EMPIRICAL INVESTIGATION OF THE NEXUS BETWEEN GOVERNMENT EXPENDITURE AND GDP GROWTH IN KENYA AND TESTING OF WAGNER'S LAW FOR THE PERIOD 1960-2011

BY

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DECLARATION

This is my original work and has never been presented for any degree in any other university.

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DEDICATION

To my caring parents who first sowed the seed of education in me and have incessantly provided both moral and financial support, my wife Damaris for her great support and love and my daughter Naomi for giving me a genuine reason to work hard in life.

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Abstract

This study examined the relationship between the growth in Total Government Expenditure and GDP growth in Kenya and tested the applicability of Wagner's law using time series data for the period 1960-2011. The study utilized Cointegration and VECM techniques. Firstly, the study investigated the existence or otherwise of the long-run equilibrium relationship between the two variables by utilizing Johansen-Juselius Maximum Likelihood Test (commonly referred to as the Johansen Cointegration Test). The results of Johansen Cointegration Test indicated the presence of a long-run equilibrium relationship between Real Total Government Expenditure and Real GDP in Kenya during the period under review. Secondly, the study sought to establish the direction of causality between the two variables. To establish the causality direction, the study utilized the Vector Error Correction Model (VECM). The results of the VECM indicated that there exists a long-run causality running from Real GDP to Real Total Government Expenditure. The VECM results also revealed that there exists no short–run causality running in either direction. Finally, the study examined the nature of the elasticity of Real Total Government Expenditure with respect to Real GDP. VECM results were utilized to identify the parameters of the cointegrating equation (ce). The coefficient of the explanatory variable (GDP) in the cointegrating equation (ce) revealed that the elasticity of Real Total Government Expenditure with respect to Real GDP is more than unity. The results of Johansen Cointegration Test, the VECM and the nature of the elasticity of Real Total Government Expenditure with respect to Real GDP validated Wagner's law for Kenya during the period under review.

LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller test
ARDL	Auto Regressive Distributive Lag
CDF	Constituency Development Fund
CPI	Consumer Price Index
EU	European Union
FMOLS	Fully Modified Ordinary Least Squares
GETS	General to Specific Technique
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
IMF	International Monetary Fund
JML	Johansen Maximum Likelihood
KNBS	Kenya National Bureau of Statistics
LDCs	Less Developed Countries
LREALEXPC	Natural Logarithms of real total government expenditure per capita
LREALGDPC	Natural Logarithms of real GDP per capita
MDAs	Ministries, Departments and Agencies
MDGs	Millennium Development Goals
OLS	Ordinary Least Square
RGDP	Real Gross Domestic Product
UECM	Unrestricted Error Correction Model
VECM	Vector Error-Correction Method
VAR	Vector Autoregressive
WB	World Bank

CHAPTER ONE:

1.1 Introduction and background of the study

The relationship between growth in government expenditure and the economic growth has attracted much theoretical and empirical research and analysis for a long period of time. In particular, the long-run relationship between growth in government expenditures and economic growth has attracted great attention from the scholars across the world. In most countries, both developed and developing, the data based on government expenditure as a fraction of national output proves that public sector spending has an inevitable upward trend of growth in the long-run. According to Scully (1989), there is a perpetual upward trend in public expenditure in relation to the real income of any particular country.

Since the end of Second World War, many economists have delved into studies, most of which are empirical in nature, in trying to understand the causes which give rise to the level of public expenditure in relation to the national income. Furthermore, the recent advances in time-series and other econometric techniques have played a significant role in encouraging the researchers to re-examine the long-run relationship between the two variables. Key among the questions that the researchers have endeavored to unravel is whether the causality runs from government spending to economic growth or vice versa.

The first economists who discussed the salient relationship between public expenditure and economic growth were Wagner and Keynes respectively. Suleiman (2010) noted that Wagner and Keynes present two opposite views in terms of the relationship between public sector expenditure and national income. Their views were obviously motivated by, among other factors, the economic events that were unraveling during their time. Wagner developed his theory at the time when Europe was experiencing rapid industrialization and hence rapid economic growth while Keynes was writing at the wake of the great depression of 1930s.

1.1.1 Analysis of Public Expenditure in Kenya

Since the attainment of independence in 1963 hitherto, Kenya has experienced a perpetual growth in total government expenditure. Between 1963 and 1970, Kenyan as a young nation was experiencing tremendous changes in terms of re-organization of the government functions and setting up governance structures that were necessary for any young independent country at that time. During this period, new expenditures were incurred that were related to the restructuring and reorganization of the new government as well as the cost related to the process of transferring power from colonial government to the newly formed Kenyan government. For example, the total government expenditure rose by 7.7% between 1962/1963 and 1963/64. This was attributed to sharp rise in the costs of pensions and gratuities as a result of departure of the expatriates, reorganization of the government as a result of the independence which gave rise to new expenditures such as embassies abroad and the expanding military costs. The repaying of the public debt as an obligation also rose sharply.

The general services sector recorded an increase of 18.2% in 1969/70 compared to the previous year. This was attributed to the growth in expenditure in areas of administration, law, and order, defence, collection and financial control. In the administration, the greatest expenditure was in form of capital expenditure in buildings especially government buildings both in capital city and in the provincial and district levels.

Between 1964/65 to 1969/70, the overall financial obligation of the government rose significantly. During this period, the greatest bulk of the government expenditure went to the socials service which rose by 155.6%.

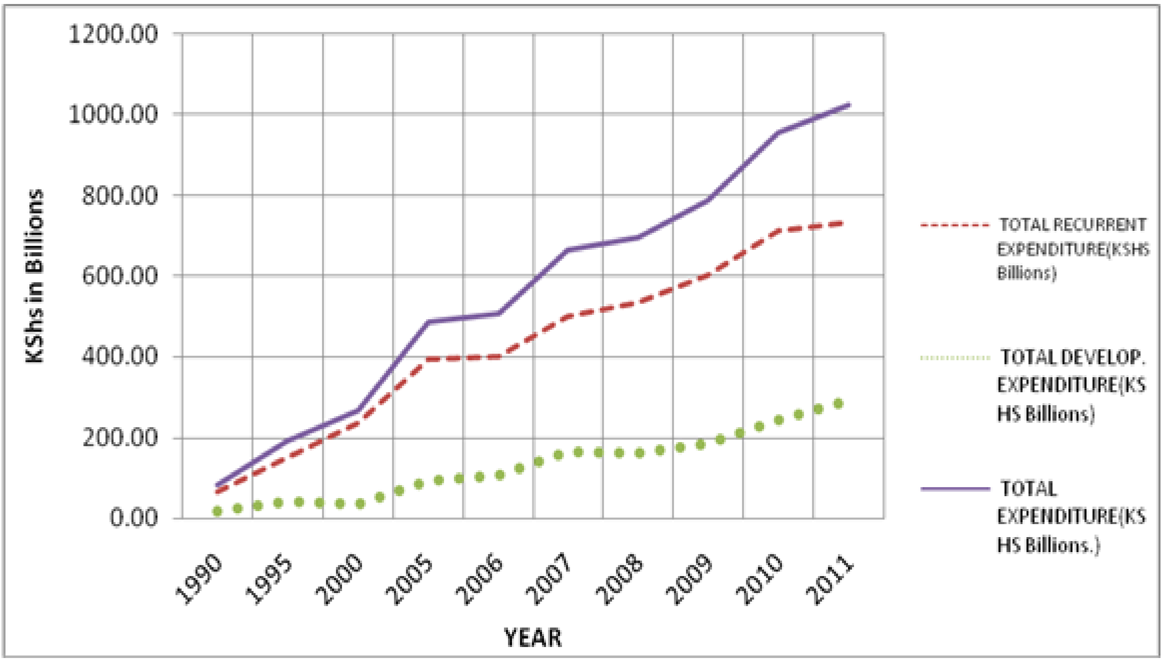
Between 1971 and 1980, Kenya had set most of the structures necessary to stimulate the economy. However the total government expenditure continued to rise due to the need to improve social infrastructures to cater for the increasing population as indicated in the table 1. For example, the government expenditure on education sector increased by 35.7% due to introduction of free primary education from Standard 1 to 4 in early 1970s.

Table 1: Composition of the Total Government Expenditure and Population

YEAR	TOTAL RECURRENT EXPENDITURE IN CURRENT VALUE (KSHS)	TOTAL DEVELOP. EXPENDITURE IN CURRENT VALUE (KSHS)	TOTAL GOVT EXPENDITURE IN CURRENT VALUE (KSHS.)	TOTAL POPULATION
1960	865,300,000.00	153,540,000.00	1,018,840,000.00	8,105,435
1963	1,080,820,000.00	281,680,000.00	1,362,500,000.00	8,908,388
1964	1,138,300,000.00	272,440,000.00	1,410,740,000.00	9,200,107
1970	2,226,340,000.00	909,780,000.00	3,136,120,000.00	11,252,318
1975	4,971,860,000.00	2,490,320,000.00	7,462,180,000.00	13,486,116
1980	13,786,600,000.00	5,654,800,000.00	19,441,400,000.00	16,267,558
1985	26,932,200,000.00	6,182,400,000.00	33,114,600,000.00	19,655,192
1990	65,564,800,000.00	16,562,600,000.00	82,127,400,000.00	23,447,177
1995	151,558,800,000.00	39,434,800,000.00	190,993,600,000.00	27,425,720
2000	235,065,960,000.00	33,364,530,000.00	268,430,490,000.00	31,253,701
2005	393,206,160,000.00	93,916,500,000.00	487,122,660,000.00	35,614,576
2006	401,827,650,000.00	106,839,810,000.00	508,667,460,000.00	36,540,948
2007	501,718,540,000.00	162,896,230,000.00	664,614,770,000.00	37,485,246
2008	533,452,370,000.00	160,712,990,000.00	694,165,360,000.00	38,455,418
2009	603,831,540,000.00	185,529,080,000.00	789,360,620,000.00	39,462,188
2010	712,067,620,000.00	244,158,600,000.00	956,226,220,000.00	40,512,682
2011	732,793,730,000.00	291,969,540,000.00	1,024,763,270,000.00	41,609,728

Source: Various Statistical Abstracts and Economic Surveys, KNBS

Figure 1: Growth trend in Total Government Expenditures and its components



Data source: Various Statistical Abstracts and Economic Surveys, KNBS

Figure 1 shows the components of the government expenditure which have grown tremendous since 1990. The growth in total public expenditure is also attributed to the population growth. Between 1990 and 2011, the population figure grew from 23.4 Million to 41.6 Million persons as indicated in table 1. The increasing population has in turn exerted pressure on the government expenditure in terms of increased demand for public goods such as security, roads, free education and health facilities among other social amenities provided for by the government.

With implementation of the Structural Adjustment Programmes (SAPS), the size of government declined drastically from 1992 to around 2003 mainly due to increased privatization of the state-owned enterprises. During this period however, the overall government expenditures grew steadily due to the costs associated with the implementation of SAPs as well as the changing roles of government from directly participating in the economy to assuming supervisory and regulative roles.

But around 2004, the government size grew up again. This latter growth in the government size was attributed to failing SAPs not only in Kenya but in most of the developing countries. The failed SAPs almost brought most of the developing economies to their knees. Kenya adopted the recovery strategies for wealth and employment creation in 2004 to resuscitate the economy. The government's initiative to generate economic development through free education, rural electrification and economic stimulus programs contributed to increased government expenditures.

Due to the government initiative to jumpstart the economy, the Total Government Expenditure increased significantly from Kshs 379.8 billion in 2004/05 to Kshs 664.6 billion in 2007/08, representing an average annual growth rate of 18.7 per cent over the period. The development expenditures during this period stood at Kshs. 162.9 billion in 2007/08 up from Kshs 40.1 billion in 2004/05. This represented an average annual growth rate of 76.6% during the period. As a proportion of total government expenditure, development expenditure accounted for 24.4 percent in 2007/08 compared to 10.6 per cent in 2004/05. The shift in expenditure pattern observed was in line with the government's key objective of refocusing expenditure in favor of development expenditure. Expenditure on domestic debt also increased from Kshs 92. 4 billion in 2004/05 to 112.8 billion in 2007/08. This depicted the government action to revert to domestic borrowing to finance budget deficits. If such action by the government continues, in the long-run, it may lead to higher interest rates as government competes with private borrowers.

After 2007 post-election violence, the government was faced with new challenges related to the aftermath peace processes that included resettlement of the internally displaced persons due to the post-election violence, bloated government following the signing of the National Accord among others related costs. During this period, while the development expenditure was Kshs 162.9 Billion in 2007/08, this figure reduced to Kshs 160.7 billion in 2008/9 as the government priorities changed to take care of the issues arising from the disputed poll results. The global economic crisis of 2008 also affected the government expenditures and the overall economic development in Kenya.

The commitment by the government to improve terms and conditions of service for civil servants and teachers in Kenya has also contributed to high public spending. As a result of this commitment, the expenditure on consumption of goods and services that includes compensations of the employees and use of goods and services rose by 20% from Kshs 274.1 billion in 2008/09 to Kshs 328.8 billion in 2009/10.

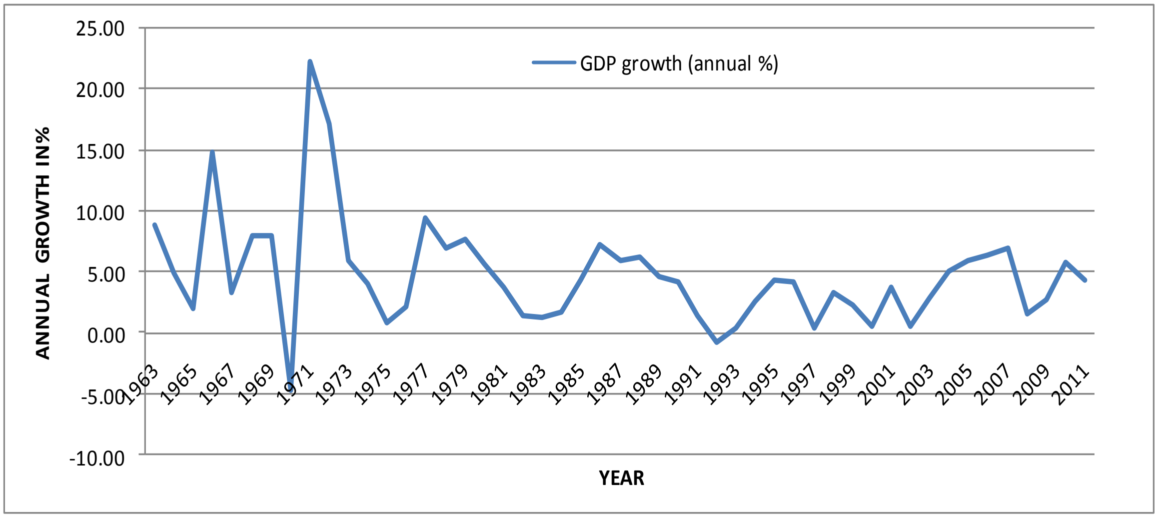
The central government grants to various entities has been on the rise moving from Kshs 107.0 billion in 2008/9 to Kshs 138.2 billion in 2009/10. The main contributor to this growth is grants to general government units that include transfers to parastatals, public universities, the constituency development fund (CDF), and higher education loans Board, among others.

In conclusion, the total government expenditure has perpetually risen from Kshs 29.5 billion in 1960 to Kshs 528.3 billion calculated using the 2001 GDP deflator. This is attributed to increased population and the commitment by the government to improve the social infrastructure, improve the provision of public goods and services as well as increasing complexity of the economy. The population growth has been on an upward trend, rising from 8.1 million in 1960 to 41.6 million people by 2011. This has increased demand for public goods and services as well as the increased complexity of the economy.

1.1.2 Analysis of GDP trend in Kenya

The GDP trend in Kenya, like the total government expenditure, has been on the rise. Kenyan GDP recorded a total of Kshs 179.79 billion in 1963. This has perpetually grown and stood at Kshs 1.5 Trillion measured in real terms using 2001 GDP deflator. But the annual growth rate since independence has been characterized by rise and fall in growth as indicated in figure 2 below.

Figure 2: GDP growth trend for the period 1963-2011



Source: Computed by author using data from various Statistical Abstracts and Economic Surveys, KNBS

The economy experienced a steady growth from year 2002 up to year 2007. Before the general elections of December 2007, the economy enjoyed a broad expansion touching on all sectors of the economy. Real GDP grew by 7.1 per cent in 2007, up from 6.3 per cent in 2006 and 5.1 per cent in 2004. This continued broad-based growth was driven mainly by the agriculture, manufacturing, tourism, building and construction, and transport and communication sectors. As a result, growth in per capita income rose from minus 1.7 per cent in 2002 to 4.1 per cent in 2007 before plummeting following the post-election violence of 2007/08.

The effects of this economic growth trickled down to the grass root level, and had a significantly positive impact on poverty reduction, which declined from 57 percent in 2000 to 46 per cent in 2006/07. However, following the post-election violence during the early part of 2008, economic activities were disrupted, resulting in stagnation in GDP growth during the first quarter, with tourist arrivals going down by over 50 per cent. Most sectors were hampered by disruption to the supply chains and displacement of productive resources and humanity.

