GOVERNMENT SIZE AND ECONOMIC GROWTH IN KENYA

By

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DECLARATION

I do hereby declare that this research paper is my original work and has not been presented for award of a degree at any other university.

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Kennedy O. Ojwang' **Date**

X50/73127/2012

This research paper has been submitted for examination with our approval as University supervisors.

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Prof. Leopold P. Mureithi **Date**

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Dr. George M. Ruigu **Date**

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May Glory be to God and Jesus Christ.

DEDICATION

This work is dedicated to my father, Hezron; my mother, Penina; and all my step mothers.

ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey-Fuller.
ADL	Autoregressive Distributed Lag.
ECM	Error Correction Mechanism.
ESP	Economic Stimulus Programme.
EU	European Union.
GDP	Gross Domestic Product.
GNP	Gross National Product.
GoK	Government of Kenya.
IMF	International Monetary Fund.
KKV	Kazi kwa Vijana.
KNBS	Kenya National Bureau of Statistics.
MDGs	Millennium Development Goals.
NARC	National Rainbow Coalition.
OECD	Organisation for Economic Cooperation and Development.
OLS	Ordinary Least Squares.
PEV	Post Election Violence
SAPs	Structural Adjustment Programmes.
SNA	System of National Accounts
UK	United Kingdom.
UN	United Nations.
VAR	Vector Autoregressive.
WDI	Word Development Indicators.

ABSTRACT

The goal of the study was to establish causal link between the size of the government and economic growth in Kenya. The two variables were represented by the final general government consumption expenditure and gross domestic product respectively. Use was made of annual time series data for Kenya covering the period from 1965 to 2012. Data analysis began with tests for stationarity of each series then proceeded to cointegration tests, lag length determination tests, vector autoregressive modelling, model reliability tests, forecasting and generation of an impulse response function. The study did not find causality between the final general government consumption expenditure and gross domestic product, which, by extension, implied no causality between government size and economic growth, that is, neither economic growth nor government size causes the other in Kenya. The study findings therefore supported neither the Keynesian theory, which states that government expenditure causes economic growth, nor the Wagner's law, which postulates that an increase in government expenditure is caused by economic growth. A ten step forecast and an impulse response function based on the model reinforce the findings, since very little impact of the variables on each other is established. The findings imply that some common arguments for and against the expansion of the public sector are not factual.

Keywords: *vector autoregressive model; economic growth; Granger-causality*

CHAPTER 1: INTRODUCTION

This chapter provides the background information, research problem, research questions, rationale of the study as well as an outline of the paper.

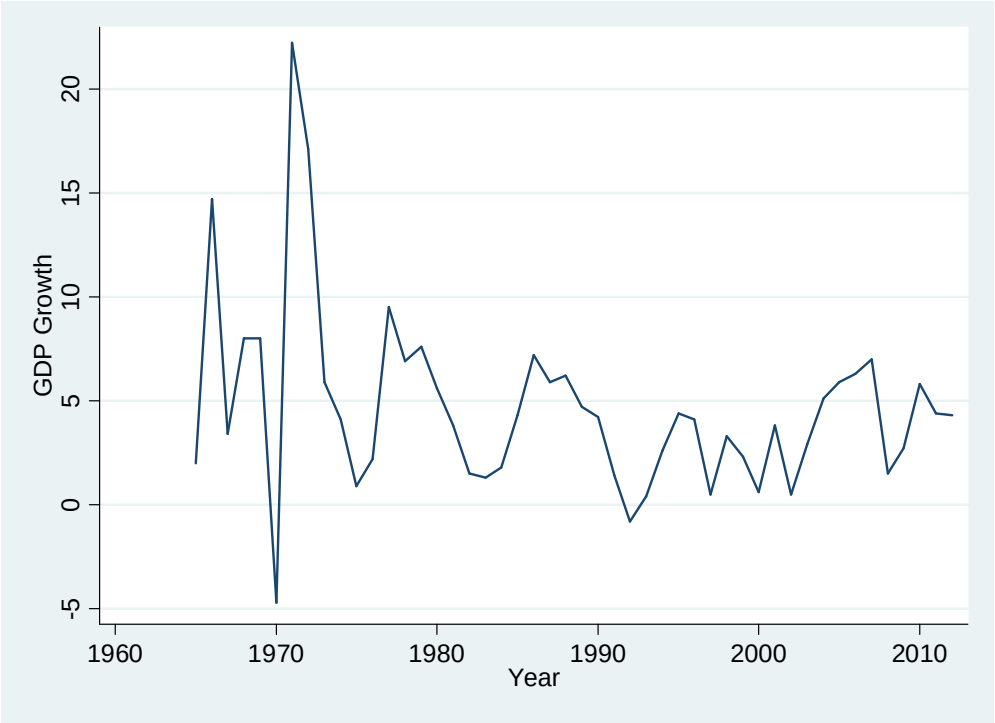
1.1. Background

There are a variety of factors that determine the long-run economic growth of a country. These include physical capital, human capital, initial per capita income, population growth, investment, inflation, exports, foreign aid, openness, government size and political stability. Different combinations of these variables have been tested to establish their contribution to economic growth. Similarly, there has been a lot of interest among researchers to unearth the link between government expenditure and economic growth. This has led to volumes of research papers on the link between the two variables. The studies have employed different data sets and econometric techniques: a situation that has inevitably resulted in varied and sometimes conflicting results.

Levine and Renelt (1992) suggest that one of the reasons for multiplicity of results from the empirical studies is the differences in the set of conditioning variables across studies. The second reason that has been advanced to explain the varied results is the tendency among researchers to ignore the implications of the government budget constraint in their regression models (Helms, 1985; Mofidi and Stone, 1990; Kneller et al., 1999). Economic theory suggests that a large but inefficient public sector retards economic growth. Ram (1986) and Carr (1989) are in agreement that if the government sector provides necessary public goods that cannot be provided by the private sector, then economic growth will be promoted by a large government size.

Between 1970 and 2000, Kenya recorded an average real GDP growth rate of 4.6% per year and the average real income per capita grew by 1.3% annually (World Bank as cited in Muthui, Kosimbei, Maingi and Thuku, 2013). The economic performance of Kenya began to deteriorate towards the end of the 1970s partly due to the collapse of the East African Community in February 1977; the erosion of fiscal prudence due to the windfall from the boom in coffee prices; the first oil shock in 1973; the second oil shock in 1977; and the anti-export bias of the import substitution strategy (Ikiara, Olewe-Nyunya & Odhiambo, 2004).

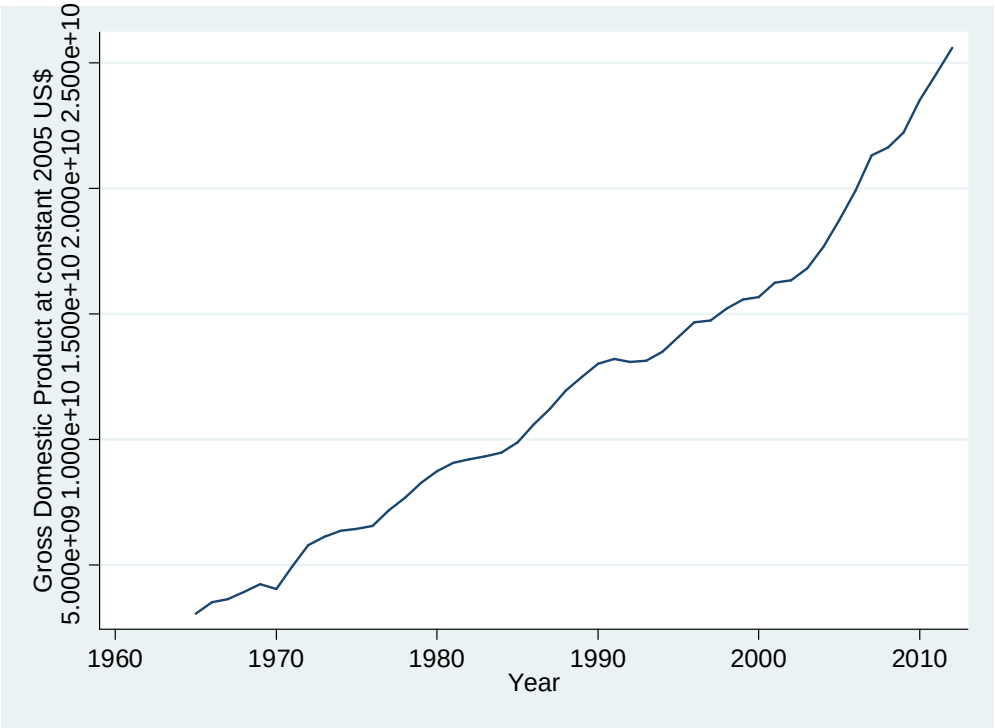
Figure 1: Kenya's economic growth rates, 1965-2012



Source: Generated by the author from the data set

Figure 1 shows how Kenya's GDP growth has been fluctuating from 1965 to 2012. Despite the fluctuations in economic growth rates, Kenya has experienced a steady increase in its GDP over the years. Figure 2 shows the country's GDP measured at constant 2005 US$.

