in 2009. Mining, manufacturing and construction sectors are the major contributors to the recovery in the later period (African Economic outlook, 2012). Decline in mining sector did not retard growth in other sectors (Botswana country overview, 2013/14). Figure 2 below shows the GDP growth per annum from 1974 – 2012.

Figure 2: Trends in GDP growth in Botswana

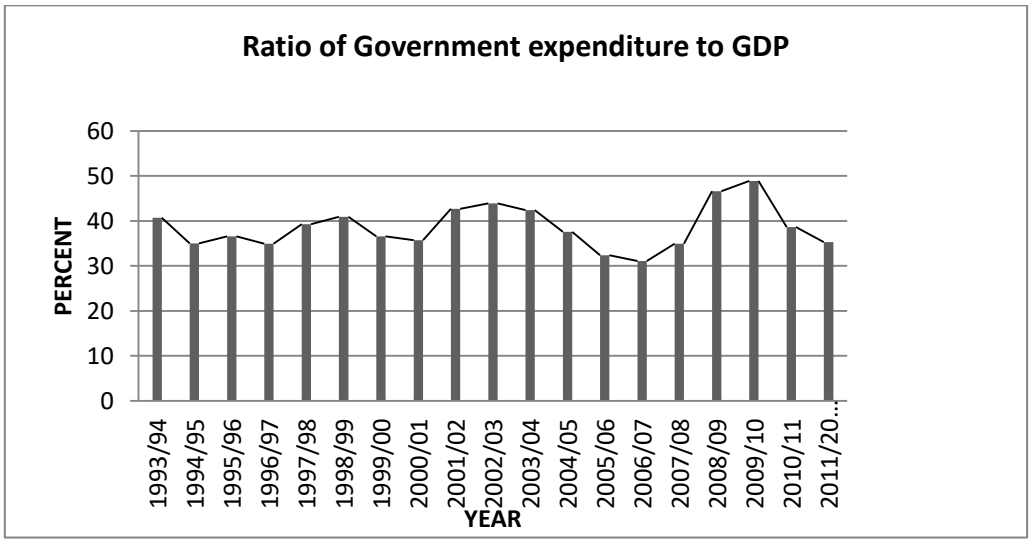


Source: WDI

***Government expenditure*:** Botswana is considered among countries with the large government expenditures in Africa with 30 percent on average (Fan and Rao,

2003). Between the years from 2000/01 to 2009/10, government expenditure grew by an average annual rate of 14.8 percent but was set to be maintained within the 40 percent range of the long – term average revenue yield in the National Development Plan (NDP) 9 in order to strengthen commitment to sustainable budgeting (Bank of Botswana, 2012). This 40 percent rule states that government spending and available resources should be balanced as well as a balance between rest of the economy and the government sector (International Monetary Fund, 2010). The current NDP 10 stipulated cutting government size to 35 percent and to 30 percent by NDP 11. The IMF however has warned that the rule might possibly yield negative effects if GDP rises temporally. The government expenditure as a percentage of GDP has averaged over 30 percent since 1993/94, but fluctuating between 37 percent and 30 percent between 2004 and 2008, the lowest was in 2006/07 at about 31 percent it went up over 40 percent in 2008/09 and 2009/10 (Figure 3). Even fall in GDP growth did not affect government expenditure growth (Bank of Botswana, 2012).

Figure 3: Share of Government Expenditure in GDP (%) in Botswana



Source: Bank of Botswana

Expenditure on general services which includes expenditure on defense is the second largest component after the expenditure on social service of total expenditure. Among those categories of social services, education constitutes the largest share of expenditure. The second largest component of government expenditure on social

services is the health expenditure consists of health services like public hospitals and health posts as well as administration is the second largest component. Expenditure on health has been growing at a steady rate but it has been lower than expenditure on education. The bulk of the expenditure on health goes to health services like hospitals and clinics. Rise on health expenditure can be attributed to building and maintenance of hospitals clinics around the country, expenditure on medication like ARV's as well as salaries to health workers. The lowest under social services is the expenditure on food and social welfare programmes. Expenditure on housing, urban and regional development has been one of the highest under social services but it has been fluctuating over the years. The rest of the expenditure on social services went to other community & social services.

***Economic services*:** Expenditure under the economic services which include spending on agriculture, forestry & fishing, mining, electricity & water supply and roads has been growing. From 1991/92 expenditure on economic services has constituted the third highest share of total government expenditure after social services and general services. Expenditure on electricity & water supply and on roads/transport have been representing the largest share of expenditure on economic services and they have been growing as a higher rate as compared to expenditure on Agriculture, forestry & fishing which has been declining over the years.

***Recurrent and development expenditures*:** Government expenditure in Botswana is divided into two components of recurrent and development expenditure. Recurrent expenditure which includes expenditure on paying of resources, bills, interest and wages among others is more than 50 percent of the total government expenditure. The bulk of recurrent expenditure is spent on the civil servants wage bill as well as pensions and gratuities as it constitute about 45 per cent (Bank of Botswana, 2012). The size of the public sector wage bill in Botswana was unsustainably large and needed of reduction as it distorted the labour market, (Econsult review, 2013). However the government of Botswana has plans to adhere to the IMF call and reduce the wage bill in the next three years by 5 per cent each year though freezing of new posts and outsourcing of other services like cleaning etc. (Bank of Botswana, 2012). The second component development expenditure includes expenditure on infrastructure for development like schools, roads, hospitals etc. For the period 1980 – 1990 development expenditure had a proportionately greater increase than recurrent expenditure mainly because more funds were spent on infrastructure for development. In recent years the recurrent expenditure has been growing faster than development expenditure because of maintenance of the infrastructure as well as the increase in the wage bill. Development

expenditure grew substantially largely because of the on-going government projects, (International Monetary Fund, 2010).

***Government revenue*:** Government revenue in Botswana is divided into three components; tax revenue, non-tax revenue and grants. Tax revenue comprising of the customs & excise, mineral revenue, non-mineral income taxes and other taxes is the largest source of government revenue in Botswana. Mineral revenue has been the highest source of tax revenue with an average of more than 40 percent. Even though mineral revenue has been contributing the largest share to total government revenue its revenue is expected to decline as the cost of extracting diamonds rises as well as a fall in demand for diamonds. Another source of revenue is the receipts from SACU[1] because of a review of the SACU sharing formula among the members, changes in membership and lower tariffs might lower the revenues for Botswana (Bank of Botswana, 2012). According to the current SACU sharing formula, Botswana gets the second largest share from SACU after South Africa based on the countries GDPs.

Botswana has experienced large budget surpluses since the discovery of diamonds due to two reasons namely more revenues than anticipated coming from the mineral, and under spending (Bank of Botswana, 2012). However, since 1998/99 Botswana has experienced more budget deficits than surpluses. The main reason behind that has been the decline in mineral revenues caused by low global demand. The largest deficit of about -12 percent as a proportion of GDP was achieved in year 2009/10. The reason behind that was because of the global financial crises that threw the country into a recession between 2008 and 2009. That led to a heavy fall in the demand for diamonds thereby leading to a fall in mineral revenues and hence total revenues. Since then though the mineral revenues have been slowly recovering from the global financial crisis impact as in 2011/12 the deficit was only about -3.5 (Bank of Botswana, 2012). This recovery has also been boosted by the rise in non-mineral revenues.