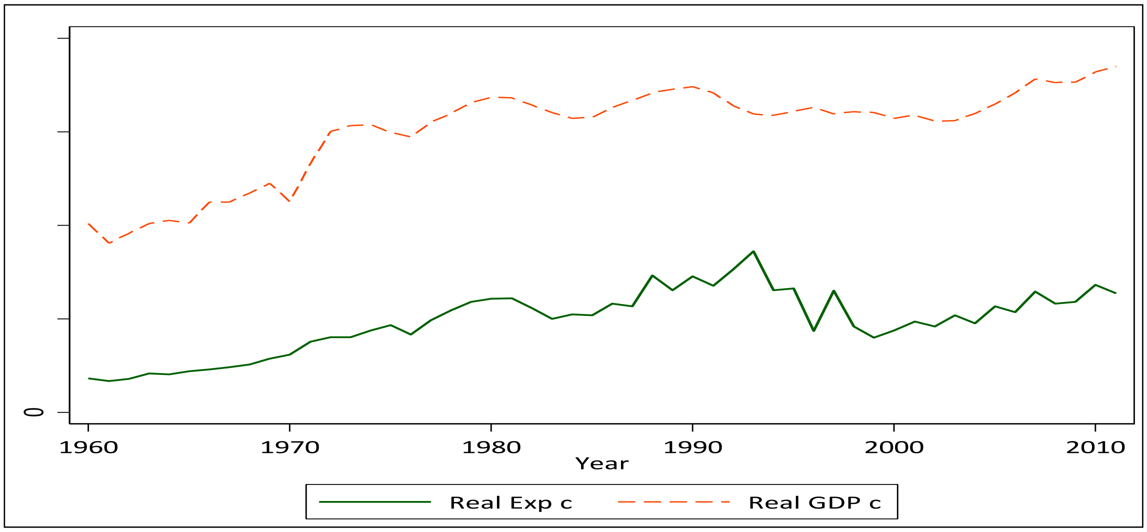
In 2007, the agriculture, manufacturing, wholesale and retail trade and transport and communication sectors, which are the key pillars of the Kenyan economy, accounted for 55.8 per cent of GDP growth. In 2008, the agricultural sector contracted by 5.1 per cent, mainly due to the effects of post-election violence, drought and high input prices, especially those of fertilizer. But, as much as other sectors were performing poorly, the wholesale and retail trade sector registered a quick recovery to an estimated growth of about 5 per cent in 2008. The level of Gross Fixed Capital Formation (GFCF) as a percentage of GDP increased from 19.1 per cent in 2006 to 19.4 per cent in 2007 due to the improvement in the enabling environment at the time. This rate of fixed investment stood at 19.4 in 2008. Growth in real investment decelerated from 13.4 per cent in 2007 to 9.7 per cent in 2008.

In the period 2008 to 2030, Kenya will be guided in her public expenditure decisions by the Vision 2030 (Republic of Kenya, 2007). The vision's main objective is to make Kenya a prosperous and globally competitive nation. The expected achievement will be to transform Kenya into a middle income industrialized country providing high quality of life to all people living in Kenya by 2030. Vision 2030 is hinged on three pillars, the political, social and the economic pillars.

1.1.3 Relationship between growth in Public Expenditure and Economic Growth

From the above analysis, it is clear that both the total government expenditure and GDP in Kenya has been rising since 1960. Figure 3 depicts the rising trend between these two important economic variables. It depicts the growth trend in real public expenditure per capita and the real GDP per capita 3 years before independence and after independence.

Figure 3: Trend in Real Government Expenditure per capita and the Real GDP per capita for the period 1960-2011.



Source: Author

In figure 3 above, it is clear that the two variables in Kenya moves together. However the nature of their relationship has attracted many scholars of public finance who have attempted to study and explained the nature of the above relationship in many countries. But all the studies on the relationship between these two variables are variations of either Keynesian hypothesis or Wagnerian hypothesis.

Keynesian hypothesis is attributed to the 20th century British economist called John Maynard Keynes. Keynes, while offering economic solutions in the wake of the great depression of 1930s, postulated that causality runs from public expenditure to income. According to Keynes therefore, public expenditure is an exogenous factor. It can therefore be utilized as a policy instrument to influence economic growth.

On the other hand, Wagner's law holds that causality runs from national income to public expenditure. Wagner therefore proposed that there exist a long-run tendency for the public expenditure to grow relative to national income. Based on Wagner's law, expenditure is an endogenous factor. Afzal and Abbas (2010) while analyzing the Wagner's law noted that during industrialization, the share of public expenditures in the economy would increase at a rate more than the rate of increase in national income. This relationship reflects a greater role for the government as the economy becomes more complex and the demand for public goods and social programmes rises.

Adolph Wagner (1835- 1917) was a German political economist who first present the relationship between public expenditure and national income when he published his first classic book titled *Grundlegung der Politischen Ökonomie* in 1893. In this book, Wagner formulated his 'law' of expanding state activities. He argued that there is a long run tendency for the government spending and scope to increase as the level of economic development rises. He argued that there is also a tendency that the government sector grows faster than the economy. Further, Wagner emphasized in the process of economic development, that government economic activity increases relative to private economic activity. Wagner's law was not based on empirical research but rather on progressive observation of the economic trends on several countries in Western European civilization towards the end of 19th century.

In supporting his theory, Wagner's gave three main reasons. Firstly, he argued that as the nation's develop, they experience increased complexity as well as the scope of the governments' mandate. The developing countries experience complexity in legal relationships and communications, mainly due to the immense division of labour that accrues with industrialization, modernization and overall development. He argues that as industrialization and the modernization take place, the role of the state will diminish while the private sector role increases. Wagner asserted that the incessant diminishing role of the public sector participation in economic activities will in turn leads to more government expenditure in provision of public goods, regulatory and protective activities. Thus, as more number of private sector participants makes their entry into the economy, the likelihood of experiencing more incidences and magnitude of market failures would be high. Therefore the government would expand its regulatory and protective role and this would increase the overall government spending. Furthermore, Wagner argued that as the economic development level rises, the population growth and high rate of urbanization would lead to increased government expenditure in maintaining law and order, higher economic regulations usually as a result of high economic conflict associated with densely populated urban areas.

Secondly, Wagner argued that as the level of economic development rises, the per capita income of the citizens will also increase. This will lead to increased demand for improved welfare hence raising government expenditure. Wagner opined that as the income increases, the society will demand for more education facilities, healthcare facilities, recreation facilities, better laws governing equitable distribution of wealth and incomes, better transport and communication infrastructures and generally more and better services. The provision of public services being public goods is only efficiently supplied by the government mainly due to the high cost of investments and low or no direct returns (Samuelson, 1954). Wagner too asserted that the government is better able to provide the public goods and services more efficiently than the private sector. Therefore the government would provide these services directly through the State funded agencies or any established arm of the government.

Thirdly, Wagner supported his law by arguing that as the economy grows, some sectors being more dynamic than others would need government regulation to avoid unfair competitions. He noted that the dynamic nature of the technology and high cost of investments involved would attract a few powerful monopolies whose unpleasant monopolistic effects will have to be neutralized by the state in order to create an even level playground. The other option would be for the state to take over those monopolies for the interest of the economy and healthy competition.

In summary therefore, Wagner attributed the growth of the public sector to higher expenditures in areas such as enforcing contracts, regulatory and protective activities, cultural and welfare programs which are usually income elastic, and public long-term investment and infrastructure projects as well as managing and financing some government agencies which are monopolistic in nature.

Wagner's Law of increasing State activities therefore focuses on the nexus between the size of the economy and the size of the public-sector providing public goods and services and undertaking the regulatory activities. But Goffman and Mahar (1971) were quick to note that Wagner's law is not a theory but rather a generalization concerning the secular trend of public spending. Peacock and Wiseman (1967) also asserted that Wagner's Law was basically an observation and not prescriptive in nature. It was not based on any *apriori* information but rather it was based on posterior observationary results.

Many analysts have concurred, to a larger extent and with several proposed theoretical modifications, with Wagnerian Law. While analyzing the Wagner's law of increasing state activities, Peacock and Scott (2000) and Peacock (2006) noted that the state activities must also include those related to the public utilities and enterprises, public provision of healthcare and education services and sound social system of security to protect the working population against adverse social consequences of economic transformation. Henrekson (1993) while examining the Wagner's law affirmed that social progress brings an increase in state activities which in turn mean more government expenditure.

Most of the economists have argued that there exists ambiguity in the relationship between government spending and economic growth. Their view is that the government expenditure is a key factor in stabilizing the economy of any country. The significance of government expenditure is evident and paramount in provision of public goods, accommodating externalities, merit goods, and for the pursuit of socially optimal level of investment and existence of private and public synergies. The government also has a key responsibility of protecting the property rights, offering the public security and administration of courts of law to resolve disputes. However, the government spending in the economy is potentially able to slow down economic growth owing to the increased bureaucratic involvement, corruption and crowding-out of productive private investors especially when the government is involved in the actual process of doing business.

Verma and Arora (2010) while analysis the validity of Wagner's law for India observed an increase in the share of public expenditure to GDP and attributed it to the continued growth in the revenue expenditure on subsidies, interest payments, administrative and defence services which are non-developmental in effect. They noted that the most important item in non-developmental expenditure from revenue account is the defence. Other items include expenditure on administrative services, pensions and grants to states and union territories all of which have overall effect of increasing government expenditure.

1.2 Statement of the Problem

The previous research studies on Wagner's law for Kenya suffer from the following limitations which this study seeks to address.

Firstly, very few empirical studies have undertaken to investigate the relationship between the rising public expenditure and the GDP growth taking into account Wagner's hypothesis in Kenya. Further, most of the studies that have attempted to analyze the validity of Wagner's law in Kenya have not studied Kenya as single economy but rather they have studied Kenya together with other African countries. Such studies include Ansari et al (1997), Akitoby et al (2006) among others. Their conclusion and analysis therefore may not have laid the much require emphasis in testing the validity of this law in Kenya. A proper investigation of Wagner's law must focus on time series behavior of a public spending in a specific country, not a group countries, for as long period as possible (Henrekson, 1992).

Secondly, the empirical analyses of Wagner's law in many countries including Kenya have yielded ambiguous and conflicting results. One key factor that is responsible for variations in the results is wrong econometric approach in analyzing the time series data variables (Cheong, 2001). This study seeks to address this limitation by utilizing advanced econometric modelling involving the Johansen Cointegration and VECM approaches.

Finally, most of the studies that have analyzed the validity of Wagner's law in Kenya have not done so for as long period as possible using accurate, credible and flawless time series data. Such studies have therefore yielded unreliable results regarding the validity of Wagner's law for Kenya. For a credible and reliable conclusions and accurate policy prescription, the study on Wagner's law must utilize credible and flawless data and must analyze it using advanced econometrics tools for as long period as possible.

1.3 Objectives of the study

1.3.1 Main Objective

The main objective of this research paper is to empirically investigate the relationship between the public expenditure in relation to GDP and also to test the validity or otherwise of Wagner's law of growth in public expenditure in Kenyan economy using time series data for the longest period possible.

1.3.2 Specific Objectives

a) To determine whether there exist a short-run and long-run relationship (co-movement) between Total Government Expenditure and Gross Domestic Product in Kenya i.e. whether the two variables are cointegrated or not.

b) To establish causality direction between the Total Government Expenditure and the Gross Domestic Product in Kenya.

c) To investigate the nature of elasticity of Total Government Expenditure with respect to GDP.

1.4 Significance of the study

The Kenyan economy has been experiencing a tremendous rise in government spending since independence. The country's GDP has also been on the upward trend. Many economists have written extensively on the role of the government spending in the growth of an economy. There have been extensive empirical analyses as to the causality direction between the government spending and the economic growth. Two opposing propositions have been put forward; the Keynesian theory and the Wagnerian theory. The two theories have been found to hold in many empirical studies done in different countries, both developing and developed countries. These conflicting research findings have left uncertainties as to the nature of the relationship between growth in government expenditure and the economic growth.

This study seeks to firstly, analyze the growth trend in government spending visa avis the GDP growth. This will be important as the findings shall be of valuable use to the policy makers in their endeavor to efficiently allocate the resources in their provision of services to the public.

Secondly, the study seeks to analyze and empirically determine whether there existing a long-run relationship between the two variables and if so, the causality direction between the two variables. This would be vital in providing empirical information that would be useful to the policy makers both in government and in private sector in prioritizing their spending policy and investments respectively.

1.5 Scope of the study

This study analyzes the time series data for Kenya from 1960 to 2011. The long period is essential for determining the validity of Wagner's law (Henrekson, 1992). This period consist of the short-run period just before independence and after independence and long-run period after independence to 2011. This short period is important in the history of Kenya and in the analysis of Wagner's law because of the following reasons:

Firstly, immediately after independence, the major government policy was to eradicate three enemies of the economy. These were identified as hunger, disease and ignorance. Consequently, this policy could certainly not support Wagner's law as it presupposed that direction of causality was from government spending to economic growth. But this was alluded to by Wagner as he had outlined that his theory was not concerned with the short run but rather with the long run effects. And because of this effect, this study shall seek to empirically determine whether the Wagner's law holds in the short-run period.

Secondly, Wagner noted that growth in public expenditure may be affected by financial constraints in the short-run. In other words, the financial constraints may hamper the expansion of state activities in the short-run. This would cause the extent of state expansion activities to be conditioned on revenue in the short-run. Wagner noted that in the long run, the desire for development of a progressive people will always overcome these financial difficulties. Wagner law therefore does not have any interest in short-run changes, as any of these changes, like financial stringency, would cause public expenditure not to be derived from what Wagner's law suggests, but from other impermanent causes within the economy.

Wagner (1883) hypothesized that government expenditures increase by more than proportionately with income. In other words, he argues that the income elasticity of demand for government services is positive and greater than unity. But the Wagnerian theory was not empirical but theoretical in nature. This study seeks to fill this gap by undertaking empirical analysis of the elasticity of government expenditure with respect to national income.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter firstly, gives an overview of the theoretical hypotheses that have been put forward to explain the growth in government spending as the national income rises. Secondly, it provides literature review on the empirical studies on Wagner's law across diverse countries and finally gives an overview of the literature analysis.

2.2 Theoretical Review

The most common theories that have been put forward include the following:

2.2.1 Wagner's Organic State Theory

This theory is commonly referred to as the Wagner's law. Since this law has been thoroughly examined in the previous chapter, its brief summary here would suffice. Wagner's law is primarily concerned with explaining the growth of the proportion of the GNP growth that is taken up by the public sector. The theory attributes the growth in public expenditure as the economy grows to the following:

a) The state would need to expand administrative, law and order services,

b) The issues related to equitable resources distribution will increases,

c) The state will be faced with greater need to control the private monopolies and other forms of market failures.

Wagner's theory therefore envisaged a situation where a state will grow like an organism reflecting changes in the society and economy and making decisions on behalf and for the benefit of its citizens.

2.2.2 Musgrave –Rostow's Theory

This theory attributes the public expenditure as a prerequisite of economic development. The theory argues that the level of public expenditure in any given state is directly related to the stage of development in which the state has reached. The theory therefore posits that in early stage of economic development, public investment as a proportion of the total investment in the economy is high. This is due to the fact that at early stage of development, the government is mandated to provide the often costly infrastructure such as transport and communication systems, health and sanitation systems, law and order systems, education and human capital development structures. All these provisions are necessary to propel the economy for takeoff into middle stages of economic development.

Once the economy is in the middle stages of development, the government spending often continues in terms of provision of investment goods but the private sector investments now takes over. Government now becomes more involved in dealing with many forms of market failures which can frustrate the drive towards economic maturity. As the economy moves into maturity and stage of high mass consumption, the government will experience a rise in its spending as it establishes income maintenance programmes and implementation of polices aimed and ensuring equitable distribution welfare among the citizens.

2.2.3 Peacock and Wiseman's Political Constraint Theory

This theory was expounded by Alan T. Peacock and Jack Wiseman in their well-known 1961 study titled "The Growth of Public Expenditure" in the United Kingdom. This theory is based on the political theory of determining public expenditure. This theory posits that governments like to spend more money, that citizens do not like to pay more taxes, and that governments need to pay attentions of the wishes of their citizens (voters). The theory further assumes that there is some tolerable level of taxation which acts as a constraint on the government behavior. Thus, as the economy grows, tax revenue at a constant rate would rise and thereby enabling public expenditure to grow.

However, during the period of social upheavals such as wars, famines or some large scale national disaster, this gradual upward trend in public expenditure would be distorted. This phenomenon is known as *upward displacement*. In order to finance the increase public spending as a result of these social disturbances, the government may be forced to increase the level of taxation; a policy which would be regarded as acceptable to the electorate during the periods of crisis. This phenomenon is referred to as the *displacement effect.* This theory also notes that there is phenomenon known as the *inspection effect.* This arises from the people's keener awareness of social problems during the period of disasters and therefore accepting the increased level of taxation. Thus, the government increases its spending to improve these conditions. But the core of the matter is the fact that since the people's perception of tolerable levels of taxation does not return to its former level, the government continues to finance these higher levels of expenditure originating in the expanded scope of the government. The nets results of these effects are occasional short-term jumps in public expenditure within an overall rising-term trend.