Figure 2: Kenya's Gross Domestic Product, 1965-2012

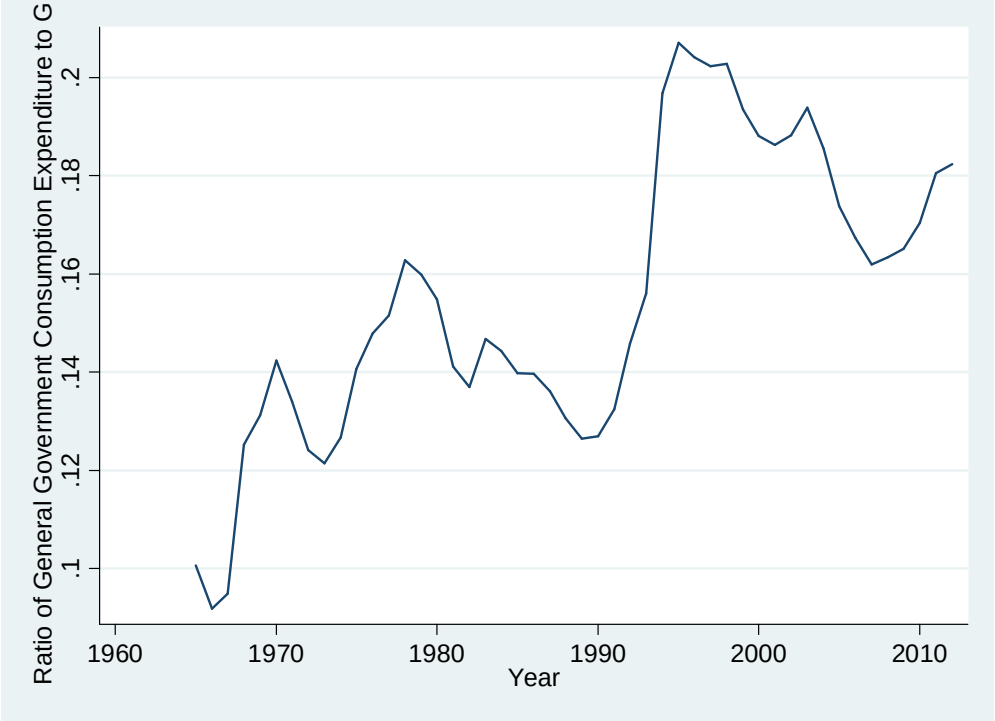


Source: Generated by the author from the data set

The Kenyan public sector, just like in many other countries, has been expanding over the years. Complaints have been raised by politicians, the civil society and development partners against the huge share of non-productive expenditure in the total government expenditure. Among the government expenditure components that are regarded as unproductive are expenditure on salaries, wages, security and servicing of debt. This view is, however, subject to debate as some scholars argue that the expenditure category that is regarded as productive cannot lead to economic growth without the so called unproductive expenditure. Expenditure on salaries and wages, for instance, support human capital, which is an undisputed and important factor of production. The main components of government expenditure are recurrent expenditure and development expenditure.

Figure 3 below depicts how the general government final consumption expenditure as a fraction of the GDP has been varying over the period under study.

Figure 3: Final general government consumption expenditure as a fraction of the GDP, 1965-2011



Source: Generated by the author from the data set

Current expenditure consists of expenditure by ministries to cover normal day to day services; salaries and wages; operation and maintenance cost; and minor capital expenditure, e.g. purchase of equipment. Development expenditure consists of expenditure on all development projects/programmes and activities undertaken by ministries. All budgetary support by donors, whether for recurrent or development expenditure, is classified as development expenditure. From 1970 to 1999, the mean total government expenditure as a proportion of the GDP was 33.2%. During the same period, the average recurrent expenditure was 80% of the total ministerial expenditure and 30.7% of the total government expenditure.

Since the introduction of Structural Adjustment Programmes (SAPs) in the 1980s, there has been pressure on the government to review its expenditure. The civil service reform programme has seen reorientation of government expenditures since 1993 with emphasis being on development expenditure as opposed to recurrent expenditure.

1.2. Research Problem and Research Questions

Kenya's economy has experienced mixed performance over the years. At independence, Kenya was at the same level of economic growth with the East Asian countries, which have since overtaken her. The most notable change in the management of the Kenyan economy was the implementation of the structural adjustment programmes (SAPs) that began in the 1980/81 fiscal year. SAPs however did not become important until after the publication of the Sessional Paper No.1 of 1986 on Economic Management for Renewed Growth. SAPs have since been integrated into the economic management tools of the country.

The Government of Kenya has initiated a series of bold economic and structural reforms aimed at reviving economic growth and achieving the Millennium Development Goals (MDGs). The reforms enshrined within the Economic Recovery Strategy for Wealth and Employment Creation (2003-2007), led to the Kenyan economy recording remarkable recovery. From 2002 to 2007, the real Gross Domestic Product (GDP) grew steadily from 0.6% to 7.1%. According to the Economic Survey 2010, the economy posted a real GDP growth of 2.6% in 2009 compared to a revised growth of 1.6% in 2008. The sharp decline in 2008 was due to the 2007/08 post election violence (PEV). The impressive growth was attributed to resurgence of activities in the tourism sector and resilience in the building and construction industry. However, a mixture of unfavourable weather and sluggish internal and external demands restrained growth from attaining its potential (Government of Kenya [GoK], 2007).

It is widely acknowledged that economic growth goes hand in hand with an upward trend in expenditure, yet very little effort has gone into establishing causality between public expenditure and economic growth in Kenya. This has made it difficult to target policy interventions at optimal levels of the two variables. Considering the conflicting views on the relationship between government size and economic growth held by Keynesian theory and Wagner's law (the former states that economic growth is a product of government expenditure while the latter credits economic growth with promotion of public expenditure), it is imperative to empirically analyse the issue of causality between economic growth and public expenditure so as to provide answers to some of the following questions: Is there any long-term relationship between economic growth and government expenditure? If a relationship exists, what is the direction of causality? What combination of the two variables

gives optimal results? What are the implications of the observed relationship? The study attempts to answer the first, second and fourth questions.

1.3. Research Objectives

The general objective of this study is to investigate the causal relationship between government expenditure and economic growth in Kenya. The choice of a single country has been motivated by the need for a more in-depth investigation of the issue at hand. Specifically, the study seeks to establish the direction of causality between public expenditure and the GDP growth; determine the impact of a change in either variable on the other; make informed conclusions based on the findings of the study; and propose areas for further research.

1.4. Justification of the study

Most studies on the relationship between government expenditure and economic growth presume that Keynesian theory applies and use cross-sectional data from different countries. Such analysis, however, can identify correlation but not causation between variables. The approach also fails to disentangle the effects for each country because it provides only pooled estimates of the effects of government size on economic growth (Hsieh and Lai, 1994; Ghali 1999). In addition, many studies have relied on traditional Ordinary Least Squares (OLS) method to analyse data but the method is not capable of establishing the direction of causality between variables since it can only show correlation, which does not necessarily imply causality. Further, only a handful of studies along this line have been dedicated to Kenya and very short time series datasets have been used. Such studies typically seek to investigate the contribution of government expenditure components to economic growth in Kenya.

The study extends previous studies on similar topics in a number of ways. First, it uses a model (the Vector Autoregressive (VAR) model) that has rarely been used for studies on similar subjects for the country. Secondly, unlike the previous studies that have used short time-series data, the present study uses fairly long time-series data covering the period from 1965 to 2012. Thirdly, the study explicitly takes into consideration and addresses challenges related to the use of time series data in empirical analysis.

The paper is organised into five chapters. In chapter 1, the introduction is presented followed by a review of literature in chapter 2. In chapter 3 the econometric models to be estimated are

specified and procedure for the analysis expounded. Chapter 4 presents and discusses empirical results while chapter five summarises and makes conclusions on the study.

CHAPTER 2: LITERATURE REVIEW

This chapter analytically reviews both theoretical and empirical literature on public expenditure with a view to informing the approach to the study. Overview of the literature is then undertaken to synthesize and direct the study.

2.1. Theoretical Literature Review

A number of theories have been developed to explain both the observed increase in government expenditure and the relationship between government expenditure and economic growth. Wiseman and Peacock, in their study of public expenditure in UK for the period 1890-1955, revealed that public expenditure does not increase in a smooth and continuous manner, but in jerks or step like fashion. The analysis was founded upon a political theory of public determination; namely that governments like to spend more money but citizens do not like to pay taxes, and that governments need to pay some attention to the wishes of their citizens. During periods of social upheaval, however, the gradual upward trend in public expenditure would be disturbed. The government would be forced to raise taxation levies. The rise in taxation levels would, however, be regarded as acceptable to the people during the period of crisis. Peacock and Wiseman referred to this as the "displacement effect".

Engle pointed out that the composition of the consumer budget changes as family income increases. An increase in income causes a smaller income share to be spent on certain goods such as work clothing and a larger share on others, such as coats, expensive jewelleries etc. As average income increases, smaller changes in the consumption pattern for the economy may occur. At the earlier stages of national development, there is need for overhead capital such as roads, harbours, power installations, pipe-borne water etc. But as the economy develops, one would expect the public share in capital formation to decline over time. Individual expenditure pattern is thus compared to national expenditure and Engel finding is referred to as the declining portion of outlays on food.

The basic Wagnerian assumption is that public expenditure growth is continuously associated with the continuing growth in community output in developing countries. This is well-known as the 'Wagner's Law'. According to this Law, the scope of government tends to increase with the level of income (Fölster and Henrekson,2001). Hence, a higher GDP per capita is expected to lead to a higher share of government consumption in GDP. Also, some

government spending is needed to finance the operation of the rule of law. Economic growth will be very low if core government functions do not exist.

Marxist theorists view the rise of state expenditure as inherent to the political-economic system. In the Marxist model, the private sector tends to overproduce, so the capitalist-controlled government must expand expenditures to absorb the production. Typically, this is accomplished by augmenting military spending. At the same time, the state attempts to decrease workers' discontent by increasing spending on social services. Eventually, rising expenditures outpace tax revenue capacity and the government collapses.

According to Ghali (1999), empirical findings on economic growth can be classified into two categories: Keynesian growth and Classical/Neoclassical growth models. Keynesian growth model implies that government consumption expenditures enhance economic growth, i.e., a greater proportion of expenditures relative to GDP speeds up the pace of economic growth. This is mainly attributable to: influence of the government in reconciling the differences between private and social interests, guidance by the government toward a "socially optimal" growth path and protection of the country against foreign exploitation.

With regard to the Classical growth assumption, government consumption expenditures hamper the path of economic growth. The explanation is that the collection of taxes to fund government spending crowds out both consumption and saving by the private sector. Further, government spending introduces distortionary effects on incentives that serve to further destabilize the economy (Hyman, 2005). These effects are felt particularly with respect to income redistribution in the forms of welfare payments and subsidies. Public investments undertaken by heavily subsidized and inefficient state-owned enterprises in agriculture, manufacturing, energy and banking, and financial services have more often reduced the possibilities for private investment and long-run economic growth (Ghali, 1999). In addition, government expenditure often turns into inefficient expenditure which causes a distorted allocation of resources as well as corruption since expanding government expenditure requires more taxes to support the expenditure, but expanding taxes gradually damages the economy.

2.2. Empirical Literature Review

A number of studies have been conducted to determine causality between public expenditure and economic growth. The studies have produced mixed results with some suggesting that causality runs from government expenditure to economic growth, others suggesting that it is economic growth that determines government expenditure, yet others have not found any relationship between the variables.