2.0 Literature Review

Empirical studies examining the relationship between government size and economic growth known as the Wagner Law have provided mixed evidence about relationship between government spending and growth. However economic theory too does not give us any robust conclusions on the effects of government size and economic growth as there are different theories with different views which are quite diverse. The government spending can be both enhancing and hurting to economic growth, but the common believe however is that large government spending lead to economic instability because it crowds private investment (Yasin, 2000).The government involvement in the

economy is very important to drive economic activities The Keynesians support the involvement of government in the economy and argued that government expenditure enhanced economic growth (Mitchell, 2005) through the multiplier effect on aggregate demand. However consumption expenditure is said to hurt economic growth because of the crowding out of private investment (Kweka and Morrissey, 1999. The neoclassical growth model on the other hand argued against Keynesian views and they stated that government intervention in the economy does not have any impact in the economic activity and national output growth (Sharma, 2012).

According to Solow (1956) on economic growth suggests, the government policy does not have any impact on growth except only during transition to the steady state (Herath, 2012). The endogenous growth model by Romer (1986), Lucas (1988) and Barro (1990) argued that long run growth rates are endogenous as steady state growth rate are endogenous. Growth rate is affected by government sizes; tax increase etc. On the other hand increasing government expenditure enhances growth as it raises marginal productivity of capital, the tax increase effect is prevalent when the government is large while the government spending increase effect is more prevalent when government is small. Barro used an inverted U – shaped curve to show the nonlinear relationship between government spending and economic growth. Gwartney *et al.* (1998) argues that government with its core functions like provision of infrastructure and public goods can provide a framework conductive for economic growth but as government size continues to expand there will be negative effects on growth.

Empirical evidence often suggests that a small government is positively related to economic growth. This is not always the case when a small government fails to perform efficiently its core functions in the economy in many poor countries (Gwartney e*t al.* 1998). Most studies disaggregated government expenditure according to components and investigated the effects of different components on economic growth. The general classification of productive expenditure includes investment on education, health, infrastructure, roads, and research & development. Unproductive expenditure includes interest payments on government debt, salaries to government employees, subsidies & transfers etc.

The studies supporting a negative relationship between government expenditure and economic growth include *inter alia* Landau (1986), Engen and Skinner (1992), Hansson and Henrekson (1994), Dar and Amirkhalkhali (2002), Chen & Lee (2005) and Herath (2012). The common reason for the negative relationship is that expanding size of government leads to decreasing return of government spending as well as crowding out private investment. On the other hand Ram (1986), Kormendi and Meguire (1986), Diamond (1989) supported the positive relationship between government size and

economic growth. The explanations behind this positive role of the government are government plays a crucial role in harmonizing conflicts between private and social interests and providing a socially optimal direction for growth and development (Ghose and Das, 2012).

Big governments increase their spending by transferring resources from productive sectors to the government sector affect economic growth adversely (Mitchell, 2005). Using data from 43 developing countries on composition of public expenditure and economic growth an increase in government current expenditure had a significant and positive impact on growth. On the other hand increase in the capital account expenditure had a negative impact on per capita growth which seemed like a surprising result. The explanation for the negative relationship was that productive expenditure reaches a point when more expenditure it becomes unproductive (Devarajan *et al.* 1996).

Using panel data on 18 developing countries Samini and Habibian (2011) found that government consumption expenditure was detrimental to economic growth but government construction expenditure has a positive relationship with growth. This implies that government construction expenditure enhances economic growth and therefore they suggested a cut down on consumption expenditure and increase development in government investment. Kweka and Morrissey (2000), using linear models, found results different from Samimi and Habbian (2011) in that government consumption expenditure and economic growth were positively related in Tanzania, because it is low-income country government consumption contributes to private incomes and consumption largely. On the other hand, productive/investment expenditure has a negative relationship with economic growth. This means that in Tanzania government investment expenditure was inefficient in promoting economic growth.

Sharma (2012) in Nepal found that government capital expenditure was inefficient in influencing growth of the economy because of political instability and weak governance in Nepal. Usman and Nurudeen (2010) for Nigeria on observed negative relationship between government expenditure and economic growth mainly because of corruption for the period from 1970 – 2008. The reason for the negative relationship might be the mismanagement of public funds and corruption. Ghali (1997), using time series data applied vector auto regression (VAR) analysis and adopted the endogenous growth model by Barro (1990) to investigate the relationship between government spending and economic growth in Saudi Arabia and observed a positive relationship between government expenditure and per capita output growth. Using panel data estimated by fixed effects and random effects estimation techniques, Yasin (2000) examined the relationship between public spending and economic growth in 26 Sub-Sahara African countries and showed that government expenditure on private

investment, trade-openness, and expenditure on capital formation positively affected economic growth while official development assistance and population growth rate were found to be insignificant. Alexiou (2009) also used the same variables as Yasin (2000) on the study of government spending and economic growth in South East Europe (SEE) countries found development assistance to be positively significant in enhancing growth.

Ramayandi (2003) using ECM argued that economic growth decline as the size of government gets larger, when government size increase and reaches a certain optimal level it affects economic growth negatively, because of the mismanagement on government spending. Odawara (2010) argued that over expanding of government size may cause distortions and misallocations which may have negative effects on economic growth. Kweka and Morrisey (2000) observed that the relationship between government size and economic growth vary, depending on the country (whether developed, developing or poor), method used for analysis and how government expenditure was categorized.

However, most studies support the evidence that expanding government size negatively affect growth Increasing government expenditure meant taxes too had to be increased thereby leading to harmful effects on the economy. The relationship between government size and growth is positive when share of government in economic activity is low but becomes negative as the share increases (Sheehey, 1993). Studies which support a positive relationship include Ram (1986), Kormendi and Meguire (1986), Diamond (1989). When government involvement in the economy is low the economic growth is also slow (Afonso and Jalles, 2011). On the other hand, increase in the government involvement in economic activity affect the economic growth negatively because crowd out private investment. Government is therefore important in economic growth but how much of government involvement is needed for positive growth of the economy is the question.

2.1 Studies on nonlinear relationship between government size and economic growth

Many studies have shown that there is a negative relationship between government size and economic growth after a certain point of government participation in the economy is reached (Chobanov and Mladenova, 2009). Using Hansen (2000) method Chen and Lee (2005) showed that there was existence of a threshold in Taiwan. They classified government size as total government expenditure as a percentage of GDP, investment expenditure as a percentage of GDP and consumption expenditure as a percentage of GDP and observed the threshold values to be 22.8 percent, 7.3 percent and 14.9 percent respectively.

Like Chen and Lee (2005), Samimi *et al.* (2010) used the Hansen (2000) employed threshold regression approach to examine if the Armey curve existed in those Islamic countries. Similar to Chen and Lee which they showed that using government expenditure as a percentage of GDP as a threshold variable the nonlinear relationship existed in Islamic countries. Herath (2012), too investigated the possibility of constructing an Armey curve in a developing country like Sri Lanka. The aim of the study was to investigate how government expenditure affected economic growth and if it was possible to construct the Armey curve for Sri Lanka. The findings of the study showed that government expenditure positively affected economic growth but if the government expenditure was excessive it negatively impacted the economic growth. Using total government expenditure as a function of GDP as the government size, they found the optimal government size in Sri Lank to be 27 percent.

