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PUBLIC EXPENDITURES AND ECONOMIC GROWTH IN NIGERIA: 1961 - 2012

BY

UKWUEZE, EZEBUILO ROMANUS
PG/Ph.D/03/34566

A Ph.D THESIS

DEPARTMENT OF ECONOMICS
UNIVERSITY OF NIGERIA, NSUKKA

SUPERVISOR: PROFESSOR F. E. ONAH

MARCH, 2014

PUBLIC EXPENDITURES AND ECONOMIC GROWTH IN NIGERIA: 1961 - 2012
BY

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PG/Ph. D/03/34566

A Ph.D Thesis Presented to the Department of Economics, University of Nigeria, Nsukka.

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DEDICATION

To my wife and little Chimamanda, for their love, support and encouragement,

To my mother for being my wonderful mother,

To the memory of my father for his words of admonition,
and, to you the reader.

ACKNOWLEDGEMENTS

First, I submit myself to Almighty God who gave me life. I thank Him for protecting and guiding me all through the thick and thin of my life, and for guiding me through the stages of this programme. God is wonderful! To Him will all glory be.

I wish to acknowledge the efforts of my dear wife, who is always there urging me to go ahead and not relent in spite of all odds. She would always say well done even if I have not done much. God bless you and keep you.
I wish to recall what my father (of the blessed memory) told me – “In any good thing you want to do, don’t look back even though you may not have resources to achieve it”. This is the summary that made this work easy for me. Papa, I am sure you are with God, thanks.

To my dear mother and other relations, what do I tell you people? There is nothing more than to wish and pray for God to bless you abundantly and keep you to reap the fruits of your past labour.

I want to thank in special way my Chairman, Dr. Emma Nwosu, who is a true friend and resource person to me, and other colleagues for their comments and contributions in this thesis.

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I love you all!

_Ukwueze, Ezebuilo Romanus_
_March, 2014._

Abstract

The link between public expenditure and economic growth has attracted considerable interest on the part of both economic researchers and policy makers both at the theoretical as well as empirical levels. Two strong but opposing views exist in the public expenditure literature, namely, the Keynesians - government spending is an important policy tool to be used to ensure a reasonable level of economic activity, correct short-term cyclical fluctuations in aggregate expenditure, and the opposite view – that excessive government intervention in economic activities crowds out and distorts the activities of other economic agents. The size of the public sector keeps expanding day by day and one wonders if such continuous expansion is accompanied by expansion and growth of national output. This research work is set out to estimate the determinants of public expenditure; determine the impact of public expenditure on output growth.
in Nigeria; determine the direction of causality between public expenditures and output growth; investigate if output growth responds significantly to public expenditures shocks in Nigeria; determine the impact of public expenditure by sector on economic growth. To achieve these, four models were applied both for the short run dynamics and the long run relationships. From the results, it was found that the size of revenue, national output growth (national income), external debts and domestic debts are the determinants of the size of public sector in Nigeria. The result also showed that public expenditure has strong (but positive) and significant impact on output growth in the short run but insignificant in the longer period. It was also found that both the recurrent and capital expenditures granger cause output changes, and also that the shocks from them cause fluctuation in output of Nigeria. This research discovered that, in the short run, public expenditures on education, agriculture, all have both positive and significant impact on output growth, while expenditures on health and building and construction have negative and significant relationship and defence has both positive and insignificant link with output growth. In the long run, however, defence, education and agriculture expenditures are positive and significant, whereas health and building and construction are negative and significant. The recommendations in this research are that public debts should be curtailed, revenue base should be expanded, price moderation is important, more social infrastructures should be provided to create avenues for private investment to increase, restraining from the use of recurrent expenditure because it is inflationary and can worsen the economic situation, policies for the health and building and construction sectors should be reviewed to check why they retard economic growth of Nigeria.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Many developing countries are currently undergoing substantial macroeconomic adjustment. It is not clear how such programmes are affecting government expenditures and hence longer-term economic growth and poverty reduction. Thus, it is important to monitor trends in the levels and composition of government expenditures, and to assess the causes of change over time. It is even more important to analyze the relative contribution of various expenditures to production growth and poverty reduction, as this will provide important information for more efficient targeting of these limited and often declining financial resources in the future.