2.2.4 Keynesian Theory

This theory is attributed to the ideas of the 20th century British economist John Maynard Keynes. His theory asserted the importance of aggregate demand for goods as the driving factors of the economy, especially in the periods of economic depressions. Keynes believed that the government was responsible for pulling a country out of depression. He argued that if the government increases its spending, then the citizens would be encouraged to spend more because more money was in circulation. The people would start to invest more and the economy would climb back to normal. His theory therefore proposes that the causality direction of the relationship runs from government expenditure to GDP.

2.2.5 Public Choice Theory

This theory is attributed to Meltzer and Richard (1981). The theory was born out of the proposition by Kuznets (1955) that economic growth raises the income of the skilled laborers relative to the income of the unskilled. In this way, as the economy grows, it raises the level of inequality and therefore governments must focus on redistribution of wealth. The theory concentrates more on the redistribution and neglects other public goods and services provided by the government. The authors argued that the process of identifying the tax rate and resource redistribution is a political process. The theory argues that citizens vote for the government whose promises are in tandem with their needs. It proposes a concept of a decisive voter. Under universal suffrage majority rule, the median voter is the decisive voter. The theory further argues that the voters do not suffer from fiscal illusions and they are not myopic. They know that the government must extract resources through taxation to pay government spending which include redistribution. Voters with income below the income of the decisive voter choose political candidates whose policy favors high taxes and more redistribution while voters with income above the decisive voter desires lower taxes and less redistribution.

2.3 Empirical Literature

Wagner's law has in the past been subject to empirical test by many researchers. Studies have been conducted for groups of countries using cross-section data, single countries using time series data, as well as pooled time series data. The studies conducted employed different econometric techniques. The empirical results from these studies have yielded different results. Karagianni (2008) while analyzing the validity of Wagner's law in European Union economies noted that the empirical results are often very ambiguous and that the validity or invalidity of Wagner's law is very sensitive to the empirical method applied.

Tang (2001) sought to investigate the relationship between the national income and the government expenditure in Malaysia using the annual time series data over the period 1960 to 1998. His results of Johansen multivariate cointegration revealed the existence of a unidirectional causality from national income to government expenditure growth and hence supported the existence of Wagner's laws for Malaysia in the short-run. In yet another study, Tang (2006) sought to determine the causality direction between national income and government expenditure for 5 countries namely Indonesia, Malaysia, Philippines, Singapore and Thailand. In this study, Granger causality tests were used on time series data spanning four decades (1960-2002) for each country. The results indicated that the reverse of Wagner's hypothesis (Keynesian hypothesis) only existed for Philippines. There was no evidence of existence of Wagner's law or its reverse for the other countries.

Rauf *et al* (2012) set out to investigate the validity or otherwise of Wagner's law for Pakistan using the time series data for the period 1979-2009. To investigate the long run relationship, the ARDL approach to cointegration was used while the causality was determined using the Toda and Yamamoto approach. Their study concludes that there was no long run relationship between public expenditure and the national income at aggregate level. The Toda and Yamamoto causality results asserted that there was no causality at all from directions of national income to public expenditure and also from public expenditure to national income.

Islam (2001) sought to examine the Wagner's hypothesis for USA using advanced econometric techniques such as cointegration and exogeneity test and taking into account much longer time series data for the period 1929-1996. His empirical results based on the Johansen–Juselius cointegration and exogeneity tests provided strong evidence for a long run equilibrium relationship between per capita real income and the relative size of the government. The elasticity coefficient associated with per capita real income was also found to be greater than zero as hypothesized by Wagner's law.

The empirical testing for Wagner's law in Nigeria by various scholars has yielded ambiguous results. Some studies found support for Wagner's law while others did not. Example of the studies which found no support for Wagner's law includes Babatunde (2008) which tested Wagner's Law for Nigeria using annual time series data between 1970 and 2006 using Bounds Test Approach proposed by Pesaran et al. (2001) based on Unrestricted Error Correction Model and Toda and Yamamoto's (1995) Granger non-causality tests. Empirical results from the Bounds Test indicated that there exists no long-run relationship between government expenditure and output in Nigeria and the Toda and Yamamoto's (1995) causality test results showed that the Wagner's law does not exist during the period studied. Another study that found no empirical support for Wagner's law includes Omoke (2009). The study sought to test for causality direction between Government expenditure and National Income in Nigeria using annual data for the period 1970-2005 using Cointegration and Granger Causality test. Johansen multivariate approach to cointegration test for the long-run relationship among the variables was employed. Results showed no long-run relationship between Government expenditure and National Income in Nigeria. The Granger Causality test revealed that causality runs from Government expenditure to National Income, as a support for Keynesian hypothesis and rejection of Wagner's hypothesis.

But some studies found the support for Wagner's law in Nigeria. For example, Akpan (2011) examined the causal relationship between the national income and the public expenditure for Nigeria over the period 1970-2008 by deploying modern advances in econometric techniques such as Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, vector error-correction method (VECM) and the standard Granger causality test. A strong support for the Wagner's long run causal relationship from national income to public expenditure was found. In support of Wagner's hypothesis, Aladejare (2013) examined the relationships and dynamic interactions between government capital and recurrent expenditures and economic growth in Nigeria over the period 1961 to 2010. He used Real Gross Domestic Product (RGDP) as a proxy for economic growth in his study. He then applied the Vector Error Correction Model and Granger Causality techniques and the empirical results supported the Wagner's hypothesis for Nigeria.

Similarly, Ogbonna (2012) while analyzing validity of Wagner's law in Nigeria over the time period 1950-2008 found support for Wagner's law. The author adopted Musgrave (1969) version of Wagner's law and then applied three of the most advanced econometric methods: Johansen maximum likelihood (JML) cointegration method, Error Correction Modeling and the Granger causality. The empirical results found validity of Wagner's law in Nigeria during the period under review.

But perhaps the greatest support for Wagner's law in Nigeria came from Dada and Adewale (2013) and Olomola (2004). Dada and Adewale (2013) sought to examine the long-run relationship and direction of causality between economic growth and government spending with consideration for exchange rate, consumer prices and monetary policy rate for the period 1961 to 2011. Times series data on variables such as real GDP, total government expenditure, exchange rate, inflation rate and monetary policy rate during the period (1961-2011) were used. The study employed Phillips-Perron technique to identify the order of integration of the variables used in the study. The test was conducted with a drift and time trend. The study then employed Johansen multivariate cointegration tests to determine if a group of I(1) variables converge to a long-run equilibrium. Vector Error Correction Mechanism (VECM) was employed to model the causal relationship between economic growth and government spending. Johansen multivariate cointegration test showed that variables are cointegrated. Both the Trace test and Maximum-Eigen test suggested one cointegrating vector. The result of VECM estimates provided strong evidence in support of long-run causality running from real GDP to government spending.

Olomola (2004) examined the causal relationship between national income and public expenditures in Nigeria in the short and long-run. He adopted cointegration techniques to study Wagner's law in Nigeria for the period 1970-2001 and found evidence in support of Wagner's law. He also utilized VECM and established that the causality direction was from national income to government expenditure thus validating Wagner's law.

Ghartey (2007) used Granger causality, Autoregressive Distributed Lag and the Error Correction Model to determine the validity of Wagner's' law for Ghana for the period 1965-2004. The empirical findings strongly supported the validity of Wagner's law in Ghana.

Sideris (2007) sought to empirically examine the validity of Wagner's law for 19*th* century Greece for the period 1833-1938 using the various specifications of the hypothesis and the cointegration analysis. His results provided positive evidence for the existence of a long-run relationship between government expenditure and national income. The causality test for the study indicated that causality runs from income to government expenditure, thus validating Wagner's hypothesis.

Chang (2002) undertook to investigate the five different versions of Wagner's law by employing annual time-series data on six countries over the period 1951-1996. The study chose three emerging industrial countries in Asia (South Korea, Taiwan, and Thailand) and three industrialized countries (Japan, USA, and United Kingdom). The study utilized Augmented Dickey-Fuller (ADF) tests to investigate stationarity and Johansen and Juselius cointegration analysis to investigate a long-run relationship between income and government spending. The study then utilized Granger causality test to establish the causality direction between the two variables. The results indicated existence of a long-run relationship between income and government spending for sample countries studied with the exception of Thailand and thus Wagner's law was found to be valid for the sample countries except in Thailand.

Richter and Paparas (2012) examined the long-run relationship between national income and government spending in Greece using data from 1833 until 2010. This was longer period of time than the one examined by Sideris (2007) as it spanned a period of almost 2 centuries. They used 5 different versions of Wagner's law, all of which sought to examine the long run tendency for government expenditure to expand relative to economic growth. The versions of Wagner's law investigated included, Peacock-Wiseman, Musgrave, Gupta, Goffman and Pryor versions. The data set used covered a crucial period in the history of Greece in terms of early periods of development, a period of growth, industrialization and modernization of the Greek economy; conditions which are conducive for Wagner's law. Johansen cointegration technique and Engel-Granger approach were used to examine the long-run relationship. The results indicated strong evidence of long-run relationship between government spending and national income while Granger causality tests indicate that causality runs from the national income to spending.

Lamartina and Zaghini (2008) applied a panel cointegration analysis to test for Wagner's hypothesis in 23 OECD countries from 1970 to 2006. Countries studied were Australia, Austria, Belgium, Canada, Denmark, Finland, France, Great Britain, Germany, Greece, Iceland, Ireland, Italy, Japan, South Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland and USA. The empirical results indicated a positive correlation between public spending and per-capita GDP which is consistent with Wagner's law. The presence of a long-run elasticity greater than one suggested a more than proportional increase in government expenditures with respect to economic activities as alluded to in the Wagner's law.

Demirbas (1999) examined Wagner's hypothesis using the six various specifications of the theory for Turkey over the period 1950-1990 and found no empirical support for any of the six versions of Wagner's law.

Bagdigen and Cetintas (2003) while studying Turkey for the period 1950-2000 using the co-integration test and the Granger Causality test empirically found no causality in support of Wagner's Law.

However, Oktayer and Oktayer (2013) undertook a study which tested the validity of Wagner's law by applying Autoregressive Distributed Lag (ARDL) cointegration technique using annual data over the period 1950-2010 in Turkey. In order to determine the possible impact of omitted variables, the authors first tested the standard bivariate versions of Wagner's law. The authors then included a third variable, inflation ratio, thus extending the analysis on a trivariate system. The findings of each testing procedure indicate that omitted variables matter. The study found that while there existed no long-run relationship between the variables in the first step of the testing procedure (bivariate system), a long-run correlation was found in the second step (trivariate system). Unlike the other studies for Turkey, the authors utilized the non-interest government expenditure instead of total government expenditures. The different results for the same Turkish economy validate the argument by Karagianni (2008) that the outcome of the empirical tests is very sensitive to the empirical method applied.

Huang (2006) undertook to establish the validity of Wagner's hypothesis for China and Taiwan using annual time series data covering the period 1979-2002. To estimate the long-run relationship between government expenditures and output, the author applied a robust estimation method known as the Bounds Test based on Unrestricted Error Correction Model (UECM) estimation suggested by Pesaran *et al*. (2001). Empirical results from the Bounds Test indicated that there exists no long-run relationship between government expenditures and output in China and Taiwan. Furthermore, Toda and Yamamoto's (1995) Granger non-causality test results also showed that Wagner's Law does not hold for China and Taiwan over the same period.

Webber et al (2010) undertook an empirical investigation into the validity of Wagner's Law for New Zealand over the period 1960-2007. Autoregressive Distributed Lag Bounds test was used to select the optimal model. The results suggested that there is a cointegrating relationship between the share of government spending in national output and per capita income. Granger causality tests were used to confirm the causality direction between the variables. The study found statistically significant evidence that in the long-run, per capita income Granger-causes the share of government spending in income, which is consistent with Wagner's Law.

Kuckuck (2012) used historical data (1850-2010) to test the validity of Wagner's law of increasing state activity at different stages of economic development for five industrialized European countries namely the United Kingdom, Denmark, Sweden, Finland and Italy. The study classified each country into three individual stages of economic development in terms of per-capita income and covering periods of major social disturbances e.g. World Wars I and II, Great Depression of 1930s and Oil crises of 1970s. Advanced Johansen and Juselius cointegration and Vector Error Correction analyses were employed. The study found that the cointegration exists irrespective of the development stage except in Denmark, where cointegrating relationship was only detected in the second and third development stage.

Ghorbani and Zarea (2013) investigated Wagner's law by using Iran's time series data for the period 1960 -2000 by applying Engel-Granger cointegration technique. The result found empirical support for Wagner's law and concluded that along this period of time, government expenditure growth and the size of government in Iran was a natural result of economic growth.

Magazzino (2010) assessed empirical evidence of Wagner's hypothesis in 27 EU countries for the period 1970- 2009. The study included public deficit as a variable together with aggregate income on one side and government spending on the other side. The study used six versions of Wagner's law where cointegration technique was employed. The results indicated ambiguous results according to the versions applied and also according the respective countries.

Ghali (1997), while not expressly indicating that he was investigating Wagner's law, undertook to untangle the nature of the relationship between government expenditure and economic growth in Saudi Arabia. He examined the inter-temporal interactions among the growth rate in per capita real GDP and the share of government spending in GDP using annual data for the period 1960 - 1996. Vector autoregressive (VAR) analysis and Granger Causality tests were used. The empirical results were quite interesting in two folds: First, the results found no evidence that government spending can increase Saudi Arabia's per capita output growth (thus rejecting Keynesian hypothesis) and secondly, the flow of causality was from output growth to government spending thus validating the Wagner's hypothesis in Saudi Arabia.

Rehman *et al* (2007) while investigating the validity of Wagner's law deviated from the way other researchers have approached the subject. The study included other variables such as openness of Pakistan's economy and the financial development in addition to real per capita income on one side and government expenditure on the other. Johansen and Juselius (1990) Cointegration Approach was used to analyzed the long-run relationship between the variable while Short-run dynamics were estimated using the Error Correction Mechanism (ECM). The results, in support of Wagner's law, indicated existence of a long-run relationship between government expenditures and per capita income, openness of Pakistan's economy, and the financial development.

Akitoby (2006) while analyzing the existence of Wagner's law noted that generally, there seems to be a feeble support for Wagner's law in developing countries compared to the developed countries. He investigated both short-run and the long-run relationship between the government expenditure in a group of 51 developing countries including South Africa using Error Correction technique. He also estimated the elasticity of government spending with respect to output for each country. The results depicted long-run relationship between the government spending and the output and concluded that the results were consistent with Wagner's law.

As mentioned earlier, very few studies have been undertaken to investigate the validity of Wagner's law for Kenya. Such few studies include Ansari et al (1997). Ansari et al (1997) undertook to empirically test the Wagnerian hypothesis using data for three African countries namely Ghana, Kenya and South Africa. The study analyzed the long-run relationship between real income per capita and per capita real government expenditure using Engle and Granger (1987) cointegration test. Causality between the two variables, on the other hand, was analyzed using the Granger (1969) causality tests as well as the Holmes and Hutton (1988) tests. The results showed no significant evidence of causality for the two variables and concluded that Wagner's law does not hold for South Africa and Kenya. But the short coming of their study was the utilization of panel data for countries whose per-capita income is not of equal magnitude.

Mutuku and Kimani (2012) is one key study that sought to investigate the validity of Wagner's hypothesis for Kenya for a long period as recommended by Henrekson (1992). The study assessed the Wagner's hypothesis for the period 1960-2009 by employing Engle and Granger two-steps cointegration test to investigate the co-movement between the GDP and public expenditure. The study then utilized Granger causality test to establish the causality direction between these two variables. The study tested five versions of Wagner's law namely Peacock and Wiseman (1967), Pryor (1969), Gupta (1967), Goffman (1968) and Mann (1980). The study found validity of Wagner's law for two of the five models namely Peacock and Wiseman as well as Gupta models.

Ziramba (2008) sought to investigate the validity of Wagner's hypothesis in South Africa using time series data for the period 1960-2006. The study used Autoregressive Distribute Lag (ADL) approach to cointegration to test the long-run relationship between government spending and real income. The study then applied the granger non-causality test developed by Toda and Yamamoto (1995) to investigate the causality direction between the two variables. The results found no support for Wagner's law in South Africa.

Perhaps, Peters (2007) is the author who greatly emphasized the sensitivity of the cointegration techniques. The author undertook to investigate the applicability of Wagner's hypothesis to four totally diverse countries namely USA, Thailand, Barbados, and Haiti. The study aimed at testing the applicability of the law to these countries which are at various stages of development and with different characteristics. The Engle Granger cointegration test and the Johansen and Juselius maximum likelihood estimation technique of cointegrating vectors were employed to determine whether there is a long run relationship between government spending and income. While the Engle Granger test supports the existence of Wagner's 'law' for only United States and Barbados, the Johansen procedure with an improved model supports the existence of Wagner's 'law' for all countries under all assumptions. The different results for the two approaches was alluded to by Cheong (2001) who posits that Johansen (1988); Johansen and Juselius (1990) is more efficient than the Engle-Granger (1987) method. Verbeek (2000) noted that one of the shortcomings of the Engle –Granger approach is that the results of the tests are sensitive to the left-hand side variable of the regression, that is, to the normalization applied to the cointegrating vector. According to Hallam and Zanoli (1993), the Johansen (1988) analysis provides more accurate estimate for the parameters of the long run relationship.