Another study that applied the threshold regression model is that of Abounoori and Nademi (2010). They estimated the threshold regression model when investigating the relationship between government size and threshold economic growth in Iran. Just like the study of Chen and Lee (2005) and Samimi *et al.* (2010), this study used the two sector production function by Ram (1986) and to test for the threshold effect they applied the Hansen (2000) method. Their findings indicated the existence of the threshold effect between size of government and growth of the economy. They used total government expenditure share in GDP, government consumption expenditure share in GDP, and government investment expenditure share in GDP as government size indicators and found threshold values to be 34.7 percent, 23.6 percent and 8.0 percent, respectively.

Dar and Amirkhakhali, (2002) used panel data to investigate the relationship between government size and economic growth in 19 OECD countries using random coefficient model. They found out that large size of the government affected the growth of the economy through its negative effects of factor productivity. The negative impact was said to be weak for countries with small government size as supposed to those with a large government size.

Chobanov and Mladenova (2009) discussed the theoretical foundations for the existence of an optimal size of government based on data from the OECD countries in a cross country analysis using a model which estimates the share of government spending that maximizes real economic growth. The results showed that the optimal level of government spending is 25 percent. They however argued that the results may be biased because of data limitations. They also argued that the optimum government level did not only depend on size but on government quality as well. This study supported other

studies who argued that increase in government size beyond the optimal point was detrimental to the growth of the economy.

Gwartney *et al.* (1998) also investigated the size and functions of government and economic growth focusing on OECD countries as well as USA separately. They found results similar to those found by majority of studies. They found strong evidence that increasing government size was detrimental to economic growth thereby implying that there was a negative relationship between government size and economic growth. Their findings were also supported by the evidence that in countries which scaled down their government size, the scaling down was correlated with increasing of the real GDP growth. In the USA they found that expansion of the government size over the years has impacted negatively on investment as a percentage of GDP, labour productivity and real GDP growth. The study also found that the top five fastest-growing economies in the world from 1980 to 1995 had government sizes averaging 20.1 percent, which according to the study is less than half the average government size of OECD countries. With the evidence from the study the conclusion was that large and expanding government has impacted economic growth negatively.

Pevcin (2004), using the Armey curve also found a negative relationship between government size and growth. He argued that the negative relationship was because the government size exceeds a certain threshold. The study found the optimal government size for the European countries under study to be approximately between 36 and 42 percent.

Hajamini and Falahi, (2012) studied economic growth and the optimum size of government in 15 European countries using a threshold panel approach. They investigated the non linear relationship between government size and economic growth. They used four government size indicators such as; total expenditure to GDP, government gross fixed capital formation to GDP, current expenditure to GDP and Final consumption expenditure to GDP. They found the impact of government expenditure on growth to be nonlinear. They also proved that the Barro inverted U-shaped curve existed in the 15 countries which could be used to determine the optimum level expenditure. They found the optimum sizes for the indicators to be 41.7 percent, 2.5 percent, 19.4 percent and 15.8 percent respectively.

Christie (2012) investigated the effects of government spending on economic growth. He tested for the nonlinear hypothesis in a cross country study of 136 developed and developing countries using threshold regression methods analysis. The results showed a strong negative effect on economic growth if government was above 33 percent of GDP.

Odawara (2010) too estimated a threshold regression model when investigating a non linear relationship between government expenditure and growth. The model related real GDP growth to some measures of government expenditure as government investment to GDP, Government consumption to GDP and total government expenditure to GDP. The results like others showed strong evidence of a nonlinear relationship for the government spending measure in all the four countries under study and they also found that there is an optimal government size.

2.2 Empirical literature on Botswana

Relationship between government size and economic growth in Botswana has been investigated by Mogotsi and Mupimpila (2003), Chepete (1997) and Botshelo (2010). Considering government development expenditure Mogotsi and Mupimpila (2003) for the period 1978 – 1998 found that in Botswana, until 1995 government development expenditure enhanced growth because it had a positive externality to the private sector. However later it had a negative impact on growth. Chepete (1997) and Botshelo (2010) investigated the impact of government expenditure on economic growth considering the Armey curve in Botswana and found the optimal government size which will maximize economic growth. The optimal government size will also help policy makers to determine whether the fiscal rule of 40 percent government size targeted by the NDP 9 and 35 percent by NDP 10 are feasible. The optimal government size will also be important to policy makers given diamond revenues are expected to decline dramatically from 2029 due to resource depletion, (Bank of Botswana, 2012). Reference is made to the analysis being based on second degree polynomial regression for the period 1974/5 – 2011/12. Given the increase in government expenditure in Botswana, this study seek to determine whether increase in government size is enhancing or detrimental to economic growth and aims to find the optimal government size for Botswana. Mogotsi and Mupimpila (2003) investigated the impact of government size on economic growth using two methods, the conventional approach which is a variant of Solow growth model and the novel approach using data for 1976 –1998. Until 1995 government development expenditure enhanced growth because it had a positive externality to the private sector. After 1995 government development expenditure started to have a negative impact on growth for both the modified equations.

Chepete (1997) as in Devarajan et al. (1996) investigating the effects of the composition of government expenditure on growth. Considering different components of current expenditure, capital expenditure, defense, health, education and economic service expenditures for Botswana, Chepete (1997) and Botshelo (2010) showed that development and economic service expenditures were both positively related to

economic growth while current expenditure, education and health expenditures were negatively related to economic growth however health expenditure was found to be positively related to growth rate of non-mining GDP. The positive relationship between development expenditure and economic growth as well as the negative relationship between current expenditure and growth were consistent with most of the past studies. On a similar relationship between government expenditure and economic growth, Botshelo (2010) has shown that government development expenditure enhances economic growth while on the other hand as expected government current expenditure was detrimental to economic growth. The results also showed that total government expenditure was negatively related to economic growth which supports findings from studies such as of Landau (1986), Hansson and Henrekson (1994), Devarajan et al. (1996) among others.

Generally the theoretical literature provides the yardstick for empirical studies to investigate the relationship between government expenditure and economic growth. Empirical literature on the relationship between government size and growth of economy is based on studies that looked at the linear as well as the nonlinear relationship between government size and economic growth. Most studies who investigated the nonlinear relationship find the relationship to be non-monotonic. They came up with similar results that increase in government size was detrimental to economic growth and they found optimal government size that maximizes growth. This therefore can be concluded that findings from the nonlinear relationship studies clear the mixed results from the studies on the linear relationship.

3.0 Methodology

This section discusses the methodology used in this study. It focuses on the specification of the model adopted as well as the procedure and techniques of analyses and Type and sources of data used are also discussed.