Keynes (1936) supports government spending as a way of increasing economic output and promoting growth. Wagner's law on the other hand states that it is economic growth that cuses puplic expenditure to increase. Some study results have supported Keynes theory (see Ram, 1986; Donald and Shuaglin, 1993; Gupta et al., 2002; Korman & Brahmasrene ,2007; Gregorious & Ghosh , 2007; Lin ,1994; Ghali, 1999; and Loizides and Vamvoukas , 2005) , others have supported Wagner's law (for example Landau, 1983; Barro 1991; Grier,1997; Hansson and Henrekson,1994; Dalamagas, 2000; Folster and Henrekson, 2001), yet others have found no significant relationship between the two variables (for example Kormendi and Meguire, 1986; Easterly and Rebelo,1993; and Mendoza et al. 1997).

One of the initial studies to establish the link between economic growth and government expenditure was done by Singh and Sahni (1984). The duo used the Granger-Sims methodology to study causation between government expenditure and national income in a bivariate framework using data for India. The results supported neither the Keynesian theory nor Wagner's law.

Using the same approach as Singh and Sahni (1984) but in a trivariate framework, Ahsan, Kwan and Sahni (1992) found out that US data did not show any causality between public expenditure and national income. In a bivariate framework, there was strong evidence of indirect causality from GDP to public spending through money stock and budgetary deficits.

Tests of integration, cointegration and Granger causality were done in a bivariate context by Bohl (1996) on data for the G7 countries covering the World War II period. The results supported Wagner's law for only the United Kingdom and Canada.

A study done by Ghali (1998) examined dynamic interactions between government size and economic growth in a five-variable framework. The variables were GDP growth rates, total

government spending, investment, exports and imports. The study used data from 10 Organisation for Economic Cooperation and Development (OECD) countries and the results showed that Government size Granger caused growth in all countries included in the sample. The study is credited with being the only one that had used multivariate cointegration techniques at that time.

Kolluri, Michae and Wahab (2000) used data for the G7 countries to estimate the long-run relationship between GDP and government size for the period 1960-1993 in a multivariate environment. Wagner's law was confirmed by most of the findings i.e. government expenditure is income elastic in the long run.

With a view to discovering the effect of accelerating and decelerating economic growth on government spending for OECD countries, European Union (EU) and G7 countries, Wahab (2004) used data for the period 1950-2000 and found that Wagner's law held for EU countries only. With respect to all the countries included in the study, the findings implied that government expenditure increased less than proportionately with accelerating growth and decreased more than proportionately with decelerating economic growth.

Ghali (1999) used a quarterly data set covering the period from 1970:1 to 1994:3 to study the causal relationship between government expenditure and economic growth for 10 OECD countries. The results were in support of the Keynesian theory but did not show any evidence to support Wagner's law.

A study by Oxley (1994) done exclusively for UK using data for the period from 1870 to 1913 proved the existence of a unidirectional causality from national income to public expenditure, hence Wagner's law was found to hold for UK.

Using five key sectors (security, health, education, transportation and communication), Loto (2011) studied the effects of government expenditure on economic growth in Nigeria over the period from 1980 to 2008, with a particular focus on sectoral expenditures. The study found that in the short-run, expenditure on agriculture is negatively related to economic growth while the impact of expenditure on health has a positive relationship with economic growth. The impact of education was found to be negative but insignificant. Expenditures on national security, transportation and communication were found to have positive but insignificant

effect on economic growth. Loto opined that the negative impact of education on economic growth could be reversed if brain drain could be checked. The negative impact of public expenditure on economic growth is disturbing considering the fact that agriculture is the backbone of many African economies including Kenya and the result may have been due to the presence of endogeneity at the modelling and testing stages.

Mudaki and Masaviru (2012) used the Loto model (2011) to investigate the impact of public spending on education, health, economic affairs, defence, agriculture, transport and communication on economic growth. They used data covering the period from 1972 to 2008 and found that economic growth was highly and significantly determined by expenditure on education but expenditure on economic affairs, transport and communication were found to be weakly significant determinants of economic growth. Expenditures on health and defence, were, however, found to be insignificant determinants of economic growth. The findings conformed to those of other studies, which, as Mudaki and Masaviru (2012) report, include in Deger and Smith (1983), Knight et al., (1996), Donald and Shuanglin (1993), Wadad and Kamel (2009), and Loto (2011). Based on their findings, Mudaki and Masaviru (2012) recommended increased expenditure on education to promote economic growth in Kenya. On the contrary, reduced spending on economic affairs, health, transport and communication was recommended. Just like the findings by Loto (2011), expenditure on agriculture was found to be a significant but negative determinant of economic growth. According to Mudaki and Masaviru (2012), the negative relationship between agriculture and economic growth could have been due to inefficiency in the agricultural sector.

Following Jerono as cited in Muthui et al., (2013), expenditure on education does not significantly affect economic growth though growth is positively influenced. Jerono's study was conducted to investigate the impact of government spending on economic growth in Kenya. The explanation given for the result is that the rate of expansion of education is higher than that of job growth and since job opportunities outside the public sector are relatively few, the surplus graduates take long to secure employment. The study consequently underscores the role of other factors in economic growth rather than merely increasing public expenditure.

A study done by Were (2001) on the impact of external debt on economic growth and investment in Kenya applied time series data and found that external debt accumulation

negatively impacts on economic growth and private investment, which confirms the existence of a debt overhang problem in Kenya. Despite some crowding out effects on private investment, the study did not unearth any negative effect of debt servicing on economic growth. The findings were in line with World Bank reports that Kenya's debt was sustainable.

M'Amanja and Morrissei (2005) used the Autoregressive Distributed Lag (ADL) model on time series data to establish the relationship between various measures of fiscal policy on growth in Kenya on annual data covering the period 1964-2002. The study categorised government expenditure into productive and unproductive while tax revenue was categorised as either distortionary or non-distortionary. Productive government expenditure was defined to include expenditure on health, education and economic services while unproductive expenditure included total recurrent expenditure less recurrent expenditure on health, education and economic services. Direct (income) tax revenue was classified as distortionary revenue while indirect tax (nominal) revenue fell into the category of non-distortionary revenue. Unproductive expenditure and distortionary tax were found to be neutral to growth as economic theory predicts but there was no evidence of distortionary effects on growth by distortionary taxes. Contrary to expectations, productive expenditure was found to have a strong negative impact on economic growth. Government investment was found to be supportive of growth in the long-run. The duo recommended that expenditure and tax policies in Kenya should be geared towards curtailing more unproductive expenditures and boosting public investment.

Public expenditure on areas such as physical infrastructure and education were found by Maingi (as cited in Muthui et al., 2013) to be supportive of economic growth but other expenditures like foreign debt servicing; government consumption; public order and security; and salaries and allowances were found to retard growth in Kenya. The study aimed at gauging the impact of government expenditure on economic growth in Kenya. This kind of expenditure categorisation may give misleading results due to linkages between sectors that are financed under different expenditure categories. Expenditure on public order and security; salaries and allowances; and foreign debt servicing for instance, are supportive of economic growth since no meaningful growth can be realised in an environment that lacks such services.

Muthui et al. (2013) set out to investigate the impact of government expenditure components (education; infrastructure; health; defence; and public order and security) on economic growth in Kenya. Using annual data for the period 1964-2011, they applied the vector error correction model and found out that on average, there is a long-run relationship between public expenditure and potential economic growth. The composition of government expenditure was found to influence growth with public expenditure components like education; transport and communication; and public order and security being the main drivers of economic growth. Expenditure on health was, however, found to be negatively related to economic growth, a possible explanation according to the authors being that Kenya is a net importer of Medicare facilities and drugs. The negative relationship between expenditure on health and economic growth is, however, a likely manifestation of endogeneity in the model used for the study.

2.3. Overview of Literature

From the empirical literature review, it is clear that most of the studies have used data sets from developed countries or a mixture of developed and developing countries. This has made it difficult to understand how government expenditure and economic growth interact in developing countries. Development experts argue that there are glaring differences not only in the composition of public expenditures between developed and developing countries, but also in the impact of such expenditures on economic growth in the two categories of countries.

The literature review lays bare some facts which explain the divergent, and in some cases, contradictory results of the studies. Many empirical models are based on an ad hoc approach in which economic growth is specified as a linear function of a set of variables. The other approach, exemplified by Ram (1986) and Grossman (1990), derives the government spending-growth relationship from explicit production functions. However, this derived relationship, the ratio of the change in government spending to GDP, is not a common measure of government size. The results and interpretations of these two groups are therefore not comparable. Further, most of the empirical studies are primarily based on cross-sectional analysis for developed countries and lack rigorous theoretical models. Sheehey (1993), Vedder and Gallaway (1998), and Chen and Lee (2005) point out that the reason for inconsistency concerning the relationship between government size and economic growth could be due to a non-linear relationship rather than a linear one.

Ferris (2012) convincingly explains that the ambiguous relationship found between government size and economic growth in the empirical growth literature can be attributed, at least in part, to the different time series characteristics of the two series. He explains that for most countries, economic growth is stationary while government size has almost always been non-stationary, implying that the finding of a negative correlation between the two series is likely to be spurious. According to Ram (1986, 1987), the diversity in results can be attributed to differences in the nature of the underlying data, the test procedure and the period of study. Ahsan, Kwan and Sahni (1992) believe that the main factor that contributes to the conflicting results is the influence of omitted variables or endogeneity, which may give rise to a misleading causal ordering among the variables.

Studies done specifically with regard to Kenya have been based on the assumption that government expenditure influences economic growth, hence Keynesian view has been assumed to apply in all cases. Most of the studies have used time series data by applying different econometric techniques to investigate the impact of public expenditure categories in economic growth. This study seeks to use Vector Autoregressive (VAR) analysis on Kenya's time series data to test the relationship between government size and economic growth.

CHAPTER 3: METHODOLOGY

This chapter presents the theoretical and the empirical models; defines the scope of the study; identifies the sources and limitations of data; and describes the variables. The study will be undertaken under the public expenditure framework and the analysis will test the applicability of the Keynesian model and the Wagner's law in Kenya. This study will employ the Vector Autoregressive (VAR)/ Granger causality method. The method was developed by Granger (1969) and Sims (1980) in response to the criticism levelled against conventional simultaneous equation or structural models that such models are not only restrictive, but also the selection of endogenous and exogenous variables is arbitrary.