2.4 Overview of the Literature Review

From the above literature review, it is clear that the empirical testing of the validity of Wagner's law in different countries have yielded different results. Many scholars, in endeavor to empirically test Wagner's law in different countries have yielded ambiguous, conflicting and often inconclusive results. Various econometric approaches have been used to investigate the presence of long-run relationship between government spending and the national output in different countries. The studies investigating Wagner's hypothesis have also yielded different results for the same country over the same period of time. For example, studies investigating the Wagner's hypothesis for Nigeria have been ambiguous with Babatunde (2008) and Omoke (2009) finding no empirical support for the hypothesis while Dada and

Adewale (2013), Aladejare (2013) and Akpan (2011) among other studies found a strong evidence in support of Wagner's law.

Other studies by different scholars, in different countries, using different econometric approaches consistently found strong evidence in support for Wagner's hypothesis. Such studies include Peters (2007), Lamartina and Zaghini (2008, Islam (2001) and Chang (2002) consistently found statistically significant evidence in support of Wagner's law in USA. Richter and Paparas (2012) as well as Sideris (2007) also found strong support for Wagner's law for Greece in their studies.

Further, different studies using different econometric techniques have arrived at similar conclusions finding no support for Wagner's law in the same countries. For example, Tang (2001) undertook to investigate the validity of Wagner's law in Malaysia as single economy and found no empirical support for Wagner's law. Later in another study, Tang (2006) pooled Malaysia together with Indonesia, Philippines, Singapore and Thailand and found no evidence to support Wagner's law in any of the countries investigated. Ansari et al (1997) and Ziramba (2008) used different econometric approaches but arrived at a conclusion that Wagner's law is not valid in South Africa.

But one key factor that towers high in the above literature review is that the cointegration methodology is very sensitive to the technique employed. As can be deduced from the literature review, some techniques have been found to be more efficient than others. For example, Cheong (2001) and Hallam and Zanoli (1993) asserted that Johansen cointegration technique is more efficient since it provides more accurate estimates of the parameters of the long-run relationship among variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the econometric methodology and the necessary statistical tests that are used to empirically test the existence of long-run relationship between government spending and the economic growth in Kenya, the causality direction as well as the nature of the elasticity of government spending with respect to GDP.

3.2 Data Description and Sources

This research study utilizes the annual times series data from 1960 to 2011. This constitutes 52 observations, the longest possible period suitable for testing the Wagner's hypothesis (Islam, 2001). The Data on GDP, GDP per capita and Population was obtained from the World Bank (2014) website and verified using the annual statistical abstracts and Economic Surveys from the Kenya National Bureau of Statistics (KNBS). The data on Total Government Expenditure was culled out from the Government National Accounts from the Treasury and Annual Statistical Abstracts and Economic Surveys from KNBS.

The data variables which are time series in nominal values are then transformed into real variables using the GDP deflator obtained from the World Bank economic indicators data series. The formula used to calculate the real values of variable y is:

$$\text{Real value of y} = \frac{\text{Nominal value of y}}{\text{GDP deflator}} \text{ x } 100$$

The advantage of using GDP deflator over Consumer price index (CPI) is that unlike CPI, the GDP deflator is not based on a fixed basket of goods and services. The basket is allowed to change with people's consumption and investment patterns. Specifically, for the GDP deflator, the basket in each year is the set of all goods that were produced domestically, weighted by the market value of the total consumption of each good.

Finally, all the data series have been transformed into the natural logarithmic form for several reasons: Firstly, to enable estimating the relative elasticity of GDP to government spending (Kesavarajah, 2012, Verma and Arora, 2010); Secondly, to achieve stationarity in variance in a lower order of integration in case the logs of these variables are non-stationary at levels (Kesavarajah, 2012; Bojanic, 2013; Verma and Arora, 2010) and thirdly, to minimize or totally avoid heteroskedasticity (Hossain, 2008).

3.3 Preliminary data analysis

The preliminary data analysis involves plotting the graphs of the variables to visually determine their trend during the period under review.

3.4 Model Specification

The literature is cognizant of the fact that Wagner neither specified how his theory of increasing state activities could empirically be tested nor did he empirically test it himself. He did not present his theory in a mathematical form. Hence over the years, different authors have formulated different mathematical models to test Wagner's law in various countries. There are at least six versions of Wagner's law that have been formulated as follows:

1. $\ln E = \alpha + \beta \ln GDP$

This version was formulated by Peacock-Wiseman (1961) who interpreted the law that public expenditures should increase by a higher rate than GDP. E is Government expenditure and GDP is Gross Domestic product and ln is the natural logarithms. The validity of this law requires that $\beta>1$ and β is the elasticity of government expenditure with respect to output.

2. $\ln FCE = \alpha + \beta \ln GDP$

This version was adopted by Pryor (1968) who asserted that in developing countries, the share of public consumption expenditure to the national income is increasing. *FCE* stands for Final Consumption Expenditure, GDP is Gross Domestic product and ln is the natural logarithms. To support the Wagner's law, this model requires that $\beta>1$.

3. $\ln E = \alpha + \beta \ln(GDP/Pop)$

This model was formulated by Goffman (1968). He asserted that during the development process, the increase in GDP per capita should be lower than the rate of increase in public sector activities. *E* stands for government expenditure, GDP stands for gross domestic product and *Pop* for Population. This version requires that $\beta>1$ for Wagner's law to hold true.

4. $\ln(E/GDP) = \alpha + \beta \ln(GDP/Pop)$

This model was postulated by Musgrave (1969) who held that the public sector share to GDP is increasing as the GDP per capita rises during the development process. *E* stands for government expenditure, GDP stands for gross domestic product and *Pop* for Population. This model require that $\beta>0$.

5. $\ln(E/Pop) = \alpha + \beta \ln(GDP/Pop)$

This model is associated with Gupta (1967) who considered per capita government expenditure as a function of per capita GDP. *E* stands for government expenditure, GDP stands for gross domestic product and *Pop* for Population. This version requires that $\beta>1$ for Wagner's law to hold.

6. $\ln(E/GDP) = \alpha + \beta \ln GDP$

This version is known as the "Modified" version of Peacock and Wiseman and was formulated by Mann (1980) who held that the public expenditure share to GDP is a function of GDP. *E* stands for government expenditure, GDP stands for gross domestic product. For this Wagner's law to hold true, this version requires that $\beta>0$.

In all the above models, the estimator β represents the income elasticity of government expenditure to national income and it is expected to be greater than unity for the Wagner's law to hold. This is consistent with Wagner's hypothesis that as the income increases, the demand for social and public goods increases and hence the spending becomes elastic.

Since all the versions of Wagner's law have received support from many credible scholars, there exist no criteria for selecting any of the versions to be used in testing the law in any country (Demirbas, 1999). Thus, the investigators of Wagner's law in different countries either choose any of the versions as they like or they test all of them.

Thus this study, like Henrekson (1993), adopts Gupta (1967) version to test for validity of Wagner's law in Kenya for the period 1960 to 2011. The advantage of this version is that population factor is incorporated into the variables by transforming both the government expenditure and GDP into per capita variables. This helps achieving a near normal distribution of the variables and also in ensuring that the autocorrelation is achieved with minimum number of lags to save the degrees of freedom.

The model is then tested using Johansen Cointegration test and the causality direction is empirically established using Error Correction Model (ECM).

Thus the model to be adopted in this study is specified as follows:

$$\mathbf{lnE_t = \alpha + \beta\, lnGDP_t + e_t}$$

Where,

lnE_t is natural logarithms of Real Total Government Expenditure per capita

$lnGDP_t$ is natural logarithms of Real Gross Domestic Product per capita

α is a constant term

t is the time trend

e is the random error term

3.5 Descriptive Summary

The descriptive summary involves investigating the nature of the time series variables in terms of their range, mean, standard deviation and variances.

3.6 Time Series Properties of Variables

3.6.1 Stationarity

The precondition for using the Johansen Cointegration Method is that the data variables must be non-stationary at level but when difference once, they become stationary (Islam, 2001). In other words, the two variables must be integrated of the same order i.e I (1).

To investigate whether the data is stationary or not involves conducting the unit root test. Precisely, stationarity denotes the non-existence of unit root. There are several methods of determining the existence of unit root in time series variable. These methods include Dickey-Fuller test, Augmented Dickey Fuller test, and Phillip Perron (1988) unit root test among others. The graphical methods can also be used to test for stationarity.

This study shall apply Augmented Dickey Fuller (ADF) unit root test to investigate the presence of the unit root at level and then after the first difference for both variables. ADF test involves running the following regression with trend and intercept:

$$\Delta \mathrm{Y_t} = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_\mathrm{i}\, \Delta \mathrm{Y_{t-i}} + \varepsilon_\mathrm{t} \quad \text{for variables at level}$$

$$\Delta\Delta \mathrm{Y_t} = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_\mathrm{i}\, \Delta\Delta \mathrm{Y_{t-i}} + \varepsilon_\mathrm{t} \quad \text{for variables at first difference}$$

Where;

Y_t represents the relevant variable under investigation

β_1 *and* β_2 are the coefficient of a drift and time trend series respectively

δ is the coefficient of Y_{t-1}

Δ is difference operator

t is linear time trend

m is the lag order of the autoregressive process and

ε_t is a white noise random error term.

The optimal period of lag m is selected large enough (using the Akaike information criterion or other relevant criteria) to render the residual ε_t not auto-correlated (white noise). The sign of the drift parameter β_1 causes the series to wander upward if positive and downward if negative, where as the size of the absolute value of β_1 affects the steepness of the series (Pfaff, 2006).

a) The parameter of interest in the ADF model is δ. The hypothesis for each of the variables at the level shall be:

H_0: $\delta = 0$ or there is a unit root (i.e. the variable is non-stationary)

H_a: $\delta < 0$ or there is no unit root (i.e. variable is stationary)

The t-statistical shall then be compared with Critical values at 5%.

If the absolute value of t-statistic is more than the absolute value at 5%, then the null hypothesis is rejected and the alternative hypothesis is accept (Akpan, 2011).

But if absolute value of t-statistic is less than the absolute value at 5%, then the null hypothesis is accepted and the alternative hypothesis is rejected.

b) If both variables are found to be non-stationary at level, then the first difference for both variables is performed and then the ADF test is repeated. If both variables are non-stationary at level but stationary after first difference, i.e. if both variables are I (1), then the Johansen Cointegration Test can be utilized to establish the presence of long-run equilibrium relationship between the real total government expenditure per capita and the real GDP per capita in Kenya.

3.6.2 Normality

It is imperative to investigate whether the distribution of the set of time series variables is normal. This shall be done by testing for normality using the Jarque-Bera test for the time series data variables. This test measures the difference in kurtosis and skewness of a variable compared to those of the normal distribution (Jarque and Bera, 1980).

The test statistic is JB; where

$$JB = \frac{N-k}{6}\left[S^2 + \frac{(K-3)^2}{4}\right]$$

Where N is the number of observations, *k* is the number of estimated parameters, S is the skewness of a variable, and K is the kurtosis of a variable.

The hypothesis to be tested is:

H_0: The variable is normally distributed.

H_a: The variable is not normally distributed.

We reject the null hypothesis if the p-value ≤ 5% level of significance, or if the JB > $x^2(2)$.

3.7 Econometric Methodology

3.7.1 Johansen Cointegration Test

There are several econometric methodologies that have been used to examine the presence of the long-run equilibrium relationships between the two or more time series variables. The most common method used is the Ordinary Least Square (OLS) regression method. Other popular methods include cointegration approach suggested by Engel and Granger (1987), Bound test approach of cointegration, Auto Regressive Distributive Lag (ARDL) approach to cointegration development by Pesaran and Shin (1995), General To Specific (GETS) approach, Philip Hansen's Fully modified ordinary least squares (FMOLS) approach, Maximum likelihood test developed by Johansen and Juselius (1990) and Johansen (1991) commonly known as Johansen Cointegration Test.

Cheong (2001) and Hallam and Zanoli (1993) asserted that Johansen cointegration technique is more efficient since it provides more accurate estimates of the parameters of the long-run relationship among variables. It is therefore more preferred to the Engle Granger approach.

This study adopts the Johansen Cointegration Method because of its advantages over other approaches. Johansen's cointegration test considers a VAR of order p i.e. VAR (P)

$$y_t = \mu + A_1 y_{t-1} + A_2 y_{t-2} + \ldots\ldots\ldots.\ldots.\ldots\ldots\ldots\ldots + A_p y_{t-p} + \varepsilon_t$$

Where

y_t is an nx1 vector of variables that are integrated of order one i.e. I (1) and e_t is an $n\ X\ 1$ vector of innovations.

Using the first difference of y_t , the VAR model becomes;

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t$$

Where,

$$\Pi = \sum_{i=1}^{p} A_i - I \quad \text{and} \quad \boldsymbol{\Gamma}_i = -\sum_{j=i+1}^{p} A_j$$

If the coefficient matrix π has reduced rank $r<n$, then there exist n x r matrices α *and* β each with rank r such that $\pi = \alpha\beta'$ and $\beta' y_t$ is stationary. The cointegrating rank (r) is the number of cointegrating relations and each column of β is the cointegrating vector. Also, the elements of α in $\pi = \alpha\beta'$ are referred to as adjustment parameters in Vector Error Correction Model.

Johansen cointegration technique estimates the $\boldsymbol{\pi}$ matrix in an unrestricted form and then test whether the restrictions implied by the reduced rank of π can be rejected. To determine the number of cointegrated vectors, Johansen (1988, 1989) and Johansen and Juselius (1990) suggested two statistic tests. The first statistic test is the trace test (λ_{trace}) while the second statistic test is the maximum eigenvalue test (λ_{Max}).

The trace test and maximum eigenvalue test are shown in equations (i) and (ii) respectively:

(i) $$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1 - \hat{\lambda}_i)$$

(ii) $$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1})$$

Where T is the sample size and $\hat{\lambda}_i$ are the Eigen values obtained from the estimate of the π matrix. The trace test tests the null hypothesis of r cointegrating vectors against the alternative that the number of cointegrating vectors is greater than r.

The maximum eigenvalue test, on the other hand, tests the null hypothesis of *r* cointegrating vectors against the alternative hypothesis of *r* +1 cointegrating vectors.

Hjalmarsson and Österholm (2007) noted that neither of these test statistics follows the chi-square distribution in general. However the asymptotic critical values can be found in Johansen and Juselius (1990), Osterwald-Lenum (1992) and are also given by most econometric software packages. STATA software provides these critical values.

3.7.2 Johansen Cointegration Hypothesis

The Johansen cointegration hypothesis is formulated as follows:

Null hypothesis is identified using the value in each maximum rank both for trace statistic and max statistic and is compared with critical values at 5% level of significance.

Thus, at maximum rank 0, the hypothesis is as follows:

Null Hypothesis (H_0) : there is no cointegration among the variables

Alternative Hypothesis (Ha) : there is cointegration among the variables

If the trace statistic value is greater than the critical value, the null hypothesis is rejected and the alternative hypothesis is accepted. Further, if the max statistic value is greater than the corresponding critical value, the null hypothesis is rejected and the alternative hypothesis accepted.

At maximum rank 1, the hypothesis is as follows:

Null Hypothesis (H_0) : there is at least one cointegration among the variables

Alternative Hypothesis (H_a) : there is no cointegration among the variables

If the trace statistic value is greater than the Critical value, the null hypothesis is rejected and the alternative hypothesis is accepted. Further, if the max statistic value is greater than the corresponding critical value, the null hypothesis is rejected and alternative hypothesis accepted and vice versa.

3.7.3 Lag Selection Criteria

The cointegration technique however, requires that first, the selection of the appropriate maximum lag length p to include in the VAR system be established. This study uses criterion such as Akaike (AIC), Hannan-Quinn (HQIC) and SBIC to select the maximum lag length. The guideline requires that the lag length that corresponds with the smallest value of each of the criterion is selected (Gorbani and Zarea, 2013). The lag selection process is very fundamental. This is because too many lags sacrifice the degrees of freedom and risks introducing multicollinearity problem in the system and on the other hand, insufficient number of lags may lead to specification errors in the system (Dada and Adewale, 2013). Akpan (2011) noted that the optimal lag length p must also be large enough to render the residual not auto-correlated (white noise).

3.7.4 VECM Causality tests

If the cointegration is found to exist, the causality test shall be undertaken to establishing the direction of causality between the real total government expenditure per capita and the real GDP per capita variables. Causality is inferred when lagged values of a variable x_i have explanatory power in a regression of a variable y_i that contains lagged values of both y_i and x_i (Akpan, 2011). There are several tests that have been developed and used to establish both short run and long-run causality between time series variables. These commonly used methods include the Granger causality test developed by Granger (1969), the Vector Error Correction Model and causality test recommended by Toda and Yamamoto (1995).