The Model: This study modifies the two-sector production model by Ram (1986) to apply a framework based on a quadratic/second-degree polynomial regression model for Botswana. Following Ram (1986), Rubinson (1977) and Landau (1986) following specification is adopted for the empirical estimation;

$$\dot{Y}_t = \beta_0 + \beta_1 \left(\frac{I_t}{Y_t}\right) + \beta_2 \dot{L} + \beta_3 \left(\frac{G_t}{Y_t}\right) + \varepsilon_t \quad \ldots.(1)$$

From equation (11), Ẏ is the economic growth, $\left(\frac{I_t}{Y_t}\right)$ is the rate of investment, L̇ is the growth of labor force, Ġ is the multiple impacts of expansion in government

expenditure and $\left(\frac{G_t}{Y_t}\right)$ is the government size (government expenditure as a share of GDP at time).Parameter β_3 captures the multiple effects of government and it shows that government sector (G) affects growth directly and indirectly through the non-government sector (C). ε_t is the error term which has a mean = 0 and variance = σ^2.

Equation (12) is a linear traditional economic growth model; Chen and Lee (2005) assume that the government sector has a reciprocal effect on economic growth through two ways: one is the direct contribution of the government sector and the other is the indirect effect of government sector through the non-government sector (externality effect).

$$\dot{Y}_t = \beta_0 + \beta_1\left(\frac{I_t}{Y_t}\right) + \beta_2\dot{L} + \beta_3\dot{G}_t\left(\frac{G_t}{Y_t}\right) + \varepsilon_t \quad \ldots.(2)$$

The approach of modelling nonlinearity by using the quadratic/second-degree polynomial function developed by Herath (2012) relates economic growth and government size in Sri Lanka using a second-degree polynomial function. It describes the Armey curve as it includes both government size variable and the squared government size variable as explanatory variables. $\left(\frac{G_t}{Y_t}\right)$ is associated with a small government which provides public goods and infrastructure which will in turn crowd-in private investment. $\left(\frac{G_t}{Y_t}\right)^2$ is associated with the expanding government expenditure which lead to the expansion of the public sector thereby leading to the Baumol's cost disease and hence the crowding out of investment. It is therefore reformulated to a quadratic equation to incorporate nonlinearity aspect of the Armey curve as follows:

$$In\dot{Y}_t = \alpha_0 + \alpha_1\left(\frac{G_t}{Y_t}\right) + \alpha_2\left(\frac{G_t}{Y_t}\right)^2 + \alpha_3\left(\frac{I_t}{Y_t}\right) + \alpha_4\left(\frac{R_t}{Y_t}\right) + \alpha_5 In\dot{L} + \varepsilon_t \quad \ldots.(3)$$

Where $In\dot{Y}$ is the economic growth which is represented by Nominal GDP growth, $\left(\frac{G_t}{Y_t}\right)$ is the government size represented by nominal total government expenditure as a percentage of GDP, $\left(\frac{I_t}{Y_t}\right)$ is the investment expenditure share of GDP, $In\dot{L}$ is the labour force growth and $\left(\frac{R_t}{Y_t}\right)$ is the nominal government revenue as a percentage of GDP, $\left(\frac{G_t}{Y_t}\right)^2$ is the squared term of the nominal total government expenditure as a percentage of GDP and it is included in the above equation to empirically verify the Armey curve phenomenon, and ε_t is the error term. This specification of the model is similar to model estimated by Pevcin (2004) using panel data for 12 European economies for the period 1950 to 1996. In terms of a priori

expectations on the signs of coefficients, the coefficient of $\left(\frac{G_t}{Y_t}\right)$ is expected to be positive as it captures the positive effects of government expenditure on output. The coefficient of $\left(\frac{G_t}{Y_t}\right)^2$ is expected to be negative as it captures the negative effects on growth of expanding government size and show the diminishing marginal productivity of increase in government spending.To examine how each variable affects economic growth a series of regression analyses is carried out using the OLS.

To calculate the optimal level of size of government that maximizes economic growth partial differentiation is used. Partial derivative of the dependent variable, growth of nominal GDP ($In\dot{Y}$) is calculated with respect to government size $\left(\frac{G}{Y}\right)$ holding other explanatory variables constant. This therefore is a local and conditional maximum that depends on the coefficients of the control variables.

$$In\dot{Y}_t = \alpha_0 + \alpha_1\left(\frac{G_t}{Y_t}\right) + \alpha_2\left(\frac{G_t}{Y_t}\right)^2 + \alpha_3\left(\frac{I_t}{Y_t}\right) + \alpha_4\left(\frac{R_t}{Y_t}\right) + \alpha_5 In\dot{L} + \varepsilon_t \quad \ldots.(4)$$

$$\frac{\partial In\dot{Y}t}{\partial\left(\frac{g_t}{y_t}\right)} = \alpha_1 - 2(\alpha_2)\left(\frac{G_t}{Y_t}\right) \quad \ldots.(5)$$

$$\alpha_1 - 2(\alpha_2)\left(\frac{G_t}{Y_t}\right) = 0 \quad \ldots.(6)$$

Procedure (6) calculates the optimal government size $\left(\frac{G}{Y}\right)$. The optimal government size will be given as

$$\left(\frac{G_t}{Y_t}\right) = \frac{\alpha_1}{2\alpha_2} \quad \ldots.(7)$$

3.1 Data base and methodology

As stated earlier, in the present study attempts has been made to see the impact of government expenditure on growth of the economy. For this purpose, growth of nominal GDP ($In\dot{Y}_t$) is considered as the dependent variable. The description of the dependent and explanatory variables included in the model is given below;

Dependent Variable: *Log of the* Nominal GDP

Independent Variables: The government size measured as nominal government expenditure as a percentage of nominal GDP is the main variable of interest$\left(\frac{G_t}{Y_t}\right)$. Squared term of government size $\left(\frac{G_t}{Y_t}\right)^2$ – to consider the effect of the Armey curve, the square of government size is considered. Investment expenditure as a percentage of GDP $\left(\frac{I_t}{Y_t}\right)$ is measured in terms of Gross Capital formation (as a percentage of GDP) in

nominal terms**.** Government revenue as a percentage of GDP $\left(\frac{R_t}{Y_t}\right)$ is a control variable expected to affect growth. Labour force growth ($In\dot{L}$) is measured in terms of the growth in number of paid employees and it is expected to affect growth. Thus $\left(\frac{I_t}{Y_t}\right)$, $\left(\frac{R_t}{Y_t}\right)$ and ($In\dot{L}$) are employed as control variables that may affect economic growth.

Data description: This study uses annual data for all the variables for the period 1973 – 2012 to analyze the impact of government size on economic growth. The main sources of data used are as follows, nominal GDP has been taken from Bank of Botswana reports and financial statistics, it is considered in Million Botswana Pula, Government expenditure and Government revenue data have been taken from Bank of Botswana annual reports, both in nominal terms. Gross capital formation as a percentage of GDP is obtained from the World Development indicators (WDI) and Statistics Botswana. Data for the growth of paid employees was taken from various issues of statistical bulletin published by the Central Statistics Office.

3.2 Estimation and analysis of econometric results

The descriptive statistics and stationarity property of the variables entering into the model discussed earlier are presented in the following section followed by the empirical estimation of the model and interpretation of the results.

Descriptive statistics: Table 1 gives the summary of the descriptive statistics on the variables used in the study. The descriptive statistics shows that most of the variables are normally distributed. The insignificant Jarque – Berra probability shows that most of the variables satisfy the normality test.