The link between public expenditure and economic growth has attracted considerable interests on the part of economic researchers both at the theoretical as well as empirical level. Roughly speaking, one may distinguish between two opposing views: On the one hand, there is the Keynesian approach according to which government spending is an important policy tool to be used to ensure a reasonable level of economic activity; correct short-term cyclical fluctuations in aggregate expenditure (Singh and Sahni, 1984); and secure an increase in productive investment, thus providing a socially optimal direction for growth and development (Ram, 1986). The opposite view is that excessive state intervention in economic life affects growth performance in a negative way for two reasons: first, because government operations are often conducted less efficiently, they reduce the overall productivity of the economic system, second, because excessive government expenditure (usually
accompanied by high taxation levels) distorts economic incentives and results in suboptimal economic decisions (Barro 1990; King and Rebelo 1990).

Those who support larger size of the government give credence to the provision of certain goods and services that would otherwise not be provided by the private sector. They assert that government comes into economic activities due to failure of the market and externalities to establish a predetermined growth path. Government exists so as to provide social and physical infrastructure, by undertaking some investment and expenditures. By these ways, the government can directly or indirectly improve the productivity of the private sector by efficient and effective allocation of resources. The existence of government is correctly justified when one looks at the legal functions of the government, in terms of property rights (Atkinson and Stiglitz 1980:5), provision of security, maintenance of law and order, etc. In this sense, government expenditures have become expedient and necessary to overcome the obstacles of economic development.

However, when the size of the public sector becomes very large it can impinge on economic growth and development (Peden and Bradley (1989: 239), Vedder and Gallaway (1998), Folster and Henrekson (2001), etc). The larger the size of the public sector, the more difficult it becomes to coordinate the activities of the key players in the system. Larger governments tend to crowd out private investment, which invariably impinges on domestic output (Ahmed and Miller, 1999). Larger sizes of government can also create output volatility (Acemoglu and Ziliboti, 1997; and Koskela and Viren, 2003).

Maintaining law and order, in particular, securing property rights is probably the most acceptable rationale for government intervention. Theoretically, it is argued that enforcement of property rights being a public good, its provision can only be
materialized through collective action (Gradstein, 2004). The rationale for the existence of government anywhere, including Nigeria, can be viewed from the perspective of the institutions of property rights, rule of law, governance, security, enforcement of the rule of law, etc. Nigeria is a Federal state with three tiers, with multiple and diverse ethnic and other socio-political differences, which most often determine the volume and rate of spending. The nature of public spending (in Nigeria) depends majorly on the revenue – of which oil controls a greater percentage – and which is also determined by the vagaries of world market interactions. The other institutional factors which can influence the public spending and economic growth include institutional quality (the enforcement of property rights), political instability (riots, coups, civil unrests, civil wars, etc), characteristics of political regimes (elections, constitutions, executive powers), social capital (the extent of civic–private activity and organizations) and social characteristics (differences in income and in ethnic, religious, and historical background) (Aron, 2000:100). All these affect nations’ investment directly as they create harsh environment and insecurity, which increases transaction costs and mar the private investment for growth.

According to North (1990:110), “Third World countries are poor because the institutional constraints define a set of payoffs to political/economic activities that do not encourage productive activity”. Such rules affect both individuals and organizations, defined as political organizations (city councils, regulatory agencies, political parties, tribal councils), economic organizations (firms, trade unions, family farms, cooperatives, etc), educational bodies (schools, universities, vocational training centres), and social organizations (churches, clubs, civic associations) (Aron, 2000). The inability of the government to enforce the rule of law affects the economies of developing countries, including Nigeria, and as such, rent-seeking behaviours,
corruption, bribery and protection of individuals and organizations connected with highly placed people become the common phenomenon. These behavioural attitudes raise the transaction costs and costs of information in the production process and make the rule of law unreliable.

Bearing all these in mind, it is necessary to verify the impact of the growth of government expenditure. Research is therefore needed to examine the source of shocks and how they influence the economy. Output volatility in Nigeria is another area that we need to find whether it is caused by public expenditure rise.