Unlike others tests, the Error Correction Methodology is appealing because of its flexibility by combining the short run and the long run equilibriums model in unified system. It also ensures that data coherence and consistency (Kesavarajah, 2012). Because of the advantages inherent in the VECM, this study utilizes this method to determine both short-run and the long-run causality relationship and direction between the real total government expenditure per capita and the real GDP per capita variables in Kenya for the period 1960-2011.

The argument holds that if the Johansen Cointegration test indicates the existence of cointegration in the model, then the VAR model gives the long run causality which is equivalent to the long run relationship in a single equation model (Aladejare, 2013). However, the short-run dynamics of the VAR model are captured with the Vector Error Correction Model which is similar to the short-run adjustment. But if Johansen cointegration test indicates that there is no cointegration between the two variables, then we cannot use VECM model to determine causality (Ansari et al., 1997). But we can run unrestricted VAR model to determine the causality. This study makes an assumption that there is cointegration among variables and therefore the granger causality test based on Error Correction Model can be used.

This study specifies the VECM model by adopting the Akpan (2011) model as follows:

$$\Delta LnE_t = \alpha_1 + \sum_{i=1}^{p} \beta_1 \; \Delta LnE_{t-i} + \sum_{i=0}^{p} \varphi_1 \; \Delta LnGDP_{t-i} + \partial_1 \; ECT_{t-i} + \mu_t$$

$$\Delta LnGDP_t = \alpha_2 + \sum_{i=0}^{p} \beta_2 \; \Delta LnE_{t-i} + \sum_{i=1}^{p} \varphi_2 \; \Delta LnGDP_{t-i} + \partial_2 \; ECT_{t-i} + \mu_t$$

Δ represents the first difference operator, $\alpha, \beta, \varphi, and\ \partial$ are the coefficients while $\mu_t \ and\ \varepsilon_t$ are the error terms. p is the order of lag determined using AIC criterion. ECT_{t-i} is the error correction term, lagged i period. It represents the disequilibrium residuals of the given co-integration equation.

The parameter φ_1 estimates the short-term causal effect of real Gross Domestic Product per capita on real Total Government Expenditure per capita while the parameter ∂_1 estimates the long- term causal relationship between the two variables.

A statistical significance of φ_1 or ∂_1 or both in equation (a) suggests that Real Gross Domestic Product per capita ($LnGDP_t$) cause Real Total government Expenditure per capita (LnE_t). More specifically, ∂_1 captures the long run causality and therefore for a true validation of Wagner's theory, ∂_1 is expected to be statistically significant.

Likewise, a statistical significance of β_2 or ∂_2 or both in equation (b) suggests that public expenditure causes national income as argued by Keynesian theory.

If the relevant coefficients from equations (a) and (b) are both statistically significant, it will suggest that there is a bi-directional causality between national income and public expenditure, in which case both Wagner's and Keynesian hypotheses holds.

The above models are estimated using STATA software.

CHAPTER FOUR

EMPIRICAL RESULTS, ANALYSIS OF DATA AND INTERPRETATION

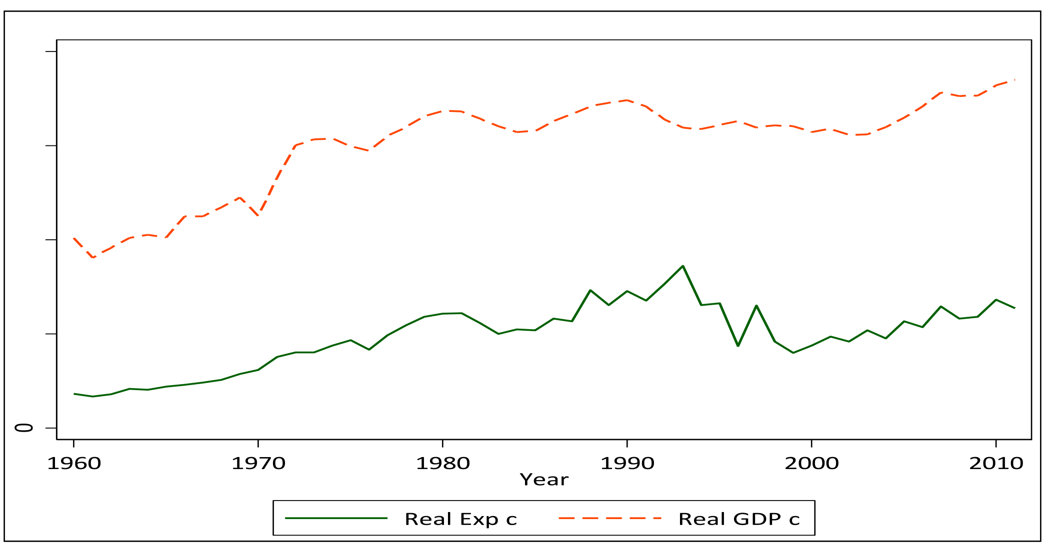
4.1 Introduction

This chapter involves undertaking the empirical tests of the times series variables namely the real total government expenditure per capita and real GDP per capita for the period under investigation. Firstly, the chapter presents the results of the preliminary data analysis, results of the descriptive summary for the time series variables and then undertakes the pre-estimation diagnostics tests.

Secondly, the chapter presents the empirical results of the Johansen cointegration test and the VECM results for the two times series variables. Finally, the chapter uses the VECM results on Johansen Cointegration Normalization equation to specify the cointegration equation (ce) in order to facilitate the analysis of the elasticity of Government Expenditure with respect to GDP.

4.2 Results of preliminary data analysis

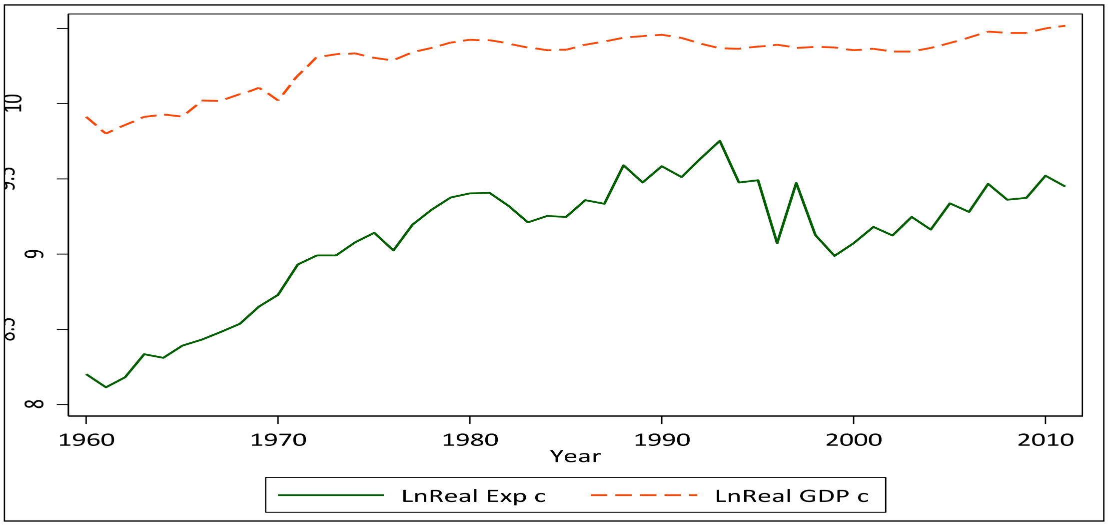
Figure 4: Graph of real total government expenditure per capita and real GDP per capita for the period 1960-2011.



Source: Author

In figure 4 above, it can be seen that there is a general upward growth in both the total real government expenditure per capita and the real GDP per capita for the period under review.

Figure 5: Graphical presentation of natural logs of real total government expenditures per capita and natural logs of real GDP per capita for the period 1960-2011.



Source: Author

The graphical representation of the natural logarithms of both real total government expenditure per capita and the real GDP per capita depicts upward growth for the two variables during the period under review.

4.3 Results of the Descriptive summary

Table 2: The descriptive Summary of the real total government expenditure and real GDP for the period 1960-2011

. summarize lrealexpc lrealgdpc

Variable	Obs	Mean	Std. Dev.	Min	Max
lrealexpc	52	9.109199	.4220799	8.11364	9.75426
lrealgdpc	52	10.2982	.18937	9.80139	10.51851

Source: Author

The descriptive summary reveals that the real GDP (LREALGDP) had the highest value while the total government expenditure (LREALEXP) had the highest standard deviation indicating that it was the most erratic of the two variables during the period under review. This can be visualized in the figures 4 and 5 which present the graphical illustration of the trend for the two variables.

4.4 Results of normality test

Normality test was carried out using Jarque-Bera test to determine whether the distribution of the set of time series variables is normal or not. The results are as shown in the table 3 below:

Table 3: Results of normality test

```
. tsset year, yearly
       time variable:  year, 1960 to 2011
               delta:  1 year

. regress lrealexpc lrealgdpc

      Source |       SS       df       MS              Number of obs =      52
-------------+------------------------------           F(  1,    50) =  413.87
       Model |  8.1063824     1  8.1063824           Prob > F      =  0.0000
    Residual | .979339507    50  .01958679           R-squared     =  0.8922
-------------+------------------------------           Adj R-squared =  0.8901
       Total | 9.08572191    51  .17815141           Root MSE      =  .13995

------------------------------------------------------------------------------
   lrealexpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lrealgdpc |   2.105315   .1034869    20.34   0.000     1.897456    2.313175
       _cons |  -12.57175   1.065905   -11.79   0.000    -14.71268   -10.43082
------------------------------------------------------------------------------

. sktest lrealexpc

                    Skewness/Kurtosis tests for Normality
                                                          ------- joint ------
    Variable |    Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)    Prob>chi2
-------------+---------------------------------------------------------------
   lrealexpc |     52      0.0062         0.8513         6.83         0.0329

. sktest lrealgdpc

                    Skewness/Kurtosis tests for Normality
                                                          ------- joint ------
    Variable |    Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)    Prob>chi2
-------------+---------------------------------------------------------------
   lrealgdpc |     52      0.0005         0.3543        10.79         0.0045

. predict residuals,r

. sktest residuals

                    Skewness/Kurtosis tests for Normality
                                                          ------- joint ------
    Variable |    Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)    Prob>chi2
-------------+---------------------------------------------------------------
   residuals |     52      0.0042         0.0152        11.49         0.0032
```

Source: Author

The normality test was carried out using Jarque Bera test for normality. The test was conducted for the natural logarithms of both Real Total Government Expenditure Per Capita and Real GDP Per Capita.

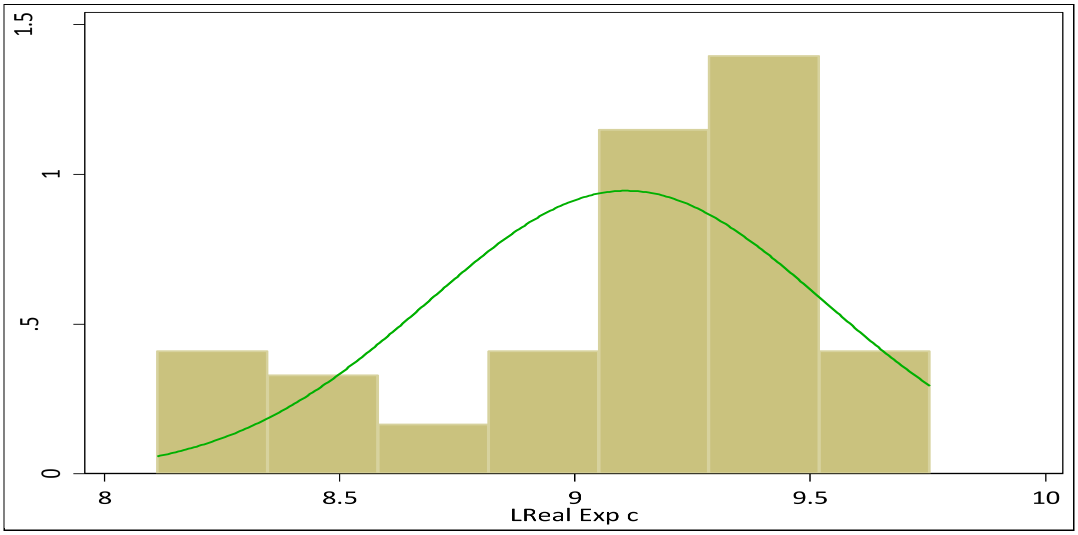
For the natural logarithms of Real Total Government Expenditure Per Capita (lrealexpc), the probability value is 0.0329. This is less that 5% level of significance and therefore we reject the null hypothesis that this time series is normally distributed.
Similarly, for the natural logs of Real GDP per capita (lrealgdpc), the probability value is 0.0045. This is less that the 5%level of significance and therefore we reject the null hypothesis that this variable is normally distributed.

Further, the regression results were undertaken and the residuals predicted. The residuals were tested to determine whether they are normally distributed or not. The normality test for the residuals in table 3 reveals that the probability value is 0.0032. This is less that 5% level of significance and therefore we reject the null hypothesis that the residuals are normally distributed.

Both variables are therefore found not to be normally distributed and the residuals of their regression are also not normally distributed. This was expected, since all variables in this data set were transformed by taking a natural logarithm. Conversion of data into natural logarithm form helps achieve a near normal distribution of the time series data.

The normality test can best be visually presented inform of histograms as indicated in figures 6, 7 and 8 below.

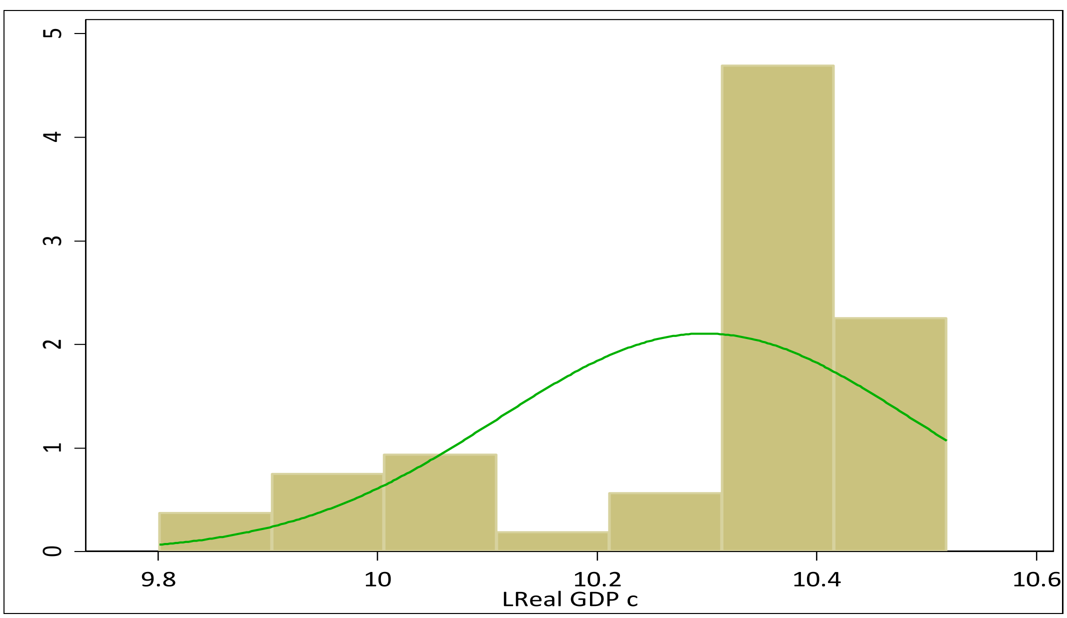
Figure 6: Distribution of natural logarithms of real Total government expenditure per capita



Source: Author

Figure 6 above indicates that the distribution of natural logarithms of real Total government expenditure per capita is skewed towards the left.

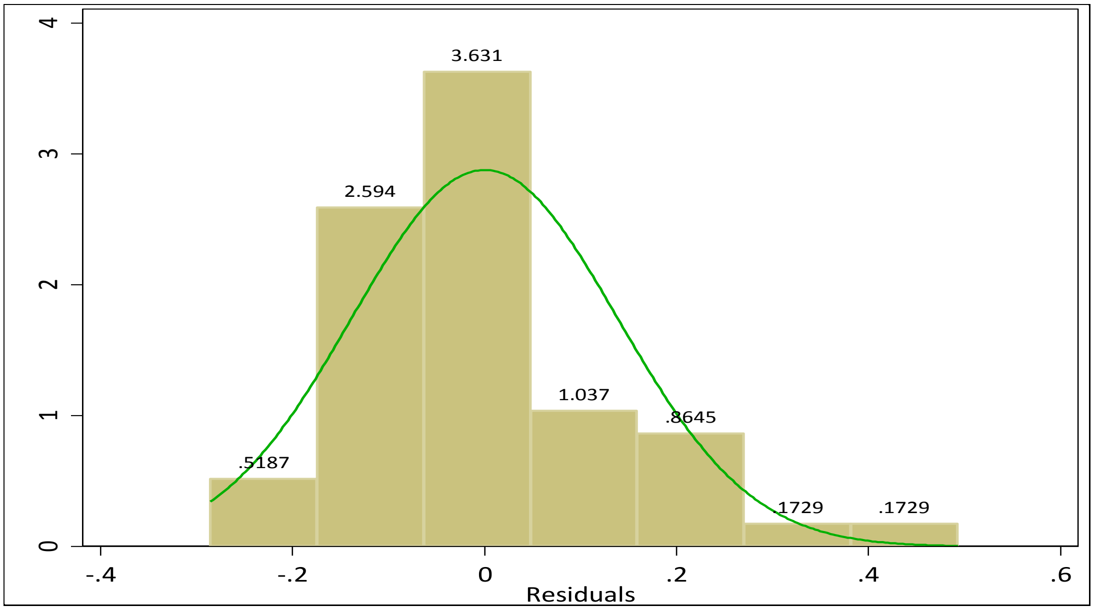
Figure 7: Distribution of natural logs of Real GDP per capita



Source: Author

Figure 7 above indicates that the distribution of natural logs of Real GDP per capita is skewed towards the left.