Table 1: Descriptive Statistics Summary, 1973 – 2012

	LOGGDPCR	GOVSZ	GOVSZ2	GOVRV	GCFCSO	LOGLABOR
Mean	8.906696	36.13775	1327.996	39.2425	30.585	12.0406
Median	9.212458	35.21	1239.885	40.11	30	12.33221
Maximum	11.66985	48.87	2388.5	54.98	53	12.87306
Minimum	5.219815	29.63	877.71	25.01	7.2	10.75684
Std. Dev.	1.961134	4.749055	359.9131	7.062302	8.558653	0.632557
Skewness	-0.34546	0.698335	0.988548	-0.034198	-0.087828	-0.588326
Kurtosis	1.869119	3.012939	3.666024	2.517912	3.803887	2.035425
Jarque-Bera	2.9271	3.251427	7.254166	0.395145	1.128483	3.858192
Probability	0.231413	0.196771	0.026594	0.820721	0.568791	0.145279
Sum	356.2678	1445.51	53119.83	1569.7	1223.4	481.6239

Sum Sq. Dev.	149.9959	879.5875	5051961	1945.168	2856.771	15.60501
Observations	40	40	40	40	40	40

Source: Results obtained from Eviews

Unit root tests: Before estimating any econometric model, a unit root test has to be conducted to test for stationarity. The study applied the Augmented Dickey – Fuller (ADF) unit root test to test for stationarity of variables and trend and intercept were included in the equation because all the variables had a trend. The unit root results showed that variables Log GDP, Government revenue (% of GDP), and Log Labour are I (1) that is stationary after taking first difference. On the other hand, government size, government size squared and Gross capital formation was stationary at levels. The results of the unit root tests are shown in Table 2.

Table 2: Unit Root Test (1973 – 2012)

Variables	ADF Statistic	Critical values	Probability	Order of integration	ADF Statistic	Critical values	Probability	Order of integration
Log GDP (Current)	-0.8193	-3.5258**	0.9549	I (1)	-5.6069	-3.5331**	0.0002	I (0)
Log adj GDP (Current)	-1.6911	-3.5298**	0.7362	I (1)	-5.3268	-3.5443**	0.0006	I (0)
Govt size	-5.7118	-3.5331**	0.0002	I (0)	NA	NA	NA	NA
Gov size squared	-6.0740	-3.5331**	0.0001	I (0)	NA	NA	NA	NA
Gov Revenue (% of GDP)	-2.1973	-3.5298**	0.4777	I (1)	-6.0852	-3.5366**	0.0001	I (0)
Gross Capital Formation	-4.0722	-3.5298**	0.0142	I (0)	NA	NA	NA	NA
Log_labor	-1.30961	-3.53660**	0.8699	I (1)	-5.85666	-3.540328**	0.0001	I (0)

Source: Results obtained from Eviews

Note:, ** and *** indicate level of significance at 1 percent, 5 percent and 10 percent respectively*

***I (0):** Variable is stationary at levels*

***I(1)** : Variable is stationary after taking first difference*

Since some variables are I (0) and others are I (1) cointegration cannot be conducted using the Johansen Cointegration test.

4.0 Empirical Results and Discussion

The model: As stipulated by the methodological framework the log of nominal GDP is stated as a function of the explanatory variables, total government spending as a percentage of GDP, government revenue as a percentage of GDP, Gross Capital formation as a proxy for investment rate and growth of paid employees as a proxy for labor force growth. To determine how each of the independent variables affects economic growth, the OLS technique was used for the analysis. In the present study for the purpose of econometric estimation, "general to specific" approach has been employed Charemza and Deadman, (2003). In the first model all the independent variables are included. In the subsequent models the insignificant independent variables are dropped one by one until only the significant ones are left as in model 2. Model 3 includes only government size and the government size squared as explanatory variables. Specifically government size (G/GDP) is, $(G/GDP)^2$ is the government size squared, Rev/GDP is government revenue as a percentage of GDP, GCF is Gross Capital Formation as a percentage of GDP and Log Labor is the growth of number of paid employees.

As General to Specific approach is being used in the present study, the model 1 is a "general" model specified in terms of five independent variables namely government size, government size squared, government revenue/GDP, gross capital formation/GDP and growth of paid employees. The coefficients of all independent variables except Gross Capital Formation (GCF) are significant. Government size and government size squared are at 10 percent while the other variables are significant as 5 percent level (Table 3).

Table 3: Government Size and Economic Growth in Botswana 1973 – 2012

Model	Dep Var.	Constant	G/GDP	$(G/GDP)^2$	Rev/GDP	GCF	logLabor	R sqrd	DW
1	Log GDP	-25.2111 (0.0000)**	-0.2372 (0.0583)***	0.0028 (0.0819)***	-0.0208 (0.0103)**	-0.0015 (0.8137)	3.3081 (0.0000)**	0.9845	0.9750
2		-25.2126 (0.0000)**	-0.2455 (0.0386)**	0.0029 (0.0584)***	-0.0198 (0.0035)**		3.3152 (0.0000)**	0.9849	0.9550
3		-14.3298 (0.2917)	1.0277 (0.1595)	-0.1047 (0.2449)				0.3149	0.4176
4	Δlog GDP	1.1772 (0.0814)***	-0.0404 (0.2537)	0.0004 (0.4247)	-0.0018 (0.5235)	-0.0019 (0.2010)	0.2746 (0.2521)	0.3869	2.2705
5		1.4297 (0.0211)**	-0.0568 (0.0812)*	0.0006 (0.1633)				0.3856	1.9750

Source: Results obtained from Eviews

Note:, ** and *** indicate level of significance at 1 percent, 5 percent and 10 percent respectively. The figures in brackets are the p-values*

The coefficient of GCF is not significant showing an unexpected negative sign, which is contrary to the theoretical view that investment as a share of GDP should enhance economic growth. Government size coefficient is negative and government size squared coefficient is a positive also showed unexpected sign which is contrary to the views of the empirical and theoretical literature. Most of these studies conducted for developed and industrialized countries for instance Gwartney et al. (1998), Pevcin (2004), Odawara (2010), Herath (2012) and others found a small government size to enhance economic growth and larger government size to be detrimental to growth. Government size was expected to have a positive coefficient because the view is that small government should have a positive effect on growth of the economy. The argument is that a small government provides by and large on public goods, infrastructure, education, health and some core functions like protection of property rights which are believed to be conducive for economic growth. It is not always the case that a small government will enhance economic growth when a small government poorly performs or is unsuccessful in efficiently performing of its core tasks it is expected to have a negative relationship with economic growth. This outcome is more common is less developed counties (Gwartney e*t al.* 1998). This shows that even though the theoretical and empirical views show that a small government enhances growth, the relationship could differ from country to country. The negative coefficient for government size therefore implies that government size is detrimental to economic growth. This means that in Botswana most of the government expenditure could be going towards the social services and welfare programmes such as education, health, poverty eradication and other programmes like Ipelegeng. This then fails to crowd in private investment which adversely contributes to economic growth in the short run. On the other hand, the coefficient of government size squared is expected to be negative as the theoretical view is that a large government leads to decreasing return of government spending as well as crowding out private investment. The results however show that government size squared which represents a large government size has a positive effect on economic growth implying that expanding government expenditure enhances economic growth. Even though the government size squared has an unexpected positive coefficient, it supports views by Ram (1986) and Kormendi and Meguire (1986) who found that there was a positive relationship between government size and growth of the economy especially in developing countries. Their argument was that expanding of government size improves the investment environment through the provision of an insurance function to private property as well as private investment of public goods which is encouraged by public expenditure (Chen and Lee, 2005). These results could