The procedure that has been adopted by the methodology comprises tests for stationarity and cointegration; determination of the appropriate model; estimation of equations; and diagnostic tests. The choice of the lag length greatly determines the test outcomes in such studies, selection of the optimum lag length will be undertaken based on the widely used lag selection criteria, that is, Akaike Information Criterion, Hann-Quinn Information Criterion and Schwartz-Bayesian Information Criterion.

3.1. Data sources, scope of the study and challenges

The study uses secondary data from the Kenya National Bureau of Statistics (KNBS), World Development Indicators website, World Bank publications and the International Monetary Fund (IMF) reports. Annual time-series data for Kenya on the Gross Domestic Product (GDP) covering the period from 1965 to 2012 have been used (see appendix 1). The study experienced the challenge of nonstationarity of data as a result of different shocks, including droughts; famine; different base years for the data; electioneering skirmishes; and the Arab Spring of 2011. Also, non-stationarity tests were conducted and appropriate modification done to variables to make them suitable for the subsequent stages of the study.

3.2. Unit Root Test

Non-stationarity of time series data may lead to spurious regression problems. Spurious regression distorts results in ways that include: OLS estimators of the slope and intercept coefficients are inconsistent; conventional test statistics such as the t-ratio and F-statistic are biased making the critical values inappropriate for decision making; according to Granger and Newbold (1974), high values of R^2 and the corrected R^2 but the Durbin-Watson (d) statistic will converge to zero as sample size increases; and spurious rejection of

cointegration tests (Leybourne and Newbold, 2003). In light of these challenges, preliminary and unit root tests preceded cointegration tests. To examine the stationarity of the dataset, the study used the Phillips-Perron unit root test alongside the Augmented Dickey-Fuller (ADF) test. The use of both tests was necessitated by the fact that one test only was likely to result in misleading conclusions regarding stationarity.

3.2.1. The Augmented Dickey-Fuller Test (ADF) test.

The Dickey–Fuller (DF) test involves fitting, by ordinary least squares (OLS), the regression model in equation (1) below:

$\Delta y_t = \rho y_{t-1} + (\text{constant, time trend}) + u_t$ (1)

Serial correlation, however, presents a problem. The augmented Dickey–Fuller (ADF) test's regression therefore includes lags of the first differences of y_t to take care of this. The test is conducted under the assumption that the error terms (residuals) may be serially correlated and involves adding the lagged values of the dependent variable, $\Delta Y_{t,}$ to the specifications to eliminate serial correlation. The appropriate lag may be set, for instance, based on minimizing the Akaike Information Criterion (AIC).

The test's null hypothesis (H_0: $\rho = 0$) implies that the series has a unit root (or is non-stationary) while the alternative hypothesis (Ho: $\rho < 0$) implies that the series is stationary. The decision rule is that the null hypothesis is accepted if the calculated ADF statistic is less than the Mackinnon critical values, with the null hypothesis being rejected otherwise.

3.2.2. The Phillips-Perron (PP) test

The Phillips-Perron (PP) test is an alternative method for correcting for serial correlation when conducting unit root testing. The test uses the standard Dickey-Fuller (DF) test or Augmented Dickey-Fuller (ADF) test, but the t-ratio is modified for serial correlation not to affect the asymptotic distribution of the test statistic. In the PP test, a decision has to be made on whether or not to include a constant and/or time trend. A method for computing an estimator of the residual spectrum at frequency zero must also be chosen and the choice is often made by a sum-of-covariances approach or autoregressive spectral density estimation. The Phillips–Perron test involves fitting equation (1) above, and the results are used to calculate the test statistics. The test statistics estimate not (1) but equation (2) below:

$y_t = \pi y_{t-1}$ + (constant, time trend) + u_t (2)

In equation (1) above, u_t is not only I (0), but may also be heteroskedastic. The PP test corrects for any serial correlation and heteroskedasticity in the error terms, u_t. This is done non-parametrically by modifying the Dickey Fuller test statistics. Phillips and Perron's test statistics can therefore be viewed as Dickey–Fuller statistics that have been made robust to serial correlation by using the Newey–West (1987) heteroskedasticity- and utocorrelation-consistent covariance matrix estimator. The PP Zt and $Z\pi$ statistics have the same asymptotic distributions as the ADF t-statistic and normalized bias statistics Under the null hypothesis that $\rho = 0$. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term u_t. The test also has an advantage that lag length specification is not necessary for the test regression.

3.3. The Co-integration Test

Cointegration refers to a long-run relationship between a set of economic variables given a particular model (Engle and Granger, 1987). In the absence of cointegration, only short-term relationships can be estimated hence an error correction model cannot be used. Although the Engle-Granger (1987) co-integration test has been widely used for testing cointegration among variables, it is not appropriate for multivariate models. The Engle-Granger approach is based on the assumption that there exists only one co-integrating vector that connects the variables, which is not always the case. Johansen and Juselius (1990) cointegration test is recommended for multivariate models.

3.4. Causality Test.

The Granger causality test tests not only the precedence, but also the information provided by a variable (X) in explaining the current value of another variable (Y). X is said to granger-cause Y if X helps in predicting the value of Y. This implies that the lagged values of X are statistically significant. The null hypothesis, $H_{0,}$ tested is that X does not granger-cause Y and Y does not granger-cause X. Granger causality testing is conducted after determining the appropriate VAR model and the test is sensitive to the number of lags used in the analysis.

Nwosa, Agbeluyi and Saibu (2011) recommend that causality tests should be based on the vector error correction model because this approach facilitates proper statistical inference.

Some authors have argued that the traditional granger causality test to determine cointegration between variables is inappropriate if the variables are integrated of order 1, i.e., I (1) because the simple F-statistic does not have a standard distribution (Shan and Morris, 2002; Jordaan and Eita, 2007).

3.5. Theoretical Model

A Vector Autoregresive (VAR) model makes all variables endogenous and each variable can be written as a linear function of its own lagged values and the lagged values of all other variables in the system. VAR has also been widely used in testing for causality between two or more variables. Barnhart and Darrat (1989) prove that testing for causality with a multivariate VAR model leads to more reliable results compared with bivariate models. According to Lutkepohl (1982), a multivariate VAR model helps in avoiding biased causality interferences which arise from the omission or exclusion of relevant variables.

If two variables are considered as stochastic trends and if they follow a common long-run equilibrium relationship, then the variables should be cointegrated. Engle and Granger (1987) state that cointegrated variables must have an Error Correction Mechanism (ECM) representation. Cointegration analysis is advocated because it provides a formal background for testing and estimating both short-run and long-run relationships among variables. Also, the ECM approach guards against spurious correlation among variables.

If two variables, for example economic growth and government size, reprented by Y_t and G_t respectively are cointegrated, then their ECM can be presented as follows:

$$\Delta Y_t = a_o + a_1 E_{t-1} + \sum_{i=1}^{n} a_{21}[1-L]\Delta Y_{t-i} + \sum_{i=1}^{n} a_{31}[1-L]\Delta G_{t-i} + u_t \quad (1)$$

$$\Delta G_t = b_o + b_1 C_{t-1} + \sum_{i=1}^{n} b_{21}[1-L]\Delta Y_{t-i} + \sum_{i=1}^{n} b_{31}[1-L]\Delta G_{t-i} + e_t \quad (2)$$

Where:

Y_t is the economic growth in year t.

G_t is the government size measured as the ratio of real government expenditure to GDP.

Real Government expenditure is expenditure on goods and services (excluding transfer payments) i.e. consumption and gross fixed capital formation.

L is the lag operator

Δ is the difference operator

E_{t-1}, C_{t-1} are the error correction terms.

The error correction term E_{t-1} is the lagged value of the residuals from the Ordinary Least squares (OLS) regression of Y_t on G_t while C_{t-1} is the lagged value of the residuals from the OLS regression of G_t on Y_t. From the above equations, ΔY_t, ΔG_t, u_t and e_t are stationary, which implies that their right hand side must also be stationary. Equations (1) and (2) constitute a bivariate VAR in first differences augmented by the error correction terms E_{t-1} and C_{t-1}. This indicates that an ECM model and cointegration are equivalent representations.

Granger (1969, 1988) asserts that in a cointegrated system of two series expressed by ECM representation, causality must run in at least one way. In equations (1) and (2), G_t does not granger-cause Y_t if all $a_{3i}= 0$ and $a_1=0$. In the same vein, Y_t does not Granger cause G_t if all $b_{21}=0$ and $b_1=0$. It is, however possible that the causal link between Y_t and G_t estimated from (1) and (2) could be due to a third variable. A multivariate framework could be used to explore such a possibility. The other included variables should represent considerable determinants of economic growth and such variables include unemployment rates, inflation rates or exports.

Inclusion of third variable results in an ECM representation that takes the following form:

$$\Delta Y_t = \alpha_0 + \alpha_1 E_{t-1} + \sum_{i=1}^{n} \alpha_{2i}[1-L]\Delta Y_{t-i} + \alpha_{3i}[1-L]\Delta G_{t-i} + \alpha_{4i}[1-L]\Delta Z_{t-i} + u_t \quad (3)$$

$$\Delta G_t = \beta_0 + \beta_1 E_{t-1} + \sum_{i=1}^{n} \beta_{2i}[1-L]\Delta Y_{t-i} + \beta_{3i}[1-L]\Delta G_{t-i} + \beta_{4i}[1-L]\Delta Z_{t-i} + e_t \quad (4)$$

Where Z_t could represent the macroeconomic state of the economy.

The introduction of the third variable could alter the causal inference based on the simple bivariate system. The presence of a third variable could remove any spurious causality in the bivariate system. A multivariate framework may also assist in unearthing direct causality between Y_t and G_t which may not be detected in a bivariate framework and in this case, causation is explained by the third variable.

3.6. Empirical model

Yuk (2005) used a trivariate VAR model to study the link between government size, economic growth and exports in United Kingdom (UK). He stated that Rivera-Batiz and Romer (1991), Grosman and Helpman (1990), and Romer (1990) had formalised the relationship between international trade and economic growth. The growth of an economy affects international trade in some way but it is not clear whether exports promote economic growth (Yuk, 2005). Cognisant of the weakness of OLS in terms of taking into account feedback in economic systems, Yuk (2005) used a VAR model to aid treatment of all variables systematically without making reference to dependence or independence between variables.