Figure 8: Distribution of the regression residuals of lrealexpc and lrealgdpc



Source: Author

In figure 8 above, the residuals show signs of right skewness (i.e the residuals bunch to left – not symmetric) and the kurtosis is leptokurtic since the peak of the distribution is higher than expected for a normal distribution.

Since the data was transformed into natural logarithms, this has helped in transforming the variables to near normal distribution as indicated in figure 8.

4.5 Results of the lag selection criteria

The ADF test and cointegration technique requires first, that the appropriate maximum lag length *p* to be included in the VAR model be selected. This is very important as it ensures that the residuals are uncorrelated and homoskedastic across time. This study utilized criteria such as Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan-Quinn Information Criteria (HQIC) and Schwarz Bayesian Information Criterion (SBIC) to select the maximum lag length, *p*. The guideline requires that the lag length that corresponds with the smallest value of each of the criterion is selected (Gorbani and Zarea, 2013). The results of the lag selection criteria for the natural logarithms of Real Total Government expenditure per capita and natural logarithms of Real GDP per Capita are as indicated in the table 4 below:

Table 4: Lag Selection Criteria Results

```
. varsoc lrealexpc lrealgdpc

   Selection-order criteria
   Sample:  1964 - 2011                         Number of obs      =        48
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	49.6593				.000471	-1.9858	-1.95634	-1.90784
1	123.891	148.46*	4	0.000	.000025*	-4.91214*	-4.82375*	-4.67824*
2	127.489	7.195	4	0.126	.000026	-4.89537	-4.74805	-4.50554
3	128.917	2.8569	4	0.582	.000029	-4.78822	-4.58197	-4.24245
4	129.682	1.5296	4	0.821	.000033	-4.65342	-4.38825	-3.95172

```
   Endogenous:  lrealexpc lrealgdpc
    Exogenous:  _cons
```

Source: Author

In table 4 above, it is clear that all the information selection criteria namely FPE, AIC, HQIC, and SBIC unanimously determine that both variables should be lagged one period. In other words, the lag length for both variables is one (1) as indicated in asterisked (*) row one (1). However, a closer inspection of the results of the information criteria depicts that the AIC has lowest value at -4.91214 while FPE has the higher value at 0.000025. But in this case, all the criteria selected the same order of lag length for both variables.

Therefore, the selected optimal period of lag *P* is one (1) i.e. *p*=1. This optimal lag length was utilized both in the ADF tests, Johansen Cointegration Test and the Vector Error Correction Model.

4.6 Results of the stationarity tests

The fundamental precondition for running the Johansen cointegration test requires that the time series data variables must be non-stationary at level but when the first difference is conducted, both variables becomes stationary (Islam, 2001). In others words, our time series variables, natural logarithms of Real Total Government expenditure per capita and natural logarithms of Real GDP per Capita must be I(1). The Augmented Dickey Fuller (ADF) test was employed for this purpose.

Therefore for the purpose of identifying whether the two variables are I(1), two ADF unit root tests were carried out. The first ADF test determined whether each variable was non-stationary at level while the second ADF test sought to investigate whether the variables were stationary when differenced once.

4.6.1 ADF unit root test for the variables at level

Firstly, the ADF unit test was carried out for both variables at level. The ADF unit root test results for the natural logarithms of Real Total Government Expenditure per Capita (lnrealexpc) are as indicated in Table 5 while the ADF unit roots test results for natural logarithms of Real GDP per Capita (lnrealgdpc) are depicted in Table 6.

The ADF unit root test for both variables at level include an intercept and a linear trend as specified in the ADF model.

Table 5. ADF unit root test for lnrealexpenditure per capita at level (ADF regression with an intercept and linear trend)

```
. dfuller lrealexpc, trend regress lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        50

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -1.761            -4.150            -3.500            -3.180
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.7231

------------------------------------------------------------------------------
D.lrealexpc  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lrealexpc |
         L1. |  -.1142104   .0648406    -1.76   0.085    -.2447278    .0163071
         LD. |   -.394967    .129414    -3.05   0.004    -.6554639   -.1344701
      _trend |   .0001308   .0018225     0.07   0.943    -.0035377    .0037993
       _cons |   1.075342   .5565896     1.93   0.060    -.0450143    2.195699
------------------------------------------------------------------------------
```

Source: Author

Table 5 above depicts the ADF unit root results for the natural logarithms of Real Total Government Expenditure Per Capita (lnrealexpc) at level. The absolute value for the test statistic is 1.761 while the absolute value of the critical values is 4.150

and 3.500 at 1% level of significance and 5% level of significance respectively. However, the critical value at 5% level of significance is commonly used.

Clearly, the absolute value of the test statistic is less that critical value at 5% level of significance (i.e 1.761<3.500). We there do not reject the null hypothesis, but rather we accept the null hypothesis that there is a unit root. In other words, this variable is non-stationary at level.

Tables 6: ADF unit root test for lnrealgdp per capita at level (ADF regression with an intercept and a linear trend)

```
. dfuller lrealgdpc, trend regress lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        50
```

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		Interpolated Dickey-Fuller		
Z(t)	-2.513	-4.150	-3.500	-3.180

MacKinnon approximate p-value for Z(t) = 0.3217

D.lrealgdpc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lrealgdpc						
L1.	-.1215472	.0483748	-2.51	0.016	-.2189207	-.0241737
LD.	.0691375	.1251469	0.55	0.583	-.1827702	.3210451
_trend	.000505	.0006114	0.83	0.413	-.0007258	.0017357
_cons	1.252264	.4854577	2.58	0.013	.2750879	2.229439

Source: Author

Table 6 above shows the ADF unit root results for the natural logarithms of Real GDP per Capita (lnrealgdpc) at level. The absolute value for the test statistic is 2.513 while the absolute value of the critical values is 4.150 and 3.500 at 1% level of significance and 5% level of significance respectively. However, the critical value at 5% level of significance is more preferred.

Clearly, the absolute value of the test statistic is less that critical value at 5% level of significance (i.e 2.513<3.500). We therefore do not reject the null hypothesis, but rather we accept the null hypothesis that there is a unit root. In other words, natural logarithms of Real GDP per Capita (lnrealgdpc) are non-stationary at level.

4.6.2 ADF unit root test for the variables after the first difference

The ADF unit root test results confirm that these two variables are non-stationary at levels.

The next step is to undertake the ADF unit root test for the variable after the first difference. If the variables are found to be stationary after the first difference, then we can proceed and undertake Johansen Cointegration and VECM tests.

The ADF unit root test results for the natural logarithms of Real Total Government Expenditure per Capita (lnrealexpc) after the first difference are as indicated in Table 7 while the ADF unit root test results for natural logarithms of Real GDP per Capita (lnrealgdpc) after the first difference are as indicated in Table 8.

The ADF unit root test for both variables after the first difference include an intercept and a linear trend as specified in the ADF model.

Table 7: ADF unit root test for lnrealexpenditure per capita after the first difference (ADF regression with an intercept and linear Trend)

```
. dfuller D.lrealexpc, trend regress lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        49

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -5.266            -4.159            -3.504            -3.182
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0001

------------------------------------------------------------------------------
D2.lrealexpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 D.lrealexpc |
         L1. |  -1.325952     .25178    -5.27   0.000    -1.833063   -.8188415
         LD. |  -.0888388   .1481945    -0.60   0.552    -.3873178    .2096403
      _trend |   -.002202   .0013748    -1.60   0.116     -.004971     .000567
       _cons |   .0929474   .0424771     2.19   0.034     .0073941    .1785007
------------------------------------------------------------------------------
```

Source: Author

Table 7 above depicts the ADF unit root results for the natural logarithms of Real Total Government expenditure per capita (lnrealexpc) after the first difference. The absolute value for the test statistic is 5.266 while the absolute value of the critical values is 4.159 and 3.504 at 1% level of significance and 5% level of significance respectively. However, the critical value at 5% level of significance is commonly used.

Clearly, we can see that the absolute value of the test statistic is more than the critical value at 5% level of significance (i.e 5.266>3.500). Therefore, we reject the null hypothesis that the variable has a unit root (i.e. the variable is non-stationary) and accept the alternative hypothesis that the variable does not have a unit root (i.e. the variable is stationary).

Further, we find that the intercept (drift) parameter of the variable, depicted as _*cons* in table 7 is 0.0929474. This parameter is positive in sign meaning that it causes this time series variable to wander upward. The absolute value of the parameter carries information about the steepness of the time series variable. Thus this time series is less steep since the magnitude of the parameter (i.e 0.0929474) is very small. The same is corroborated in figure 5.

Thus, from tables 5 and 7, we can see that the time series variable; natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc*) is non-stationary at level but when the variable is differenced once, then it becomes stationary. In other words, the time series variable *lnrealexpc* is I (1).

Table 8: ADF test for unit root test for lnrealgdp per capita after the first difference (ADF regression with an intercept)

```
. dfuller D.lrealgdpc, trend regress lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        49

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -5.335            -4.159            -3.504            -3.182
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D2.lrealgdpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 D.lrealgdpc |
         L1. |  -1.044491   .1957921    -5.33   0.000    -1.438836   -.6501452
         LD. |   .1217661   .1314887     0.93   0.359    -.1430658     .386598
      _trend |  -.0006462   .0004267    -1.51   0.137    -.0015057    .0002133
       _cons |   .0305191   .0134116     2.28   0.028     .0035068    .0575315
------------------------------------------------------------------------------
```

Source: Author

Table 8 above depicts the ADF unit root results for the natural logarithms of Real GDP per Capita (*lnrealgdpc)* after the first difference. The absolute value for the test statistic is 5.335 while the absolute value of the critical values is 4.159 and 3.504 at 1% level of significance and 5% level of significance respectively. However, the critical value at 5% level of significance is commonly used.

The results in table 8 clearly indicate that the absolute value of the test statistic is more than the critical value at 5% level of significance (i.e 5.335>3.504). Therefore, we reject the null hypothesis that the variable (*lnrealgdpc)* has a unit root (i.e. the variable is non-stationary) and accept the alternative hypothesis that the variable (*lnrealgdpc)* does not have a unit root (i.e. the variable is stationary).

Further, the intercept (drift) parameter of the variable, natural logarithms of Real GDP per Capita (*lnrealgdpc)* depicted as *_cons* in table 8 is 0.0305191. This parameter is positive in sign meaning that it causes this time series variable to wander upward. The absolute value of the parameter carries information about the steepness of the time series variable. Thus, this time series variable is less steep since the magnitude of the parameter (i.e 0.0305191) is very small as visually depicted in figure 5.

Thus, from tables 6 and 8, we can see that the time series variable; natural logarithms of Real GDP per Capita (*lnrealgdpc)* is non-stationary at level but when the variable is differenced once, then it becomes stationary. In other words, the time series variable (*lnrealgdpc) is* I (1).

4.7 Results and analysis of Johansen Cointegration Test

The precondition for utilizing the Johansen cointegration test requires that both variables be I (1). After running the ADF unit root test for both variables, it was found that the two variables; natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc*) and the natural logarithms of Real GDP per Capita (*lnrealgdpc) are I(1).*

Johansen Contegration test also requires that first, the optimal lag length to be included in the VAR system be established. The AIC and other criteria suggested the optimal lag length p to be 1(i.e. *P=1*) as indicated in table 4.

The results of Johansen Cointegration Test are as depicted in the table 9 below.

Table 9: Results of Johansen Cointegration Test

```
. vecrank lrealexpc lrealgdpc, trend(constant) lags(1) max

                       Johansen tests for cointegration
Trend: constant                                        Number of obs =      51
Sample:  1961 - 2011                                            Lags =       1
-------------------------------------------------------------------------------
                                                          5%
maximum                                        trace    critical
  rank    parms       LL       eigenvalue  statistic    value
    0       2      116.4502         .        21.2456    15.41
    1       5     125.35022     0.29462       3.4456*    3.76
    2       6     127.07299     0.06533
-------------------------------------------------------------------------------
                                                          5%
maximum                                         max     critical
  rank    parms       LL       eigenvalue  statistic    value
    0       2      116.4502         .        17.8000    14.07
    1       5     125.35022     0.29462       3.4456     3.76
    2       6     127.07299     0.06533
```

Source: Author

Table 9 above shows the results of Johansen Cointegration Test for the two variables namely; the natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc)* and the natural logarithms of Real GDP per Capita *(lnrealgdpc).* The Johansen Cointegration Test is usually conducted when the two variables are at level. The Johansen Cointegration Test considers two statistic values namely trace statistic values and max statistic values. We look at each of these statistic values in turn.

Trace statistic values

For the trace statistic values, the first hypothesis considers the rank r=0. At the rank r=0, the null hypothesis is that there is no cointegration among the variables while the alternative hypothesis is that there exist at least one cointegration among the variables. Therefore at rank r=0, the trace statistic value (λ_{trace}) is 21.2456 while the critical values at 5% is 15.41.

Clearly, the trace statistic value is more that critical value both at 5% (i.e. 21.2459>15.41 at 5%). Therefore we reject the null hypothesis that there is no cointegration among the two variables and accept the alternative hypothesis that there is at least one cointegration among the variables.

The second hypothesis for the trace statistics value considers the rank r=1. At rank r=1, the null hypothesis is that there is at least one cointegration among the variables while the alternative hypothesis is that there is no cointegration among the variables. Thus, at rank r=1, the trace statistic value (λ_{trace}) is 3.4456 while the critical values at 5% is 3.76.

Clearly, the trace statistic value is less that critical value at 5% (i.e. 3.4456 <3.76 at 5%). Therefore, we do not reject the null hypothesis. Rather, we accept the null hypothesis that there is cointegration among the two variables and reject the alternative hypothesis that there is no cointegration among the variables.

The STATA software identifies with an asterisk, the trace statistic value that corresponds with the rank which has cointegrating relationship. This trace statistic value is indicated in the table 9 with an asterisk as 3.4456* (i.e it is significant at 5% level of significance).

Max statistic values

We now analyze the hypotheses at the max statistic values. Just like in the case of trace statistic, the max statistic values also examine the hypotheses both at ranks r=0 and r=1.

At rank r=0, the null hypothesis is that there is no cointegration between the two variables while the alternative hypothesis is that there is at least one cointegrating relationship between the two variables. Thus at r=0, the max statistic value (λ_{max}) is 17.8000 while the critical value at 5% is 14.07. Evidently, the trace statistic value is more than critical value at 5% (i.e. 17.8002 >14.07 at 5%). We therefore reject the null hypothesis that there is no cointegration and accept the alternative hypothesis that there is cointegration among the variables.

The second hypothesis for max statistic values considers the rank r=1. At rank r=1, the null hypothesis is that there is cointegration among the variables while the alternative hypothesis is that there is no cointegration among the variables. Thus, at rank r=1, the max statistic value (λ_{max}) is 3.4456 while the critical values at 5% is 3.76. An important observation is that at rank r=1, both trace statistic value and max statistic value are equal. Similarly, at rank r=1, both the critical value at 5% is similar in both trace and max statistic values.

The Johansen Cointegration test therefore empirically confirms that our time series variables namely natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc)* and natural logarithms of Real GDP per Capita (*lnrealgdpc)* are cointegrated and thus a valid and stable long-run relationship exists between these two variables. In other words, these two time series variables move together in the long-run.

4.8 Results and analysis of the VECM's Causality tests

Aladejare (2013) among many other scholars argues that if the Johansen Cointegration test indicates the existence of cointegrating relationship in the model, then the VAR model gives the long-run causality which is equivalent to the long-run relationship in a single equation model.

Thus in our case, we have seen that the Johansen cointegration test has empirically confirmed that the time series variables *lnrealexpc* and *lnrealgdpc* are cointegrated. This cointegrating relationship gives a long-run causality equivalent to the long-run relationship between the two variables. If the Johansen Cointegration tests indicate the presence of a cointegrating relationship, then we can use Vector Error Correction Model (VECM) to determine the direction of causality between these two variables. The VECM incorporates variables both in their levels and first difference. Further, VECM captures the short-run disequilibrium situations as well as the long run equilibrium adjustments between the variables (Kesavarajah, 2012). In the VECM, we run the non-stationary data variables that are I (1). The VEC model then automatically converts the data variables into the first difference.

Table 10: Results of VECM's Causality tests