make sense because Botswana is a developing country. The results show that an increase in government size by 1 percent will lead to a decline in growth of the economy by 0.2371 hence implying the negative relationship. On the other hand an increase in government size squared by 1 percent will lead to a 0.0028 percent increase in the growth of the economy. The results also show that a 1 percent increase in government revenue as a percentage of GDP will lead to a decline in economic growth by 0.0014 thereby implying that government revenue is detrimental to economic growth. The reason for the negative impact on growth could be that the attributed to the fact that more than 90 percent of Botswana revenue comes from taxation and the ratio of government revenue to GDP is around 40 percent during the period understudy. The growth of paid employees as a proxy for labor force growth has a positive coefficient. The positive coefficient implies that if growth of paid employees increases by 1 percent growth of GDP will rise by 3.308 percent. The equation of the model 1 is given as;

$$\dot{InY_t} = -25.2115 - 0.2372\left(\frac{G_t}{Y_t}\right) + 0.0028\left(\frac{G_t}{Y_t}\right)^2 - 0.0015\left(\frac{I_t}{Y_t}\right) - 0.0208\left(\frac{R_t}{Y_t}\right) + 3.3081\dot{L}$$

Adjusted R^2 is 0.9845 which imply that the model is a good fit.

Since GCF is not significant in the model 1 therefore model 2 is estimated without GCF resulting in all the explanatory variables significant at 5 percent level except government size squared which is significant at 10 percent level. Like in model 1, in model 2 both government size and government size squared coefficients show unexpected signs. The results show that government size has a negative coefficient which implies a negative relationship between government size and economic growth. Increase in government size by 1 percent will lead to a 0.2455 decline in growth of the economy. On the other hand the results show that government size squared has a positive coefficient which implies a positive relationship between an expanding government expenditure and economic growth. A 1 percent increase in government size squared will lead to an increase in growth of the economy by 0.0029. Similarly growth of paid employees has a positive relationship with economic growth as it shows a positive coefficient. Government revenue has a negative coefficient implying a negative relationship with economic growth, a 1 percent increase in government revenue as a percentage of GDP leads to decline in economic growth by 0.01982 percent. The equation of the reduced model without GCF is given as;

$$\dot{InY_t} = -25.2127 - 0.2455\left(\frac{G_t}{Y_t}\right) + 0.0029\left(\frac{G_t}{Y_t}\right)^2 - 0.0198\left(\frac{R_t}{Y_t}\right) + 3.3152\dot{L}$$

Adjusted R^2 implies that the independent variables account for about 98.49 percent changes in the growth of GDP jointly. The two models have slight differences, the level of significance of the variables have improved slightly in model 2. Government size is weakly significant at 10 percent in model one but improves to 5 percent in model two. The model was run again with variables specified in their order of integration to avoid spurious results. Growth of nominal GDP, Government revenue/GDP and Growth of paid employees are stationary after taking first difference so they were specified in first difference. Government size, government size squared and GCF are stationary at levels and so they are specified in levels. Armey (1995) considers the nonlinear relationship between government size and economic growth show the results of the variables specified in their order of integration.

Model 4 is the full model which includes all the explanatory variables but none is significant and the signs of the coefficients are similar to those in model 1. Government size has a negative coefficient implying that a small government size in Botswana is detrimental to economic growth. Government size squared has a positive coefficient implying that a large government size in Botswana enhances economic growth supporting the findings of Ram (1986) and Kormendi and Meguire (1986) who argued that a large government enhances economic growth especially in developing countries. Government revenue/GDP and GCF also have negative coefficients implying that they are detrimental to economic growth. Growth of paid employees has a positive coefficient therefore implying that as the number of paid employees grow that will have positive impact on economic growth.

Model 5 includes the main explanatory variables only, government size and government size squared in order to determine the optimal government size. The results show that government is significant at 10 percent level while government size squared is not significant. Government size has a negative coefficient and government size squared has a positive coefficient. From the results, if government size increases by 1 percent economic growth will decline by 0.05 percent. This implies that in Botswana a small government size has a negative effect on economic growth. To determine the optimal government size models 3 and 5 were supposed to be used. However, in both the models government size and government size squared are not significant hence model 2 was used to determine the optimal government size. The optimum government size which maximizes growth is obtained by partially differentiating model 2 given below

$$\dot{lnY_t} = -25.2127 - 0.2455\left(\frac{G_t}{Y_t}\right) + 0.0029\left(\frac{G_t}{Y_t}\right)^2 - 0.0198lnL \qquad \text{....(8)}$$

Partial differentiation of the above equation with respect to government size$\left(\frac{G_t}{Y_t}\right)$ yields the optimal government size for Botswana as;

$$\left(\frac{G_t}{Y_t}\right) = 42.3 \quad \text{....(9)}$$

During the period under study, it is observed that this level of government expenditure is never reached. The average size of the government during the period is approximately 35 percent and the NDP 10 also stipulates it to be 35 percent. The results however show that 35 percent government size has a negative impact on economic growth. Government size will have to grow to at least 42.3 percent for the maximum economic growth.

The stationarity tests were performed using the Augmented Dickey Fuller tests to obtain the order of integration of the variables. Some variables were found to be stationary at levels while others became stationary after taking first difference. Due to different order of integration for the variables, cointegration test could not be performed using the Johansen Cointegration test because it requires that all variables be stationary after first difference. The study therefore used the OLS for the regression analysis to examine the effect of government size on economic growth. A series of regression was performed using OLS dropping the insignificant variables. The models with growth of nominal GDP as a dependent variable and those with first difference of growth of nominal GDP gave identical results in terms of the signs of coefficients. The models with variables specified in their order of integration however were not significant. Both models showed unexpected signs for GCF, government size and government size squared. Coefficient of GCF is negative which is different from the theoretical view that investment rate enhances economic growth. Likewise government size has a negative coefficient which is contrary to the theoretical and empirical literature. The view is that government size should enhance economic growth but in Botswana the results showed otherwise. Government size squared showed a positive coefficient which too is contrary to the empirical and theoretical. The reason for the unexpected results could be the fact that Botswana is a middle level income and not a developed country whose major share of income comes from the mining sector hence most expenditure is spent on social services and welfare programmes which rather do not crowd in investment. Most studies on government size and economic growth in which the optimal government size was found to exist were developed and industrialized countries. The positive coefficient of government size squared however supports views by Ram (1986) and Kormendi and Meguire (1986) who found that there was a positive relationship between government size and growth of the economy especially in developing countries. For this study due to the fact that coefficient of government size is negative and that of government size

squared is positive, the pattern of results do not support the concept of the Armey curve. The study therefore concludes that the Armey curve does not exist in Botswana. The reason could be that in Botswana most expenditure goes to non-development activities. Pevcin (2004) found that the Armey curve could be modelled for only 8 countries out of the 12 European countries.