Yuk's (2005) model is presented as follows:

$$y_t = \psi_0 + \psi_1 t + \Sigma \Gamma_i y_{t-i} + \varepsilon_t$$

$$y_t = \begin{bmatrix} LGDP_t \\ LSGOVEXP_t \\ LSEXPORTS_t \end{bmatrix}, \quad \psi_0 = \begin{bmatrix} A_{10} \\ A_{20} \\ A_{30} \end{bmatrix}, \quad \psi_1 = \begin{bmatrix} A_{11} \\ A_{21} \\ A_{31} \end{bmatrix}, \quad \Gamma_i = \begin{bmatrix} \gamma_{11i} & \gamma_{12i} & \gamma_{13i} \\ \gamma_{21i} & \gamma_{22i} & \gamma_{23i} \\ \gamma_{31i} & \gamma_{32i} & \gamma_{33i} \end{bmatrix}$$

$$\varepsilon_t = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix}, \quad \text{and} \quad \Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_2^2 & \sigma_{23} \\ \sigma_{31} & \sigma_{32} & \sigma_3^2 \end{bmatrix}$$

Where;

$LGDP_t$ is the log of the GDP.

$LSGOVEXP_t$ is the log of the ratio of government expenditure to GDP.

$LSEXPORTS_t$ is the log of the ratio of exports to GDP.

The present study modifies Yuk's (2005) trivariate VAR model into a bivariate one. The two variables used in the model are economic growth and government size. The former variable is represented by the Gross Domestic Product (GDP) while the proxy for the latter variable is the general government final consumption expenditure.

$$y_t = \psi_0 + \psi_1 t + \Sigma \Gamma_i y_{t-i} + \varepsilon_t$$

$y_t = \begin{bmatrix} LGDP_t \\ LGFCER_t \end{bmatrix}$, $\psi_0 = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix}$, $\psi_1 = \begin{bmatrix} A_{11} \\ A_{21} \end{bmatrix}$, $\Gamma_i = \begin{bmatrix} \gamma_{11i} & \gamma_{12i} \\ \gamma_{21i} & \gamma_{22i} \end{bmatrix}$

$y_t = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$, and $\Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}$

Where;

$LGDP_t$ is the natural logarithm of the gross domestic product (GDP).

$LGFCER_t$ is the natural logarithm of the ratio of general government final consumption expenditure to the GDP.

Since Kenya has experienced some shocks, both internal and external, during the period under review, the model takes into account the effects of such shocks since failure to do so is likely to result in misleading conclusions with regard to unit root tests, i.e. the presence of a unit root will be established when in real sense the model is free from a unit root (Perron, 1989 cited in Yuk, 2005).

3.7. Definition of Terms and Variables

The multiplicity of macroeconomic terms and variables used in this study makes it prudent to undertake definition of such terms and variables as follows:

Economic growth and Gross Domestic Product (GDP)

Economic growth is the percentage rate of increase in Gross Domestic Product (GDP). GDP is the value of goods and services produced in an economy in a given period of time. The use of GDP growth to measure economic growth has been practised by many studies (Ram, 1986; Ghali, 1999; Muthui et al, 2013). A related term to the GDP is the Gross National Product (GNP), which is the income earned by a country's residents in return for contributions to current production, whether production is located at home or abroad. GNP=GDP+ Net property income from abroad. The study uses GDP as one of its variables (a proxy for economic growth) and the unit of measurement is constant 2005 US$ to take care of the different base years used in Kenya.

General government sector

In the System of National Accounts ([SNA], 1993) of the United Nations, the general government sector consists of the totality of institutional units which, in addition to fulfilling

their political responsibilities and their role of economic regulation, produce principally nonmarket services (possibly goods) for individual or collective consumption and redistribute income and wealth. SNA (1993) distinguishes between two types of production, and refers to them as market and non-market activities. Goods and services sold in the market are regarded as output of public corporations, not government. They are valued at market prices, even if these prices are less than cost. Examples of such goods and services are publicly-owned telecommunications, railways, utilities, etc.

Goods and services which are produced by state employees and distributed without charge (or at prices which are not economically significant) are deemed to be the output of general government. These include the activities of government ministries, but they also include activities of public non-market institutions such as schools, provided they are both controlled and financed by government. This means that the general government sector does not include public corporations or quasi-corporations, although they are part of the public sector.

The general government sector can be divided into three levels: central, state (or regional) and local. However, not all countries have these three levels, depending on the political organization and level of fiscal decentralization of each economy.

Government size

There are various ways in which the size of government is measured in the literature, but the measures are usually spending-based or revenue-based. Furthermore, estimating the government and public sector employment also provides information on the size of government sector.

Total general government expenditures: this measure includes all types of outlays by the government sector. This figure represents the consolidated spending of all levels of the government sector, that is, the national and county levels, and as such is deemed to be the most comprehensive measure of spending by the government. However, fiscal instruments are only one part of the two instruments used by the government, the other one being regulation. Therefore, the government budgets tend to underestimate the true size of the government sector due to the existence of other forms of intervention, such as regulation of economic activities or state ownership of enterprises. These non-budget items have the impact of a tax or an expenditure programme on the private sector, since public finance

policies do affect the functioning of markets and the behaviour of economic players. The general government expenditures can be divided into several sub-categories:

1) **Final general government consumption expenditure** – according to SNA (1993), this expenditure category consists of expenditure (including imputed expenditure) incurred by the general government on both individual consumption goods and services and collective consumption goods and services. Government consumption is the sum of all goods and services provided without charge to individual households and collectively to the community. It includes goods and services purchased from the private sector as well as those produced by the government. The principle behind the broad definition of government consumption is that consumption is private only when households are free to choose how or whether to spend the income. Government transfers in kind, such as food, housing, healthcare and schooling, are thus classified as government consumption (United Nations, 2001).

Government consumption is a component of the expenditure method of measuring GDP:
$GDP = C + I + G + (X - M)$, where *C, I, G and (X-M)* are private consumption, gross investment, government consumption expenditures on final goods and services, and net exports respectively. Therefore, *G* is available for most countries since it is estimated as part of national income accounts. This category of the general government expenditure has been adopted by the study to represent government size and the unit of measurement, just like the case of the GDP, is constant 2005 US$.

2) Transfers and subsidies – these consist of cash payments to households and producers. When the recipient is a household, the payment is referred to as a current transfer payment. When the recipient is a private or public institution, it is defined as a subsidy or, when tied to the acquisition of fixed assets, as a capital transfer. Transfer payments also include payment of interest on the national debt, provision of public pensions for the elderly, income support for the unemployed and other cash outlays (SNA, 1993).

3) Public investment of capital spending - this is the aggregate of government capital formation, purchases of land and intangible assets, and capital transfers to non-government sectors.

Central government expenditure

This measure of government size includes cash transfers and subsidies as well as outlays for consumption and investment. However, according to United Nations (2001), these statistics have two drawbacks. First, they record investment expenditure, rather than depreciation of capital, and consequently all the outlay for a large highway or a new port, for example, shows up in the year of construction and not in subsequent years when it is actually in use. Second, the statistics include only transfers to lower levels of government, and thus ignore self financed expenditures of local governments.

Total government revenue

This measure of government size comprises the following sub-components: (a) total government tax revenues that include direct tax revenues (profit tax revenues and personal income tax revenues); indirect tax revenues (such as revenues from VAT, sales tax, excise duties); and revenues from social security payments; (b) general government net lending; (c) sale of state assets; and (d) capital revenue, fees, etc.

The study uses the final general government consumption expenditure and GDP as the proxy variables for government size and economic growth respectively. Chapter 4 presents and discusses the study findings.

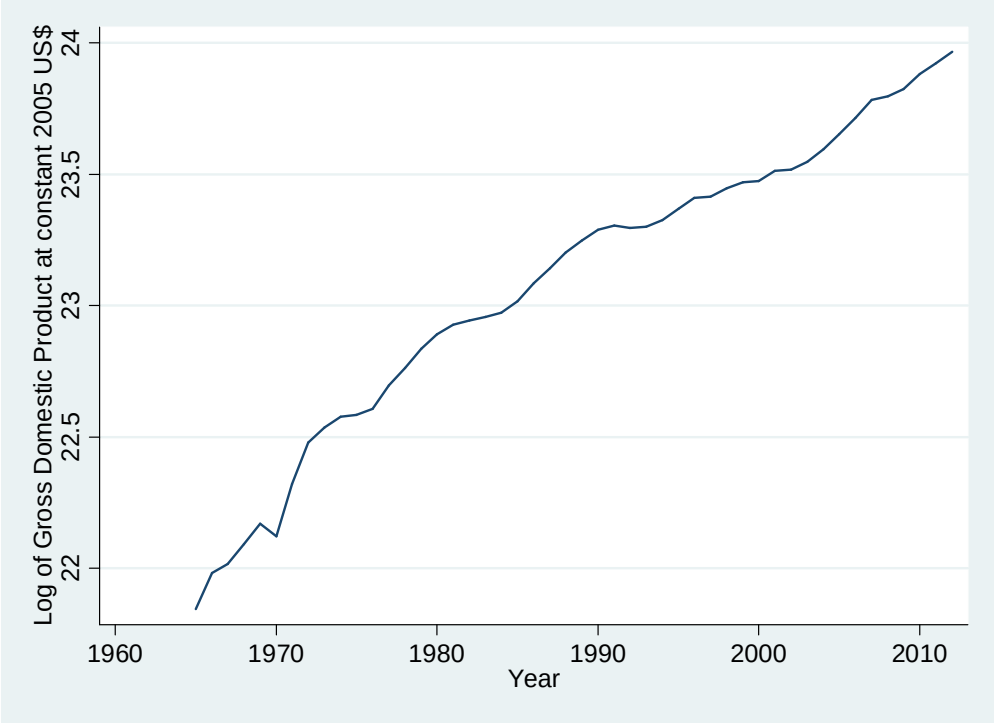
CHAPTER 4: RESULTS AND DISCUSSION

In this chapter, results from the empirical analysis are presented and discussed with focus on issues such as unit root test, cointegration test, vector autoregressive model as well as post estimation tests.

4.1. Unit root test results

The empirical analysis commenced with tests to establish the stationarity of the two time series. Figure 4 below shows that the natural logarithm of the GDP series is on an upward trend, hence the series may be non-stationarity. The same trend is displayed by Figure 2, which graphs the GDP over the entire study period.