```
. vec lrealexpc lrealgdpc, trend(constant)

Vector error-correction model

Sample:  1962 - 2011                              No. of obs      =        50
                                                  AIC             = -4.839571
Log likelihood =  129.9893                        HQIC            = -4.708511
Det(Sigma_ml)  =  .0000189                        SBIC            = -4.495406

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
D_lrealexpc          4     .122096   0.3389   23.58589   0.0001
D_lrealgdpc          4     .039684   0.2057   11.91031   0.0180
----------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_lrealexpc  |
        _ce1 |
         L1. |  -.2211095   .0772851    -2.86   0.004    -.3725856   -.0696334
             |
   lrealexpc |
         LD. |  -.3694045   .1284544    -2.88   0.004    -.6211705   -.1176386
             |
   lrealgdpc |
         LD. |   .2105826   .4137062     0.51   0.611    -.6002667    1.021432
             |
       _cons |  -.0011723   .0216415    -0.05   0.957    -.0435888    .0412442
-------------+----------------------------------------------------------------
D_lrealgdpc  |
        _ce1 |
         L1. |   -.050688   .0251195    -2.02   0.044    -.0999212   -.0014547
             |
   lrealexpc |
         LD. |    .062239   .0417507     1.49   0.136    -.0195908    .1440688
             |
   lrealgdpc |
         LD. |  -.0403991   .1344641    -0.30   0.764     -.303944    .2231457
             |
       _cons |   .0051137    .007034     0.73   0.467    -.0086727       .0189
------------------------------------------------------------------------------

Cointegrating equations

Equation           Parms    chi2     P>chi2
-------------------------------------------
_ce1                 1   7.53291   0.0061
-------------------------------------------

Identification:  beta is exactly identified

                 Johansen normalization restriction imposed
------------------------------------------------------------------------------
        beta |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
_ce1         |
   lrealexpc |          1          .        .       .            .           .
   lrealgdpc |  -1.065152   .3880881    -2.74   0.006    -1.825791   -.3045136
       _cons |   1.693052          .        .       .            .           .
------------------------------------------------------------------------------
```

Source: Author

Table 10 above shows the results of the Vector Error Correction Model. The results for the variables indicate that they have been converted to first difference automatically. The cointegrating equation 1 (depicted as *_ce1 L1* in the table 10) represents the error correction term. The guidelines require that the coefficient of this error correction term be both negative in sign and significant. This error correction term is also called the speed of adjustment towards long-run equilibrium.

The VECM model using the above results is as follows;

(a) $\Delta \mathrm{LnE_t} = -0.0011723 - 0.3694045\, \Delta \mathrm{LnE_{t-1}} + 0.2105826\, \Delta \mathrm{GDP_{t-1}} - 0.2211095\ \mathrm{ECT_{t-1}}$

(b) $\Delta \mathrm{LnGDP_t} = 0.0051137 + 0.062239\, \Delta \mathrm{LnE_{t-1}} - 0.0403991\, \Delta \mathrm{GDP_{t-1}} - 0.050688 \mathrm{ECT_{t-1}}$

Based on our VECM model specification in section 3.4.7, the values of the parameters of interest in VECM equations (a) and (b) are as follows:

Parameters for VECM equation (a) are:

$\alpha_1 = -0.0011723$, $\beta_1 = -0.3694045$, $\varphi_1 = 0.2105826$ and $\partial_1 = -0.2211095$

And the parameters for VECM equation (b) are:

$\alpha_2 = 0.0051137$, $\beta_2 = 0.062239$, $\varphi_2 = -0.0403991$ and $\partial_2 = -0.050688$

The parameter φ_1 estimates the short-run causal effect of real Gross Domestic Product per capita on real Total Government Expenditure Per Capita while the parameter ∂_1 estimates the long-run causal relationship between the two variables.

4.8.1 Results and analysis of VECM's Long-run causality

The guidelines require that if ∂_1 is negative in sign and significant, then there exists a long-run causality running from natural logarithms of Real GDP per Capita (*lnrealgdpc) to* natural logarithms of Real Total Government Expenditure per capita (*lnrealexpc).* In other word*s, lnrealgdpc* granger causes *lnrealexpc.*

Clearly, the value of ∂_1 is negative *(i.e.* $\partial_1 = -0.2211095$ *).* Next we examine whether ∂_1 *is* significant. To determine the significance or otherwise of ∂_1 , we check the probability value of ∂_1 *(i.e. P>|z|).* If the value of *P>|z|* is less than 5%, then the parameter ∂_1 is significant but if the value of *P>|z|* is more than 5%, then the parameter ∂_1 is not significant. The corresponding value of *P>|z|* for ∂_1 is 0.004 (or 0.4%). This is less than 5% level of significance and therefore the parameter ∂_1 is significant.

Since ∂_1 is both negative in sign and also significant, then we can conclude that there exist a long-run causality running from natural logarithms of Real GDP per Capita (*lnrealgdpc) to* natural logarithms of Real Total Government expenditure per capita (*lnrealexpc).* ∂_1 is known as the speed of adjustment towards the equilibrium long-run relationship between the two variables. The adjustment coefficient is -0.2211095 which suggests that the speed of adjustment towards long-run equilibrium is slow, about 22% per year with respect to the previous year. This validates Wagner's law for Kenya for the period 1960-2011.

Next, we may need to examine whether ∂_2 is significant or not. The value of ∂_2 is negative (i.e $\partial_2 = -0.050688$). To determine the significance or otherwise of ∂_2 , we check the probability value *(i.e. P>|z|)* of this parameter. If the value of *P>|z*| is less than 5%, then the parameter ∂_2 is significant but if the value of *P>|z|* is more than 5%, then the parameter ∂_2 is not significant. The corresponding probability value for ∂_2 is 0.044 (i.e 4.4%). This is slightly less than 5% level of significance and therefore the parameter ∂_1 is weakly significant.

Since ∂_2 is both negative and significance, then it indicates that there is also a (weak) long-run causal relationship running from natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc) to* natural logarithms of Real GDP per Capita (*lnrealgdpc).* This supports the Keynesian hypothesis.

The fact that both ∂_1 and ∂_2 are both negative and significant indicates the presence of a long-run bi-directional causality between the Real Total Government Expenditure per Capita and the Real GDP per Capita in Kenya for the period 1960-2011. Therefore, there is a strong empirical support for Wagner's hypothesis and a weak empirical support for Keynesian hypothesis in the long-run.

4.8.2 Results and analysis of VECM's short-run causality

The guidelines for establishing the presence or otherwise of the short-run causality are similar to those of the long-run causality for the parameters of interest. Thus, to determine whether there exists a short-run causality running from natural logarithms of Real GDP per Capita (*lnrealgdpc) to* natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc*), we establish whether φ_1 is both negative and significance.

From the above results we can decipher that φ_1 is not negative (i.e. $\varphi_1 = 0.2105826$). Furthermore, the probability value of φ_1 (i.e. *P>|z| for* φ_{1_1}*) is* 0.611(or 61.1%) which is more than 5% level of significance. Therefore we conclude that there is no short-run causality running from natural logarithms of Real GDP per Capita (*lnrealgdpc) to* natural logarithms of Real Total Government expenditure per capita (*lnrealexpc*). Adolph Wagner had outlined that his theory was not concerned with the short-run.

Next, we examine β_2 whose significance denotes the presence of short-run causality running from of Real Total Government Expenditures to Real GDP. From the VECM results in table 10, we find that β_2 is positive (i.e. $\beta_2 = 0.062239$). The probability value for β_2 is 0.136 (i.e. 13.6%) which more that 5% level of significance. Therefore we conclude that since β_2 is not negative and is also not significant, then there is no short-run causality running from natural logarithms of Real Total Government expenditure per capita (*lnrealexpc*) *to* natural logarithms of Real GDP per Capita (*lnrealgdpc).*

4.9 Results of Johansen Normalization Restriction Imposed and Elasticity

Apart from using the VECM results in table 10 to establish the causality direction between the two variables, we can also use VECM results to exactly identify the estimated parameters of the Johansen Cointegration Model. Our interest is parameter estimates of matrix β which contain the cointegrating parameters, α which is the adjustment coefficient and the short-run coefficients Γ. The parameter β also carries information about the elasticity government expenditure with respect GDP.

In table 10 above, the header contains information about the sample, the fit of each equation and overall model fit statistics. The first estimation table contains the estimates of the short run parameters, along with their standard errors, z statistics and the confidence interval. The second estimation table contains the estimated parameters of the cointegrating vector for this model along with their standard errors, z statistics and confidence intervals. The short-run coefficients contained in Γ are collected from row coefficients of the lagged differences (*LD*) and the constant matrix is read from the row of constants (_*cons*) in the first part of table 10.

Thus, from the VECM results, we can state the values of our estimated parameters of Johansen Cointegration Model as follows:

$$\hat{\alpha} = (-0.2211095\ ,\ \ -0.050688), \qquad \hat{\beta} = (1,\ -1.065152),$$

$$\hat{\mu} = (-0.0011723,\ \ 0.0051137)$$

$$\text{And} \quad \hat{\boldsymbol{\Gamma}} = \begin{pmatrix} -0.3694045 & 0.2105826 \\ 0.062239 & -0.0403991 \end{pmatrix}$$

Overaly, the output indicates that the model fits well.

The identification of the parameter β in cointegration equation is achieved by constraining some of the parameters to be fixed using Johansen normalization restriction imposition. The fixed parameters do not have standard errors. The STATA software, while generating the VECM results also generates the results of Johansen normalization restriction imposed in order to identify β. Thus, in table 10, the Johansen normalization restricted the coefficient of natural logarithms of Total Government Expenditure per Capita (*lnrealexpc)* to be unity and therefore its standard error is missing.

Similarly, the constant term in the cointegration equation is not directly estimated in this trend specification but rather backed out from other estimates. Not all the elements of the VEC that correspond to this parameter are readily available. Thus, the standard error for the $\_cons$ parameters is also missing.

From table 10, we can therefore specify the equation as:

$$ECT = lrealexpc - 1.065152\ lrealgdpc + 1.69305 \ldots\ldots\ldots\ldots\ldots\ldots..(i)$$

This equation can be re-arranged as follows;

$$lrealexpc = -1.693052 + 1.065152\ lrealgdpc + \ ECT \ldots\ldots\ldots\ldots..(ii)$$

Equation (ii) above identifies the β parameter which carries the information about the cointegrating relationship between the two variables. Since the time series variables are converted into logarithms, then β also carries information about the elasticity of real total government expenditure per capita with respected to real GDP per capita.

Thus, $\beta = 1.065152$ means that the elasticity of real total government expenditure per capita with respected to real GDP per capita is 1.065152. This means that an increase in Real GDP per capita by 1% causes the Real Total Government expenditure to increase by 1.065152%. Since $\beta > 1$(i.e, $\beta = 1.065152$), the elasticity is elastic which validated Wagner's law for Kenya. The fact that $\beta > 1$ specifically validates the argument which Wagner advanced that as the level of economic development rises, the per capita income of the citizens will also increase. This will lead to increased demand for improved welfare hence raising government expenditure. The government expenditure will rise by more than proportionate rise in income due to the demand pressure from the increase incomes of the people and their increased sophistication of lifestyles.

To get a better visual idea of how this model fits, we predict the cointegration equation and graph it over time as indicated in the figure 6 below.

Figure 9: Graphical presentation of the predicted cointegration equation (ce)

Source: Author

The appearance of predicted cointegration equation in figure 6 indicates that the cointegration equation is stationary. The ADF test results for the cointegrating equation at 5% level of significance in table 11 below confirms that indeed the above predicted cointegration equation is stationary.

Table 11: ADF results for the cointegrating equation (ce)