5.0 Conclusion and Policy Implications

This section provides the conclusion of the study then policy implications are given based on the results obtained from the study. The last part of this chapter is the outlining of the limitations of the study. The objective of this study was to empirically examine the impact of government size on economic growth. The study used growth of nominal GDP as a measure of economic growth and the size of government was measured by nominal total government expenditure as a percentage of nominal GDP. The study also aimed at investigating if the Armey curve exists in a developing country like Botswana as well as finding the optimal government size that maximizes economic growth. Most of the studies on government size and economic growth that supported the Armey curve have been conducted for developed and industrialized countries. The study uses time series data for the period 1973 to 2012. Unit root testing was conducted to test if variables are stationary or not. Some variables were found to be stationary at levels while others were found to be stationary after taking first difference. Since other variables variables were not intergrated of the same order, cointegration test using the Johansen cointegration test could not be conducted. This is because the main variables government size and government size squared are stationary at levels meaning they could not be excluded. For data analysis the ordinary least square method was used. Three models were estimated with growth of nominal GDP as the dependent variable. The first model is the full model which includes all the explanatory variables. The model includes government size, government size squared and some control variables like government revenue as a percentage of GDP, Gross capital formation and growth of paid employees to find their impact on government size. The second model is the reduced model which includes all the explanatory variables except Gross capital formation which was insignificant in first model. The third model includes only the main explanatory variables government size and government size squared without the control variables. The third model is included in order to find the optimal government size but the variables are found to be insignificant.

The full model showed that government size has a negative effect on economic growth which was rather unexpected. The expectation was that government size which

represents a small government will have a positive effect on economic growth. Like government size, government size squared which represents a larger government had an unexpected sign as it showed that government size squared had a positive effect on economic growth. The theoretical and empirical view was that a small government enhances growth while a large government is detrimental to economic growth. Gross capital formation was insignificant probably because of multicollinearity, it however showed an unexpected sign as well. The results showed that Gross capital formation had a negative effect on economic growth. The theoretical and empirical view is that investment rate should enhance economic growth hence the expected positive relationship between Gross capital formation as a proxy of investment rate and economic growth. Government revenue as a percentage of GDP had a negative impact on economic growth probably because of the negative effect of increase in taxation on growth. Given that more than 90 percent of revenue in Botswana comes from taxes could be the reason for the negative relationship. Growth of paid employees on the other hand had a positive effect on economic growth.

All the explanatory variables were found to be significant except for gross capital formation. Hence in the reduced model it was dropped which led to all the variables significant. However, the signs did not change from the full model meaning government size was detrimental to economic growth while government squared enhances growth. This implies that a small government negatively affects growth of the economy while a larger government enhances growth. Government revenue has a negative effect on economic growth while growth of paid employees has a positive effect on economic growth. The study also aimed at investigating the existence of the Armey curve in Botswana. The Armey curve implies that a small government should enhance economic growth while a larger government should be detrimental economic growth.

This means government size should have a positive effect on growth while government size squared should have a negative effect on economic growth. According to this study results however, that is not the case in Botswana hence implying the Armey curve does not exist in Botswana. The reason for that could be attributed to the fact that Botswana as a developing country the small government expenditure does not go to the core government tasks of protecting property rights, building of goods roads, provision of public goods like education etc. Most of the government expenditure could be going towards social welfare programmes like Ipelegeng and Tirelo Sechaba which are nonproductive and do not crowd in investment. It was common in less developed countries that a small government size could have negative effects on growth of the economy (Gwartney e*t al.* ,1998).

After investigating the existence of the Armey curve, the optimal government size that optimizes growth in Botswana was found to be 42.3 percent. Due to government size having a negative coefficient and government size squared having a positive coefficient; the optimal government size implies that any size below 42.3 percent will have negative effects on growth. This implies that a large government enhances growth in Botswana. This supports the view of Ram (1986) who argued that a large government enhances economic growth especially in developing countries.

5.1 Policy implications

Like many developing and African countries, Botswana has been found to have large government expenditure with respect to its revenue. The results however show that a small government size in Botswana has a negative impact on economic growth. This could be a result of misallocation of government expenditures, government not performing its main tasks like provision of public goods, good roads, good education and health. The other reason could be that government expenditure has been going towards activities that do not crowd in investment like social welfare programmes as Ipelegeng and social services which are non-productive. The results suggest that a large government size has a positive impact on economic growth. This implies that government expenditure in Botswana should be increased from its current size. The variables used in this study were in nominal terms. The study only considered total government expenditure as a measure of government size.

Endnotes

1. Besides South Africa, other members of Southern African Custom Union (SACU) are Botswana, Namibia, Lesotho and Swaziland under the current formula. Granting membership to Mozambique might lead to decline in revenues for Botswana.

References

Abounoori E & Nademi Y. (2010). Government size threshold and economic growth in Iran. *International Journal of Business and Development Studies,* 2(1), 95-108.

Afonso A & Jalles J.T. (2011). Economic performance and government size. European Central Bank Working paper series No. 1399.

African Development Bank. (2012). *African Economic Outlook*. Botswana

Alexiou C. (2009). Government spending and economic growth: Econometric evidence from the South Eastern Europe (SEE). *Journal of Economic and Social Research,* 11(1), 1-16

Armey, D. (1995). *The Freedom Revolution*. Washington, D.C.: Regnery Publishing Co.

Bank of Botswana. (2012). *Annual Report,* Bank of Botswana, Gaborone, Botswana.

Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *The Journal of Political Economy*, 98(5), S103-S125.

Botshelo, M. B. (2010). *Government Expenditure Composition and Economic Growth: A case of Botswana*". Unpublished MA Dissertation, University of Botswana.

Charemza, W.W & Deadman, F.D (2003). *New Directions in Econometric Practice*. USA: Edward Elgar Publishing Limited.

Chen, S.T. & Lee, C.-C. (2005). Government size and economic growth in Taiwan: A threshold regression approach. *Journal of Policy Modeling,* 27(9), 1051-1066.

Chepete, S.G.C. (1997). *The effects of the Composition of Government Expenditure on Growth: Empirical Evidence from Botswana*. Unpublished MA Dissertation, University of Botswana.

Chobanov D & Mladenova A. (2009). What is the optimum size of government. *Institute for Market Economics,* Bulgaria.

Christie T. (2012). The effect of government spending on economic growth: Testing the non-linear hypothesis. *Bulletin of Economic Research,* 66(2), 183-204.

Clover, J. (2003). Botswana: Future prospects and the need for broad-based development. *African Security Analysis Programme Situation Report,* South Africa: Institute for Security Studies, 1-11.

Dar, A., & Amir K. S. (2002). Government size, factor accumulation, and economic growth: Evidence from OECD countries. *Journal of Policy Modeling*, 24(7-8), 679–692.

De Witte, K. & Moesen, W. (2010). Sizing the government. *Public Choice*, 145(1), 39-55.

Devarajan, S., Swaroop, V. & Zou, H.-F. (1996). The composition of public expenditure and economic growth. *Journal of Monetary Economics*, 37(2-3), 313–44.

Diamond, J. (1989). Government expenditure and economic growth: An empirical investigation. *IMF Working Papers No. 89/45*.