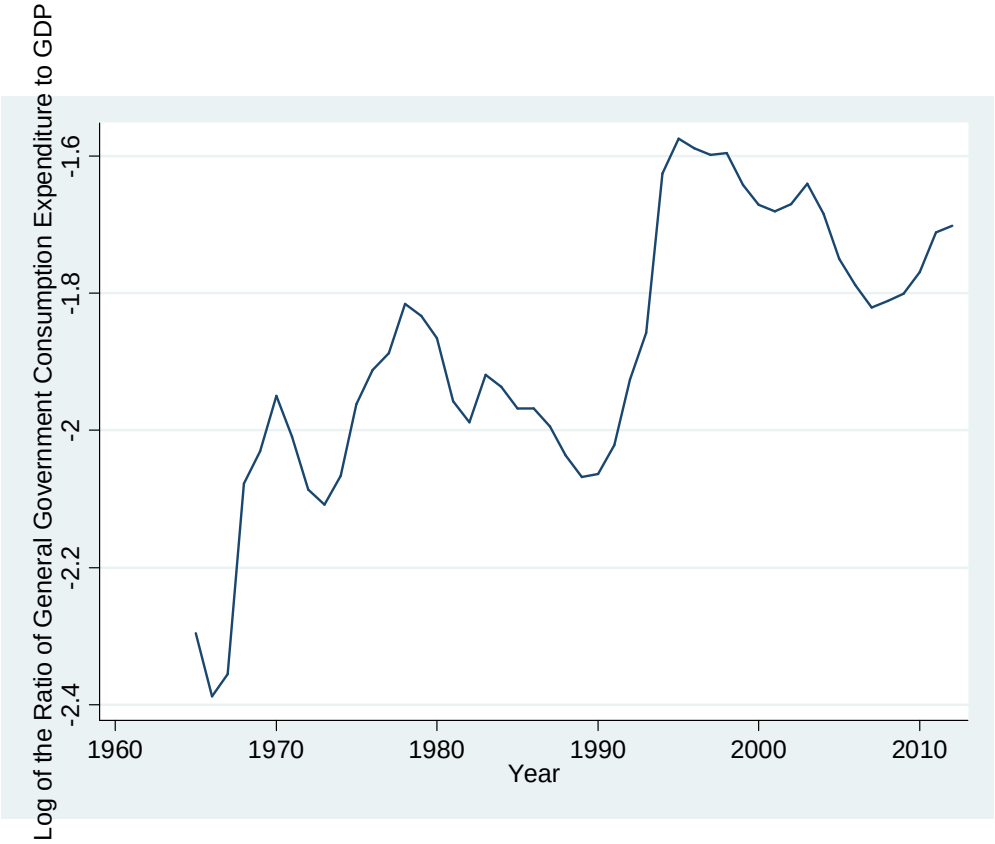
Figure 4: Natural logarithm of the GDP, 1965-2012



Source: Generated by the author from the data set

The graphs of the share of government consumption expenditure on GDP and the natural logarithm of the measure suggest that the measure of government size is also non-stationary.

Figure 5: Natural logarithm of the share of final general government consumption expenditure in GDP, 1965-2012



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The Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron test were used and both tests produced harmonious results. The unit root test results, which are presented in Tables 1 and 2 below, showed that the variables are non-stationary at their levels but become stationary after first differencing. This means that both series are integrated of order 1, that is, the two series are I(1).

Table 1: Unit Root Test at Level

	Augmented Dickey Fuller Test				Philips-Perron Test			
Variable	**Test statistic**	**Critical value**	**Significance level**	**Remark**	**Test statistic**	**Critical value**	**Significance level**	**Remark**
LGDP	-2.890	-4.178	1%	Nonstationary	-2.895	-4.178	1%	Nonstationary
		-3.512	5%			-3.512	5%	
		-3.187	10%			-3.187	10%	
LGFCE	-2.061	-4.178	1%	Nonstationary	-2.398	-4.178	1%	Nonstationary
		-3.512	5%			-3.512	5%	
		-3.187	10%			-3.187	10%	

Note: MacKinnon approximate p-value for Z(t) = 0.1660 for LGDP and 0.5681 for LGFCE.

Source: Author's computation from the data set.

Table 2 reveals that both series became stationary after first differencing. This is due to the fact that in both tests, the test statistic is outside the range for the acceptance of the null hypothesis of the presence of a unit root in the series.

Table 2: Unit Root Test at First Difference

	Augmented Dickey Fuller Test				Philip-Perron Test			
Variable	**Test statistic**	**Critical value**	**Significance level**	**Remark**	**Test statistic**	**Critical value**	**Significance level**	**Remark**
LGDP	-5.930	-3.607	1%	Stationary	-5.931	-3.607	1%	Stationary
		-2.941	5%			-2.941	5%	
		-2.605	10%			-2.605	10%	
LGFCE	-4.757	-3.607	1%	Stationary	-4.857	-3.607	1%	Stationary
		-2.941	5%			-2.941	5%	
		-2.605	10%			-2.605	10%	

Note: MacKinnon approximate p-value for Z(t) = 0.0000 for LGDP and 0.0000 for LGFCE.

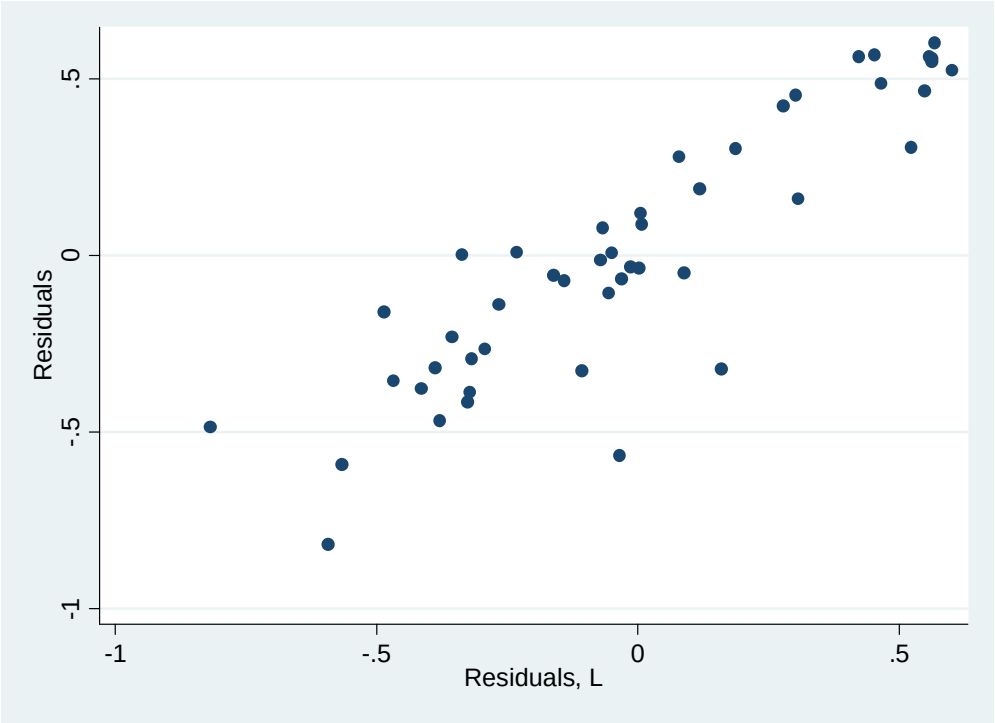
Source: Author's computation from the data set.

4.2. Cointegration test results

Tests for cointegration between economic growth and government size (proxied by GDP and share of general government fixed consumption expenditure in GDP, respectively), were conducted through the Engle-Granger as well as the Johansen cointegration tests. Figure 6 from the Engle and Granger method indicate that there is autocorrelation in the error term predicted from the regression of the natural logarithm of GDP on the natural logarithm of the general government final consumption expenditure, hence there is no cointegration between the variables. If there is a cointegrating relationship between variables, then the graph of the residuals against their lagged values should not display any pattern.

The test statistics from the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests also vindicate the graphical results (see Table 3). The Johansen test involved both the trace and maximum eigenvalue approaches. The results of both approaches, as presented in table 4 below, point to the absence of any cointegrating relationship between the two variables. All the cointegration tests therefore imply that a *vector autoregressive* model based on the first differences of the two time series can be used.

Figure 6: Two-way scatter plot of residuals and lagged values of the residuals.



Source: Generated by the author from the data set

Table 3: Summary of the Engle-Granger Co-integration Test

Test	Test statistic	Critical value			p-value for Z(t)
		1%	5%	10%	
ADF test	-1.454	-3.600	-2.938	-2.604	0.5559
PP test	-1.831	-3.600	-2.938	-2.604	0.3652

Source: Author's computation from the data set.

The table below summarises the results of the Johansen cointegration test and supports the verdict of no cointegration between final general government consumption expenditure and economic growth.

Table 4: Summary of the Johansen Co-integration Test

Trace Test				Maximum Eigen value Test			
Null	alternative	Statistics	95% critical values	Null	alternative	Statistics	95% critical values
r=0		13.3237*	15.41	r=0	r=1	11.7549	14.07
r ≤1	r≥1	1.5014	3.76	r ≤1	r=2	0.2201	3.76
r ≤2	R=2			r ≤2	r=3		

Notes: *Indicates that we cannot reject the null hypothesis of no cointegration at r=0.

Lags=4

Source: Author's computation from the data set.

4.3. Lag selection

The three popular lag selection criteria, i.e. the Akaike Information Criterion (AIC), Hann-Quinn Information Criterion (HQIC) and Schwartz-Bayesian Information Criterion (SIC), were used and all of them suggested one lag as the appropriate one for the VAR model. Table 5 shows the lag choices by the criteria:

Table 5: Selection-order criteria

Lag	**p-value**	**AIC**	**HQIC**	**SBIC**
0		-7.64742	-7.61689	-7.56298
1	0.000	-7.95911*	-7.86752*	-7.70578*
2	0.488	-7.84504	-7.69237	-7.42282
3	0.927	-7.66718	-7.45345	-7.07607
4	0.228	-7.60823	-7.33344	-6.84824
5	0.023	-7.6918	-7.35595	-6.76292
6	0.004	-7.8709	-7.47398	-6.77312
7	0.239	-7.80871	-7.35072	-6.54205

Source: Author's computation from the data set.