```
. dfuller ce, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        48

                            ---------- Interpolated Dickey-Fuller ----------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -3.526            -3.594            -2.936            -2.602
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0073
```

Source: Author

The stationary of the cointegrating equation corroborates Johansen and Juselius (1990) who argued that even if two (or more) time series variables are non-stationary I(1) variables, then there exist a linear combination relationship of the two variables which is stationary. Thus, from figure 6 and Table 11, we can infer that since our two time series variables namely Natural Logs of Real Total Government Expenditure Per Capita and Natural Logs of Real GDP Per Capita were both non-stationary I (1) variables, then there exists a linear combination of the two non-stationary variables that is stationary. This stationary linear combination is the cointegrating equation (ce) which proves that our two time series variables are indeed cointegrated.

4.10 Summary of the empirical results, data analysis and interpretation

The research study undertook to analyze the validity of Wagner law for the longest period possible spanning five decades. The study began by presenting key statistical summary for the two variables under investigation. The descriptive summary revealed that the real GDP per capita had the highest value while the total government expenditure had the highest standard deviation indicating that it was the most erratic of the two variables during the period under review.

The study then carried out the pre-estimation diagnostic test namely the normality and the stationarity tests. The ADF test was carried both at level and after the first difference for both variables. The ADF results indicated that both variables namely the natural logs of real total government expenditure and the natural logs of real GDP per capita were non- stationary at level but when differenced once they became stationary. In other words, both variables were found to be I(1). The fulfilling of this precondition enabled the utilization of Johansen cointegration test to establish the long-run relationship between the two variables.

But both ADF test and Johansen Cointegration test required that first, the optimum lag length *p* be establish. All the Criteria namely Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan-Quinn Information Criteria (HQIC) and Schwarz Bayesian Information Criterion (SBIC) to select the maximum lag length of 1(i.e p=1). The selection of optimum lag length involves trade-off between the degrees of freedom and autocorrelation. The transformation of the variables into per capita variables and use of natural logarithms played an important role of ensure that nonautocorrelation is achieved with minimum number of lag to save the degrees of freedom.

Next, Johansen Cointegration Test was used to establish whether the two variables are cointegrated or not. The results of the Johansen Cointegration Test revealed that the two variables are indeed cointegration.

The presence of cointegration among the variables then allowed for the utilization of the VECM to determine the direction of causality between the two variables. The coefficient of the integrating equation was found to have the correct sign (-0.2211095) and statistically significant. This implies that the causality direction runs from Real Per Capita GDP to Real Per Capita total government Expenditure as hypothesized by Wagner's law.

Further, $\partial_2 = -0.050688$ was also found to be both negative and weakly significant at 5% level of significance. This indicates the presence of (weak) long-run causal relationship running from natural logarithms of Real Total Government Expenditure per Capita (*lnrealexpc) to* natural logarithms of Real GDP per Capita (*lnrealgdpc* as hypothesised *by* Keynes.

Finally, the cointegration equation was normalized by imposing a restriction on the endogenous variable to ensure that the coefficient β of the exogenous variable is exactly identified. The coefficient β was found to be greater than unity ($i.e\ \beta =$ 1.065152). This implies that an increase in Real Per Capita GDP by 1% causes an increase by 1.065152 % of Real Per Capita Total Government Expenditure. This implies that the growth of Real Per Capita Total Government Expenditure with respect to growth in Real per capita GDP is more than unity.

CHAPTER FIVE

CONCLUSIONS, POLICY IMPLICATIONS AND AREAS FOR FURTHER RESEARCH

5.1 Introduction

This chapter summarizes this research paper by drawing substantive and empirical-based conclusions. The conclusions endeavor to provide answers to the specific objectives of this study. The conclusions are drawn based on the cointegration and causality test results on the nexus between the public spending and the GDP growth in Kenya. Based on the empirical results of the cointegration and causality tests, the chapter analyses the policy implications especially the impact of growth in GDP on the fiscal policies in Kenya. This chapter then concludes by suggesting areas for further studies based on the limitations and weaknesses of the methodologies employed in this study as well as its scope.

5.2 Conclusion

Firstly, this study delved in analyzing the growth in Total Government Expenditure and GDP growth in Kenya. The study found out that there has been a perpetual growth both in Government Expenditure and GDP. In particular, the study found out that the Total Real Government Expenditure per Capita has perpetually risen from Kshs 29.5 billion in 1960 to Kshs 528.3 billion calculated using the 2001 GDP deflator. Similarly, the GDP has perpetually risen from Kshs 163.72 billion in 1960 to Kshs 1.5 Trillion measured in real terms using 2001 GDP deflator. Over the same period, the population has risen from 8.1Million in 1960 to 41.6Miliion people in 2011. The growth in these three variables inspired the testing of the relationship between them. However, the population factor was incorporated into the variables by transforming both the government expenditure and GDP into capita values. This helped achieving near normal distribution of the variables and also avoids auto-correlation with few lags to save the degrees of freedom.

The study then sought to establish the nexus between the government spending and GDP growth in Kenya. The choice of this area of research was informed by the fact that this relationship has not been examined thoroughly in Kenya using advance techniques for as long period as possible. However, numerous studies have been undertaken to investigate the empirical nexus between the observed overall growth in both the government spending and the GDP in other developed and less developed countries (LDCs). The empirical approaches employed in these studies have differed in terms of the econometric methodologies and their results. Some studies found empirical support for Wagner's law in a specific country while employing different methodologies. Other studies, using different econometric methodologies found conflicting results for the same country over the same period.

But a prominent factor in the literature is that some econometric methodologies are more efficient than others. Two cointegration techniques have been widely utilized in the studies on the relationship between the perpetual growths in government spending and GDP. These techniques are Johansen-Juselius Maximum likelihood technique popularly known as Johansen cointegration technique and Engel-Granger two-stage cointegration technique.

Each of these approaches has salient weaknesses. For example, Verbeek (2000) noted that Engle –Granger approach has one shortcoming in that the results of the tests are sensitive to the left-hand side variable of the regression, which is, to the normalization applied to the cointegrating vector. Johansen cointegration technique however, is more efficient than Engel-granger approach since it provides more accurate estimates of the parameters of the long-run relationship among variables (Cheong, 2001; Hallam and Zanoli, 1993). Gujarati (2003) also noted that unlike the Engle-Granger approach which suffers the problem of normalization, the Johansen Cointegration Approach does not suffer normalization problem.

Thus, based on the advantage of the Johansen Cointegration Test over other methodologies, this study utilized this advanced cointegration technique to determine the relationship between growth in government spending and GDP in Kenya. The maximum lag length to be included in the VAR model and also in the ADF test was also established. The study utilized criteria such as Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan-Quinn Information Criteria (HQIC) and Schwarz Bayesian Information Criterion (SBIC). All the information criteria unanimously chose one period lag to be included in the VAR system (table 4).

Next, the ADF test was carried out to determine whether the variables are I (1). The ADF test revealed that the two time series variables are I (1). This allowed the use of Johansen Cointegration test to be carried out on the two variables to establish whether the two variables are cointegrated or not. The results of Johansen cointegration test shown in table 9 revealed that the two variables are actually cointegrated. This means that the growth in Government Expenditure and GDP have been moving together over the period under review.

The confirmation of cointegrating relationship between the government spending and GDP in Kenya allows the utilization of VECM to establish the causality direction between the two variables. The VECM results presented in table 10 indicates that the ECT has the right sign and is also significant meaning that the direction of causality runs from GDP to Government Expenditure. This validates Wagner's law for Kenya during the period 1960-2011. An examination of the ECT for the opposite direction also indicates that the relevant parameter is negative but weakly significant revealing the presence of weak causality running from Government Expenditure to GDP. ∂_1 represents the speed of adjustment towards the long-run equilibrium relationship for the equation with causality direction running from GDP to Government Expenditure. The adjustment coefficient is -0.2211095 which suggests that adjustment to equilibrium is slow, about 22% per year. In other words, the Government Expenditure in a given year adjusts to long-run equilibrium relationship by 22% in response to changes in the previous year's GDP.

However, the VECM analysis indicated that there is no short-run causality between the two variables in either direction. This validates Wagner's hypothesis as Wagner had stated that his theory was not concerned with the short-run. Wagner mentioned that the financial constraints may hamper the expansion of state activities in the short-run. This would cause the extent of state expansion activities to be conditioned on revenue in the short-run. Wagner noted that in the long-run, the desire for development of a progressive people will always overcome these financial difficulties. In Kenya, the short-run period may be perceived as the period just before independence and immediately after independence in 1963. During this period, the government expenditures was not derived from the growth in GDP but from grants, debts and other sources that aimed at facilitating the young nation to stand on its feet. The massive construction of infrastructures and setting of government institutions, structures and systems accounted for very huge government spending that was not derived from the growth in GDP.

The study finally endeavored to establish the nature of the elasticity of Government Expenditure with respect to GDP. This utilized the VECM normalization results to identify the parameters of the VAR model used in Johansen Cointegration Approach. The parameter of interest β was exactly identified (i.e $\beta = 1.065152$). This means that an increase in Real Per Capita GDP by 1% causes Real Per Capita Total Government Expenditure to increase by $1.065152\,\%$. Thus the nature of the elasticity is an elastic one (i.e. more than unity).

5.3 Policy implications

The empirical results for the nexus between growth in total government expenditure and GDP provide very useful insights especially to the fiscal policy makers in Kenya in several ways.

Firstly, from the cointegration analysis, it is clear that there is a long-run equilibrium relationship between Total Government Expenditure and GDP in Kenya. The elasticity indicates that the response of Government Expenditure to GDP is elastic. This indicates a near overdependence of the government expenditure on GDP growth.

Secondly, further analysis shows that the recurrent expenditure is very high compared to the development expenditure. This means that the huge proportion of government expenditure that is derived from economic growth is consumed instead of being ploughed back to the economy to spur further economic growth. This information may be useful to the fiscal policy makers in establishing other sources of funds to finance the government spending and thus reducing overdependence on

GDP growth by the government spending. The information may also be useful in curbing the ballooning wage bill in Kenya.

Thirdly, cointegration results reveal that GDP is not the only factor that explains the growth in government expenditure. Other factors such corruption may be responsible for fuelling the government expenditure upwards.

Finally, this study can best explain the mass demonstration and mass actions that have been witnessed in Kenya, where the citizens have been demanding for specific provisions of goods and services by the government. For example, where the agricultural sector has grown in a rural area, the residents often hold mass actions to agitate for the better provision of roads to take care of the grown agricultural productivity. Further, the traffic jams in big cities in Kenya indicates the fact that the transport sector and incomes of individuals have out-grown the size of the roads available and therefore pushing the government to spend more in expanding the roads in its efforts to respond to the sectoral demands.

5.4 Limitations of the study

This study applied advanced Johansen cointegration technique and VECM to establish the relationship between the growth in government spending and GDP in Kenya. However, this study suffers from a few limitations.

Firstly, Johansen Cointegration Approach assumes that the cointegrating vector remains constant during the period of study. In reality, it is possible that the long-run relationships between the underlying variables change. Such variations may occur due to reasons such as technological progress, economic crisis/boom, changes in people's preferences and behaviour, policy or regime change and institutional development among others.

In Kenya, for example, the constancy of the cointegrating vector between the Total Government Expenditure and GDP during the period under review may have been affected by the incidences that have happened during the period under review. Such incidences in Kenyan economy include change of the regime from colonialist to self-governance and independence in 1963 and 1964 respectively, effects of the Cold

War on Kenya economy, the 1971 oil crisis, the 1977 coffee boom, the shifter war of 1970s, the 1978 and 2002 regime changes, the 1982 attempted coup, introduction of SAPs , market liberalizations and privatization of state corporations in late 1980s and 1990s, the introduction of multi-party democracy in 1991, the ethnic clashes especially during the elections period in 1992 and 1997, the mega post-election violence of 2007/8 and the subsequent bloated coalition government as well as the established peace processes such as Truth Justice and Reconciliation Commission, 2008 global economic crisis, the 2010 change of the constitution and its high costs of implementation, terrorism threats especially on tourism sector and the commencement of war on terrorism in Somalia in late 2011 etc. Such structural breaks are ignored by the Johansen Cointegration Approach.

Secondly, this study only considered bivariate system. In reality however, there are other factors other than GDP that should be analyzed. These include foreign debts and foreign aid that may contribute to the perpetual growth government spending.

Thirdly, other sources reveal that a lot of public funds are lost in the incidences of corruption. The inflated government tenders and shadowy deals such as the Anglo-leasing scandal, the Goldenberg scandal among other scandals have greatly contributed in fueling the public expenditure upwards. Unfortunately, the data on the funds lost to corruption is very scanty and this makes it difficult for the researchers to determine the actual impact of corruption on government spending.

5.5 Areas for Further Research

No single study is exhaustive. Thus, this study suggests a few areas for further studies.

Firstly, as discussed in the previous sections, the Johansen Cointegration technique does not take into account the structural breaks in the economy during the period under investigation. In order to remedy this limitation, Gregory and Hasen (1996) suggest tests for cointegration with one or two unknown structural break(s). This should be carried out to take care of some of the major structural breaks mention in section 5.3 in the Kenyan economy.

Secondly, after the promulgation of the new constitution in 2010 and after conducting the first election under the new constitution, the structure of governance changed completely. The devolved system of governance was established. Many other structural and institutional changes have been altered as provided for in the new constitution. This definitely has a huge impact of the government spending and economic growth. Thus, an analysis of Wagner's hypothesis should prolong the period of testing to include the period after the promulgation of the new constitution and after holding the first polls under the new constitution in 2013. This would give an insight on the impact of the devolved government system and government restructuring on the overall government spending and economic growth.

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APPENDIX

Year	TOTAL GOVT EXPENDITURE IN NOMINAL VALUE (KSHS.)	GDP IN NOMINAL VALUE(KSHS)	TOTAL POP	GDP deflator (2001)	Real TOTAL GOVT EXP	REAL GDP	Real Exp per capita	Real GDP per capita	Natural Logs of Real Exp. per capita (lrealexpc)	Natural Logs of Real GDP per capita (lrealgdpc)
	A	B	C	D	E=(A/D)*100	F=(B/D)*100	E/C	F/C	ln(E/C)	LN(F/C)
1960	1018840000	5651898368.00	8105435.00	3.45204486158778	29514100796.81	163726098432.00	3641.27	20199.54	8.20009	9.91342
1961	1047480000	5663998464.00	8361428.00	3.75106708350852	27924853826.40	150996992000.00	3339.72	18058.76	8.11364	9.80139
1962	1154680000	6200798208.00	8628949.00	3.75175386387835	30777072321.22	165277319168.00	3566.72	19153.82	8.17940	9.86026
1963	1362500000	6618498048.00	8908388.00	3.68132158422901	37011164844.63	179785924608.00	4154.64	20181.65	8.33198	9.91253
1964	1410740000	7133998080.00	9200107.00	3.78037597327875	37317452284.42	188711337984.00	4056.20	20511.86	8.30800	9.92876
1965	1550380000	7127998000.00	9504635.00	3.70280365966028	41870435013.62	192502726451.72	4405.26	20253.56	8.39056	9.91609
1966	1697680000	8318001000.00	9822419.00	3.76626189556624	45075994369.87	220855618399.57	4589.09	22484.85	8.43144	10.02060
1967	1891320000	8804000000.00	10154382.00	3.85668265448514	49040073281.64	228279088240.81	4829.45	22480.85	8.48249	10.02042
1968	2099580000	9666400000.00	10502123.00	3.92143021855231	53541179696.81	246501900104.41	5098.13	23471.63	8.53663	10.06355
1969	2429280000	10417000000.00	10867576.00	3.91437687227271	62060452513.09	266121539645.00	5710.61	24487.66	8.65008	10.10592
1970	3136120000	11453200000.00	11252318.00	4.51388956832725	69477109542.19	253732392576.99	6174.47	22549.34	8.72818	10.02346
1971	3610440000	12702800000.00	11657321.00	4.09774696056731	88107929424.23	309994739114.92	7558.16	26592.28	8.93038	10.18838
1972	4028120000	15052000000.00	12082989.00	4.14713488563117	97130190145.41	362949371435.97	8038.59	30038.05	8.99201	10.31022
1973	4603320000	17566000000.00	12529622.00	4.57030195578022	100722447762.52	384350972210.57	8038.75	30675.38	8.99203	10.33122
1974	6031660000	21214000000.00	12997274.00	5.30380215773720	113723321885.24	399977211990.33	8749.78	30773.93	9.07678	10.33442
1975	7462180000	23934000000.00	13486116.00	5.93151290362811	125805677594.26	403505823705.79	9328.53	29920.09	9.14083	10.30629
1976	8195280000	29072000000.00	13995982.00	7.05293492723636	116196733481.15	412197195918.15	8302.15	29451.11	9.02427	10.29049
1977	11807800000	37198000000.00	14527391.00	8.24486827899421	143213931386.67	451165485502.91	9858.20	31056.19	9.19606	10.34355
1978	13952400000	40994600000.00	15081923.00	8.49889230244274	164167276198.92	482352270639.05	10885.04	31982.15	9.29514	10.37293
1979	16600000000	46604000000.00	15661593.00	8.97811459041035	184894053565.89	519084486288.23	11805.57	33143.79	9.37633	10.40861
1980	19441400000	53910002000.00	16267558.00	9.83558917938796	197663806869.27	548111567255.95	12150.80	33693.54	9.40515	10.42506
1981	22446400000	62016000000.00	16899958.00	10.90305327216770	205872606871.50	568794799510.96	12181.84	33656.58	9.40770	10.42396
1982	23813600000	70247800000.00	17557466.00	12.16699558306770	195722927960.46	577363569505.70	11147.56	32884.22	9.31898	10.40075
1983	24848660000	79592200000.00	18237830.00	13.60732908195650	182612324948.84	584921548678.80	10012.83	32071.88	9.21162	10.37574
1984	29664600000	89242600000.00	18937969.00	14.99401388377990	197842954061.09	595188191045.63	10446.89	31428.30	9.25406	10.35546
1985	33114600000	100811600000.00	19655192.00	16.23938409522920	203915368993.14	620784627106.74	10374.63	31583.75	9.24712	10.36040
1986	41769800000	117460200000.00	20387701.00	17.65411434869940	236600937180.84	665341787642.00	11605.08	32634.47	9.35920	10.39312
1987	44541800000	131155800000.00	21134404.00	18.60778114740330	239371903867.30	704843844416.68	11326.17	33350.54	9.33487	10.41483
1988	63515580000	148283780000.00	21894026.00	19.80902958742360	320639533197.15	748566603657.07	14645.07	34190.45	9.59186	10.43970
1989	64339980000	170404100000.00	22665447.00	21.74417554164050	295895238137.62	783676988229.21	13054.90	34575.85	9.47692	10.45091
1990	82127400000	196433610000.00	23447177.00	24.05714670855990	341384624681.11	816529126997.87	14559.73	34824.20	9.58601	10.45807
1991	88897200000	224230069300.00	24240108.00	27.07197916617440	328373479657.06	828273647536.52	13546.70	34169.55	9.51390	10.43909
1992	123338800000	264471872712.34	25042330.00	32.18783444561150	383184523359.00	821651649660.44	15301.47	32810.51	9.63570	10.39850
1993	180153780000	333611292400.00	25846436.00	40.45961980051410	445268099127.59	824553700812.98	17227.45	31902.03	9.75426	10.37042
1994	164734200000	400657837200.00	26642887.00	47.34439652557030	347948674160.48	846262423016.86	13059.72	31763.17	9.47729	10.36606
1995	190993600000	465250740000.00	27425720.00	52.65694480089160	362713030013.78	883550577723.84	13225.29	32216.13	9.48989	10.38022
1996	183742500000	687998000000.00	28191597.00	74.76695030374160	245753637474.24	920190000000.00	8717.27	32640.58	9.07306	10.39331
1997	313373780000	770313000000.00	28944780.00	83.31671281474430	376123552421.94	924560000000.00	12994.52	31942.20	9.47228	10.37168
1998	243335470000	850808200000.00	29696410.00	89.09172966973130	273129134322.64	954980000000.00	9197.38	32158.10	9.12667	10.37842
1999	226155070000	906927630000.00	30462154.00	92.82818251047090	243627596580.91	976996000000.00	7997.71	32072.45	8.98691	10.37575
2000	268430490000	967836930000.00	31253701.00	98.47199536045500	272595765950.93	982855000000.00	8722.03	31447.64	9.07361	10.35608
2001	311131700000	1020221000000.00	32076186.00	100.02107830738300	311066132524.42	1020006000000.00	9697.73	31799.48	9.17965	10.36721
2002	305163300000	1035373000000.00	32927864.00	100.95448056912000	302278114135.87	1025584000000.00	9180.01	31146.39	9.12478	10.34645
2003	376312000000	1131782000000.00	33805301.00	107.21094595887500	351001473435.70	1055659000000.00	10383.03	31227.62	9.24793	10.34906
2004	379830230000	1274329000000.00	34702176.00	114.85170020449900	330713632731.34	1109543000000.00	9530.05	31973.30	9.16221	10.37266
2005	487122660000	1415725000000.00	35614576.00	120.47903121489600	404321528060.04	1175080000000.00	11352.70	32994.36	9.33721	10.40409
2006	508667460000	1622567000000.00	36540948.00	129.86042081842700	391703227815.06	1249470000000.00	10719.57	34193.69	9.27983	10.43980
2007	664614770000	1833513000000.00	37485246.00	137.15183988618000	484583196661.13	1336849000000.00	12927.30	35663.34	9.46710	10.48188
2008	694165360000	2107460000000.00	38455418.00	155.27289499006100	447061517107.95	1357262000000.00	11625.45	35294.43	9.36095	10.47148
2009	789360620000	2365453000000.00	39462188.00	169.64118974229500	465311886340.30	1394386000000.00	11791.34	35334.74	9.37512	10.47262
2010	956226220000	2551161000000.00	40512682.00	172.98692474967300	552773697424.67	1474771000000.00	13644.46	36402.70	9.52109	10.50240
2011	1024763270000	2985878834400.00	41609728.00	193.97565100116500	528294796130.80	1539306000000.00	12696.43	36993.90	9.44908	10.51851

Source: Compiled by the Author using data from Government National Accounts from the Treasury, Annual Statistical Abstracts and Economic Surveys from KNBS and World Bank (2014) website