Engen, E., & Skinner, J. (1992). Fiscal policy and economic growth. Paper presented at NBER Conference on Taxation. *NBER Working Paper No. 4223*.

Fan, S. & Rao, N. (2003). Public spending in developing countries: Trends, determination, and impact. *EPTD Discussion Paper No. 99.*

Ghali, K. H. (1997). Government spending and economic growth in Saudi Arabia. *Journal of Economic Development,* 22(2), 165-172.

Ghose, A. & Das, S. (2012). Government size and economic growth in emerging market economies: a panel co-integration approach. *Macroeconomics and Finance in Emerging Market Economies*, 6(1), 14-38.

Gwartney, J., Lawson, R. & Holcombe, R. (1998). The size and functions of government and economic growth. *Joint Economic Committee,* Washington, D.C., April.

Hajamini M & Falahi M.A. (2012). Economic growth and the optimum size of government in 15 European countries: A threshold panel approach. *MPRA Paper No. 39616.*

Hansen, Bruce E (2000).Sampling splitting and threshold estimation, *Econometrica*, 68(3), 575-603.

Hansson, P. & Henrekson, M. (1994). A new framework for testing the effect of government spending on growth and productivity". *Public Choice,* 81(3-4), 381-401.

Herath S. (2012). Size of government and economic growth: a nonlinear analysis. *Economic Annals,* 57(194), 7-30.

International Monetary Fund. (2010). Staff Country Report.

Kormendi, R. C. & Meguire, P. (1986). Government debt, government spending, and private sector behaviour. *American Economic Review,* 76(5), 1180–1187.

Kweka, J. & Morrissey, O. (2000). Government spending and economic growth empirical evidence from Tanzania (1965-1996*). DSA Annual Conference, University of Bath.*

Landau, D. (1986). Government and economic growth in the less developed countries: an empirical study for 1960-1980. *Economic Development and Cultural Change,* 35(1), 35-75.

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics,* 22(1), 3-42.

Mitchell, D. (2005). The impact of government spending on economic growth. *The Heritage Foundation,* No. 1831, 1-18.

Mogotsi, I. & Mupimpila, C. (2003). The impact of government size on economic growth in Botswana. *The Indian Journal of Economics,* 89(331).

Nurudeen, A & Usman, A. (2010). Government expenditure and economic growth in Nigeria, 1970-2008: A Disaggregated Analysis. *Business and Economics Journal,* 4: 1-11.

Odawara, R. (2010). A threshold approach to measuring the impact of government size on economic growth. Department of Economics*, The George Washington University Working Paper.*

Pevcin, P. (2004). Does optimal spending size of government exist*?* Paper presented at the European Group of Public Administration Conference, 1-4 September 2004, Ljubljana, Slovenia.

Ram, R. (1986). Government size and economic growth: A new framework and some evidence from cross-section and time-series data. *American Economic Review*, 76(1), 191–203.

Ramayandi A. (2003). Economic growth and government size in Indonesia: Some lessons for the local authorities. *Working Paper in Economics and Development Studies No. 200302.*

Romer, P. M. (1986). Increasing returns and long-run growth. *The Journal of Political Economy*, 94(5), 1002-1037.

Rubinson, R. (1977). Dependency, government revenue, and economic growth, 1955-70. *Studies in Comparative International Development*, Summer, 12, 3-28.

Samimi A.F & Habibian F. (2011). Government size & economic growth: new evidence from some developing countries. *Journal of Basic and Applied Scientific Research., 1*(2), 118-123.

Samimi A.J, Nademi Y, & Zobeiri H. (2010). Government size & economic growth: A threshold regression approach in selected Islamic countries. *Australian Journal of Basic and Applied Sciences,* 4(8), 2247-2249.

Sharma B. (2012). Government expenditure and economic growth in Nepal a minute analysis. *Basic Research Journal of Business Management and Accounts,* 1(4), 37-40.

Sheehey, E. (1993). The effect of government size on economic growth. *Eastern Economic Journal*, 19(3), 321–328.

Solow, R. M. (1956). A contribution to the theory of economic growth, *Quarterly Journal of Economics*, 70 (1), 65–94, February.

Yasin, M. (2000). Public spending and economic growth: empirical investigation of Sub-Saharan Africa. *Southwestern Economic Review*, 4(1), 59–68.

Appendix: Summary Literature Review

Author	Empirical method	Subject	Government size variable	Explanation

Herath (2012)	Polynomial regression. (1959 - 2009)	Sri Lanka	government expenditure as a percentage of GDP	Armey curve existed for Sri Lanka. Optimal level of government expenditure to be approximately 27%
Dar and Amirkhakhali (2002)	Panel Data using Random coefficient model for nonlinear relationship (1971 - 199)	19 OECD countries		Large size of the government affected the growth of the economy through its negative effects of factor productivity. Therefore relationship between increase in government size and economic growth is negative
Hajamini and Falahi, (2012)	Threshold panel approach.	15 European countries	Total expenditures to GDP, final cons expenditures, current expenditures other than final cons, govt. gross fixed capital formation	Relationship is nonlinear which is similar to the Armey curve. The optimum values for the 4 measures to be 41.7%, 15.8%, 19.4% and 2.5%, respectively.
Christie (2012)	Threshold regression methods analysis. Panel data (1971 - 2005)	136 developed and developing countries	Total government expenditure as a share in GDP	Existence of the threshold. The results showed a strong negative effect on economic growth if government was above 33% of GDP
Odawara (2010)	Threshold regression model. Quarterly data (1970 - 2008)	USA and four other OECD countries	Government consumption, government investment, and total government expenditure as share to GDP	Strong evidence of a nonlinear relationship for the government spending measure in all the four countries under study and found the optimal government size.
Gwartney *et al*. (1998)	Tested the nonlinear relationship. (1960 – 1996)	23 OECD and 5 fast developing countries	Total government expenditure and govt. noninvestment expenditure	Negative relationship between government size and economic growth. All government size variables have a negative impact on the economy
Pecvin (2004)	Panel data Tested for	12 European	Total government expenditure	Armey curve can be modelled for 8 out of the 12 countries. The

	nonlinear relationship (1950-1996)	countries		study found the optimal government size for the European countries under study to be approximately between 36 and 42 percent of the GDP.
Chen and Lee (2005)	Threshold regression methodology. Quarterly data (1979 -2003)	Taiwan	Total government expenditure/GDP, government investment expenditure/GDP and government consumption expenditure/GDP	Armey curve exists in Taiwan. They found the threshold for all the 3 government size indicators.
Chobanov and Mladenova (2009)	Panel data Nonlinear relationship (1970 – 2007)	28 OECD countries	Total general govt. expend. and general govt cons expenditures	Existence of the U – shaped curve and that the optimal level of government spending is 25%.
Samimi *et al.* (2010)	Threshold regression approach	Islamic countries	General Gov.Final Expenditure on GDP	A nonlinear relationship existed in Islamic countries except Jordan and Turkey
Abounoori and Nademi (2010)	Threshold Regression approach. relationship (1960-2006)	Iran	Total government expenditure, Cons. expenditure, and investment expenditure	Armey curve holds in Iran. Threshold effects corresponding to the govt indicators are about 34.7%, 23.6% and 8%, respectively.