4.4. VAR estimates

A bivariate VAR model for one lag as suggested by the lag selection criteria was estimated using the first differences of the natural logarithm of GDP and the general final government consumption expenditure. The estimation results are presented in Table 6 below:

Table 6: Vector Autoregression results

Variable	Coefficient	Z-statistic	p-value
FLGDP			
FLGDP L1.	.209859	1.46	0.143
FLGFCER L1.	.0719272	0.85	0.394
CONS	.0327255	3.67	0.000
FLGFCER			
FLGDP L1.	-.158233	-0.66	0.510
FLGFCER L1.	.3161016	2.24	0.025
CONS	.0180472	1.21	0.227

	RMSE	R-sq	chi2	P>chi2	N
FLGDP	.039506	0.0477	2.303689	0.3161	46
FLGFCER	.066212	0.1341	7.123822	0.0284	46

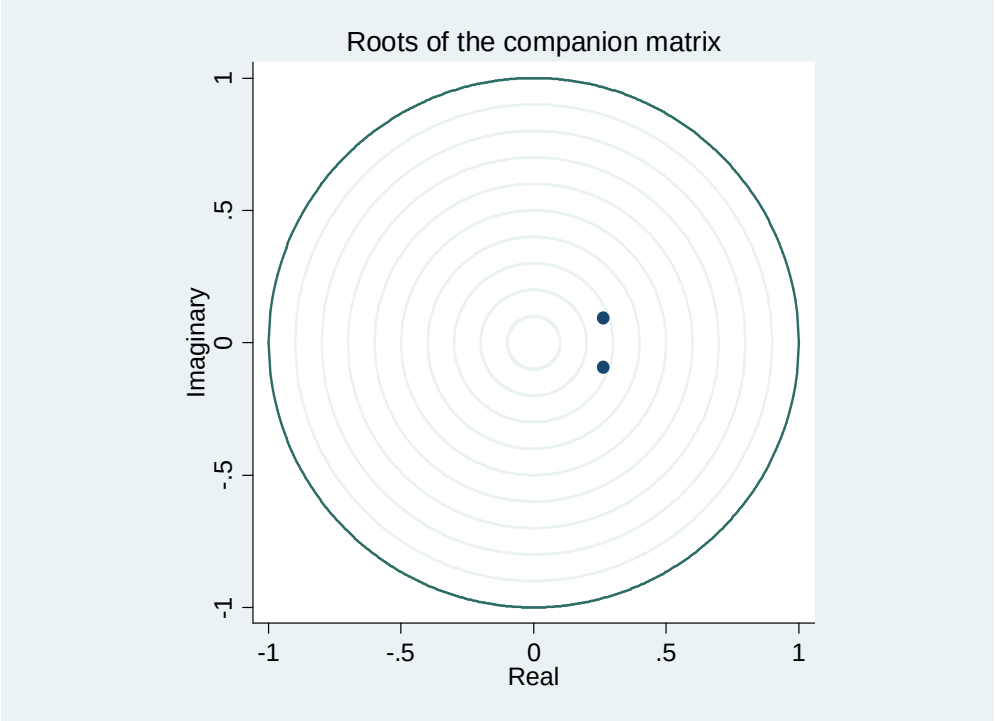
Source: Author's computation from the data set.

It is, however, difficult to interpret VAR coefficient estimates not only because of the tendency of the error terms to be contemporaneously correlated, but also because the estimated coefficients on successive lags tend to switch in sign. The standard practice is to examine the dynamic effects of a one-time shock to one variable on the other variable(s) using impulse response functions (IRFs). The study uses an IRF to examine such effects (see section 4.8.2).

4.5. VAR stability

Assessment of the validity of a VAR model necessitates testing for the dynamic stability of the system and autocorrelation of the residuals. The stability test results are presented graphically and numerically in Figure 7 and Table 7, respectively.

Figure 7: Dynamic stability of VAR



Source: Generated by the author from the data set

The graph shows that all the eigenvalues lie inside the unit circle, hence the system is stable. The table also indicates that the system is stable because none of the eigenvalues is even close to one; the threshold for system stability.

Table 7: Eigenvalue stability condition

Eigenvalue	Modulus
.2629803 +.09251693i	.27878
.2629803 +.09251693i	.27878

Source: Author's computation from the data set.

4.6. Test for serial correlation

A Lagrange multiplier test was performed for the joint null hypothesis of no autocorrelation of the residuals of the system. The results of the test are presented in Table 8 below.

Table 8: Serial correlation test

Lag	Chi2	df	p-value
1	3.5778	4	0.46615
2	4.7788	4	0.31075
3	7.9424	4	0.09371
4	9.8303	4	0.04338

Source: Author's computation from the data set.

The p-values show that we cannot reject the null hypothesis of no residual autocorrelation at order 1 through 4 at any conventional significance level. The validity of the VAR cannot therefore be contradicted.

4.7. Causality Test Results

The results of the Granger-causality test on the variables are presented in Table 9 below. The results do not support granger causality in any direction, that is, the Gross Domestic Product (GDP) does not cause general government final consumption expenditure, nor does general government final consumption expenditure cause GDP. This is implied by the large p-values of the coefficients. We therefore infer from the results that there is no causal relationship between government size and economic growth.

These findings may be perplexing considering the fact that economic theory supports some form of causality between government size and economic growth, but the results may as well be consistent with economic theory in the sense that causality can only exist where there is some form of contribution to changes in one variable by another variable. According to the definition of the general government final consumption expenditure, which represents government size in this study, most expenditure items in this category (like healthcare, education, transfer payments, etc) either impact on the economy with a long lag or fail to make any noticeable impact, except when considered alongside other variables; likewise, fluctuations in economic growth tend to have little impact on this expenditure category, which tends to be influenced by other factors in addition to the level of GDP. in the 1980s and 1990s for instance, the government expenditure continued to rise despite poor performance of the economy.

General government final consumption expenditure mainly caters for recurrent expenses which have only a limited direct connection to economic growth. Expenditure on education and healthcare for instance benefit mainly the poor who rarely get employed in the formal sector, hence their economic activities in the informal sector never get their way in the national income accounting. The government spends a lot of money on free primary education and primary healthcare, which form the bulk of the expenditure category used in this study. Also, transfer payments mainly go to those who barely use them in furthering production, but immediately consume them.

Since the study used only one government expenditure category in assessing the relationship between economic growth and government size, endogeneity may be at play, making it difficult to conclude whether the results support the findings by Muthui et al (2013), which uses a different measure of government size and assesses causality based on five expenditure categories. The results of the study by Muthui et al (2013) are mixed, with some expenditure categories being found to cause GDP growth and others being found to have no causal relationship with GDP growth. Muthui et al (2013), however, report no causality from GDP growth to any of the expenditure categories, nor is any bidirectional causality witnessed in their findings (see chapter 2).

Table 9: Granger Causality Test based on VAR

Null Hypothesis	**Chi2**	**df**	**p-value**	**Conclusion**
General government final consumption expenditure does not granger-cause GDP growth.	.72741	1	0.394	No Granger-causality.
GDP growth does not Granger-cause general government final consumption expenditure.	.43342	1	0.510	No Granger-causality.

Notes: Numbers in the parenthesis are t-statistics

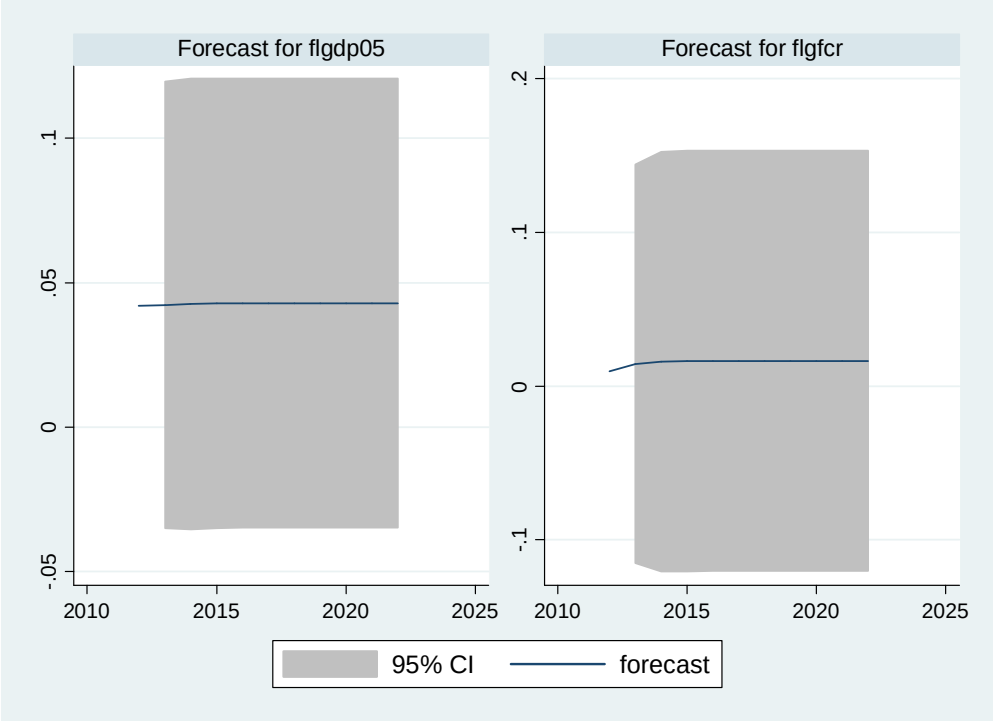
The significance level is at 5%.

Source: Author's computation from the data set.

4.8. Forecasting

The study used the VAR model to forecast the behaviour of the two variables, that is, the GDP and general final government consumption expenditure for the next 10 years, beginning 2013. The forecast values are presented in Figure 8 below. Little change in the GDP and general government fixed consumption expenditure over the next 10 years is predicted by the point forecasts. The graphs predict a negligible initial increase in the former variable and a very slight increase in the latter variable before both variables converge to their respective mean values.

Figure 8: Forecasts for LGDP and LGFCER (2013-2022)



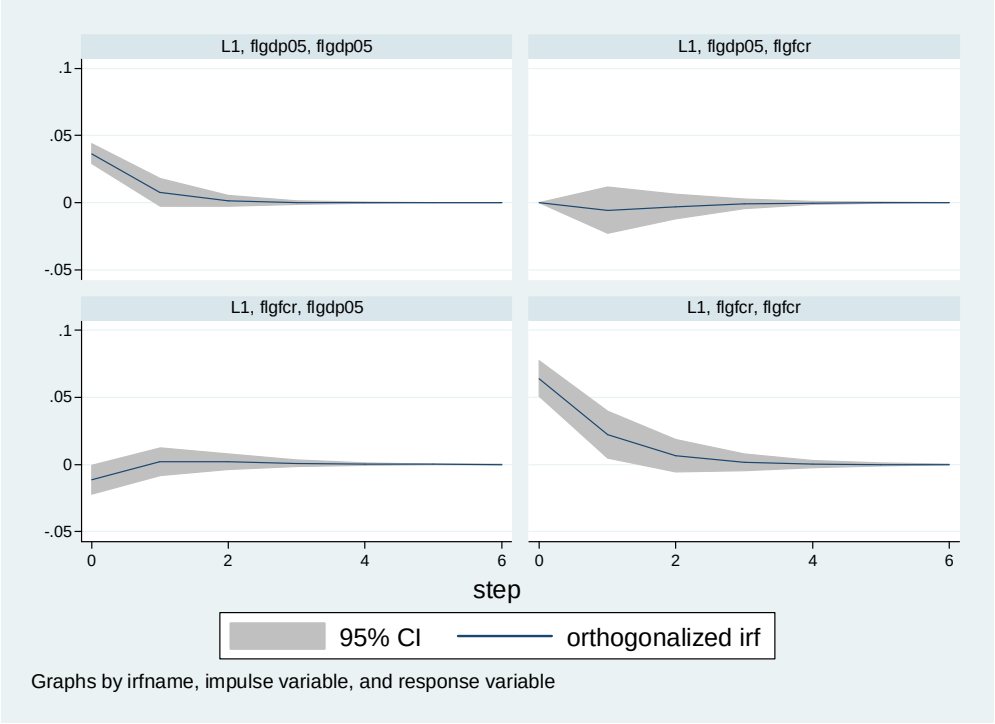
Source: Generated by the author from the data set

4.9. Impulse response functions (IRFs)

An *impulse response function* traces the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables. A shock to the *i*-th variable directly affects the *i*-th variable, and is also transmitted to all of the endogenous variables through the dynamic structure of the VAR.

Determination of the impulse response function requires identification assumptions. Although causality tests in this study have revealed no causation between the variables, the study assumes, for the purpose of this exercise, that general government final consumption expenditure causes economic growth. This follows the fact that though insignificant, the p-value of the coefficient of LGFCER is much smaller than that of LGDP based on the Granger-causality test. The contemporaneous correlation between the variables is therefore interpreted as the impact of general government fixed consumption expenditure on the gross domestic product. The impulse response functions for the model are represented by figure 9 below.

Figure 9: Impulse response functions for GDP and general government final consumption expenditure



Source: Generated by the author from the data set

The diagonal panels in Figure 9 show the effects of shocks to each variable on its own future values. In both cases, the shocks die out quickly as is usually the case when stationary variables are used. A one-standard deviation shock to the GDP is about 4% while a corresponding shock to the ratio of general government fixed consumption expenditure to the GDP is about 7%. The off-diagonal panels show the effects of a shock to one variable on the

other variable. A one-standard deviation shock to the proportion of general government final consumption expenditure in the GDP lowers the GDP by about 2% in the current year but the effect rapidly decays to zero. A one-standard deviation shock to the GDP has virtually no impact on the general government final consumption expenditure and the negligible effect dies out almost immediately. Thus a shock to either of the variables has only a transitory, but not a permanent effect on the variable itself and on the other variable.

CHAPTER 5: SUMMARY AND CONCLUSIONS

5.1. Summary of findings

The study set out to investigate the existence and direction of causality between economic growth and government size in Kenya for the period 1965-2012. The former variable was proxied by the GDP while the share of final general government consumption expenditure in the GDP represented government size. Time series data for Kenya covering the period 1965-2012 was used. Graphical analysis and formal stationarity tests of the time series data used in the study revealed that both series were integrated of order 1, that is, I(1) but both series became stationary after first differencing.

The Engle-Granger and Johansen cointegration tests found no evidence of any cointegrating relationship between the GDP and final general government consumption expenditure. In other words, cointegration analysis pointed to absence of cointegration (a long-run equilibrium relationship) between the GDP and general government final consumption expenditure. A vector autoregressive model was therefore used to establish causality, conduct forecasting and generate impulse response functions for the variables.

Causality tests established that there is no causal relationship between the GDP and the share of general government fixed consumption expenditure in the GDP. This, by extension, implies that there is no causal link between economic growth and government size. The findings agree with results from other studies on similar topics but contradict results from yet other studies, which have found either positive or negative relationship between government size and economic growth (see literature review in chapter 2). The divergence between the results might be attributed to the different variables, data sets, lag lengths and estimation techniques that have been applied in the studies. A ten-year forecast and impulse response functions (IRFs) generated from the VAR results corroborate the test results and prove that the relationship between government expenditure and economic growth is at best minimal but at worst non-existent.

5.2. Conclusions

The paper analyses causal and dynamic relationships between government size and economic growth in Kenya using time series data from 1965 to 2012 and based on a vector autoregressive (VAR) model. The findings suggest that an increase in government size does

not have an impact on economic growth, nor does an increase in economic growth have an impact on government size. Also, there is no bi-directional causality between government size and economic growth. The findings are therefore neutral to the two main and competing theories of the relationship between government size and economic growth: the Keynesian theory and Wagner's law. Keynesian theory supports the view that government expenditure boosts economic growth but Wagner's law holds that it is economic growth that attracts an increase in government size or public expenditure. The results can largely be attributed to the measure of government size used in the study, since final general government consumption expenditure usually affects economic growth indirectly and with a lag. Expenditure on education, for instance, begins to bear fruit after education infrastructure and system have produced qualified manpower to take part in production. Likewise, final general government consumption expenditure tends to depend on factors other than economic growth. Recurrent government expenditure like staff remuneration and payment of utility bills for instance, tends to be insensitive to economic growth.

One important implication of these findings is that popular arguments in favour of increases in government size to stimulate the economy may be inaccurate since such a move will have no impact on economic growth and other macroeconomic indicators like unemployment and investment. This implication is interesting and confusing, given that the Kenyan government has in the recent past adopted expansionary policies such as the Kazi kwa Vijana (KKV) and the Economic Stimulus Programme (ESP). The study results also have implications on debt sustainability of the country. The results imply that the economy can service its debt without compromising economic growth. This implication is in consonance with the argument by the World Bank that Kenya's debt is sustainable.

If we consider these findings from the economic growth perspective, the implication is that government size does not respond to the economic situation in the country. This may explain why unemployment in the public sector is generally unresponsive to economic growth. Remuneration to public servants also exhibits non-responsiveness to the state of the economy. The findings are therefore in line with modern theories of unemployment that tend to focus on the structure of the economy rather than market forces to explain unemployment.

The inconclusive nature of the findings of studies on similar topics makes it mandatory to propose areas for further research. For future research, the study recommends the use of a

proxy variable for government size with a broader base than that used in the current study. A wider time span is also recommended since results of causality studies are heavily influenced by the length of the time series. To this end, the use of quarterly or any other more frequent data is encouraged. It is further proposed that the relationship between economic growth and government expenditure be assessed in terms of the two broad expenditure categories, that is recurrent and development expenditure.

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APPENDICES:

APPENDIX 1: GROSS DOMESTIC PRODUCT AND GENERAL GOVERNMENT FINAL CONSUMPTION EXPENDITURE (1965-2012)

Year	Gross Domestic Product (GDP) at constant 2005 US$	General Government Consumption Expenditure at constant 2005 US$	Ratio of General Government Consumption Expenditure to GDP
1965	3069659898	309025496.6	.1006709
1966	3521776795	323342603.3	.0918123
1967	3640151886	345159147	.09482
1968	3930733925	492245504.9	.1252299
1969	4243589861	556964671.1	.1312485
1970	4046031787	576024928.2	.1423679
1971	4943194503	662570377.5	.1340369
1972	5787612212	718562926.3	.1241553
1973	6128883407	744440853.2	.1214643
1974	6378060354	807971797	.1266799
1975	6434327806	904480783.9	.1405711
1976	6572920943	971401083.5	.1477883
1977	7194311601	1090018800	.1515112
1978	7691617927	1251568357	.1627185
1979	8277352017	1323212328	.1598594
1980	8740219572	1353210076	.1548256

1981	9070035621	1280358403	.1411635
1982	9206673736	1261074137	.1369739
1983	9327193720	1368949154	.1467697
1984	9490906209	1369104986	.1442544
1985	9899068497	1382993554	.1397095
1986	10609579622	1481888725	.1396746
1987	11239481763	1529924079	.1361205
1988	11936687476	1558305065	.1305475
1989	12496559752	1580550148	.1264788
1990	13020421906	1653207030	.1269703
1991	13207700727	1749355654	.1324497
1992	13102105956	1908967045	.1456992
1993	13148382236	2052138113	.1560753
1994	13494550809	2655346065	.1967717
1995	14089149936	2916365426	.2069937
1996	14673404337	2995391959	.2041375
1997	14743088617	2981805940	.2022511
1998	15228167742	3087892119	.202775
1999	15579236184	3014479294	.1934934
2000	15672664146	2947088179	.18804
2001	16265076196	3028678635	.1862075
2002	16354023315	3078394916	.1882347

2003	16833601049	3263395236	.193862
2004	17692838510	3282389643	.1855208
2005	18737895401	3256685861	.1738021
2006	19924122755	3332849344	.1672771
2007	21317473473	3450941773	.1618832
2008	21642980382	3535970551	.1633772
2009	22234961889	3671161663	.1651076
2010	23516785868	4007113621	.1703938
2011	24545864807	4431662778	.1805462
2012	25601336994	4666868939	.18229

Source: Kenya National Bureau of Statistics (KNBS), Central Government and the World Bank's Word Development Indicators website.

APPENDIX 2: SUMMARY STATISTICS

Variable	Observations	Mean	Std Dev.	Min	Max
GDP	48	1.22e+10	6.10e+09	3.07e+09	2.56e+10
LGDP	48	23.07976	.5705841	21.84483	23.96591
GFCE	48	2.00e+09	1.21e+09	3.09e+08	4.67e+09
GFCER	48	.1547002	.0295327	.0918123	.2069937
LGFCRE	48	-1.884921	.1980697	-2.388008	-1.575067

Source: Computation of the author from the data set