1.2 Statement of the Problem

It is a fact that no society throughout history has ever obtained a high level of economic affluence without a government. Government is a necessary, though by no means sufficient, condition for prosperity (Vedder and Gallaway, 1998). Where governments did not exist, anarchy reigned and little wealth was accumulated by productive economic activity. We should note, however, that where governments, on the other hand, have monopolized the allocation of resources and other economic decisions, societies have not been successful in attaining relatively high levels of economic affluence. Economic progress is limited when government is zero percent of the economy, and also when it is at or near 100 percent. Too much government stifles the spirit of enterprise and lowers the rate of economic growth.

The recent revival of interest in growth theory has also revived interest among researchers in verifying and understanding the linkages between fiscal policies and economic growth. Government spending can stimulate particular sectors as well as increase aggregate demand taken globally. Over some past two decades, a substantial
volume of empirical research has been directed towards identifying the elements of public expenditure (at its aggregate and disaggregate levels) that bear significant association with economic growth. Recent literature on endogenous growth theory predicts that fiscal policy changes can affect the long-term growth rate by influencing the determinants of growth (physical and human capital, technological changes, employment and savings) (Hjerppe, et. al. 2006).

The relationship between economic growth and government spending, or more generally the size of the public sector, is an important subject of analysis and debate. A central question is whether or not public sector spending increases the long run steady state growth rate of the economy. The general view is that public expenditure, notably on physical infrastructure or human capital, can be growth-enhancing although the financing of such expenditures can be growth-retarding. Existing literature in Nigeria has not been in agreement on the nature and impact of government expenditure on economic growth. Ekpo (1995) finds that capital expenditure on construction and manufacturing crowds out private investment. Ogiogio (1995) observed a long run relationship between economic growth and government expenditure. Aigbokhan (1996) reported a bi-directional causality between government total expenditure and national income. Essien (1997) using data from 1960-1994 found no causality between public expenditure and national income. Odusola (1996) and, Nurudeen & Usman (2010) find that military expenditure has no significant relationship with economic growth in Nigeria. However, Adewara and Oloni (2012) found that expenditure on defence is positively related with economic growth

Akpan (2005) used Error Correction Model (ECM) in his study of the impact of government expenditure on economic growth in Nigeria with two lags. Aregbeyen,
Babatunde, (2009) showed that government capital expenditure has a significant positive effect on real output, but that real government recurrent expenditure has insignificant effect on growth. Olorunfemi (2008) in a study on the relationship between economic growth and public expenditure in Nigeria surprisingly concluded that there is no link between gross fixed capital formation and GDP and that public expenditure affects GDP without elaborating the type of relationship. Nurudeen and Usman (2010) studied the impact of government expenditure on economic growth by disaggregating the government expenditures into capital expenditure, recurrent expenditure, defence, education, health, transport and communication and fiscal balance, using cointegration method, and found that all the variables except defence and agriculture are statistically significant. From this review, there is no consensus among researchers on the nature and impact of public expenditure on the performance of Nigeria (and indeed other countries). Further investigation into the matter is of ultimate necessity for Nigeria.

Nigeria has consistently had deficit spending over the years without equivalent rate of economic growth. Data shows that output of Nigeria has been fluctuating for some years and the sources of these shocks may not be clear. The growth rate (real GDP growth) of output was 3.2, 2.4, 2.8, 3.8 and 4.7 respectively, in 1997, 1998, 1999, 2000 and 2001, while the total expenditure growth was 12.1, 15.6, 28.1, 15.6, and 19.3 per cent in 1997, 1998, 1999, 2000, and 2001, respectively (CBN, 2001). This implies that the growth rate of public expenditure was far higher than that of economic growth.

The aggregate expenditure of the Federal Government, in nominal terms, increased by 32.2 per cent to N3,240.8 billion in 2008 (CBN, 2008). As a proportion of GDP, total expenditure increased by 13.5 per cent, from 11.7 per cent in 2007, while the GDP
growth rate was 6.4 percent, almost the same as the 6.5 per cent recorded in 2007 and the average annual projected growth rate for the period 2004 – 2008. This implies that the public expenditure is growing faster than the rate at which the output is growing. As a percentage of GDP, recurrent expenditure increased from 1.2 percentage points to 8.8 per cent. Most of the components of recurrent expenditure increased relative to their levels in 2007. As a proportion of Federal Government revenue, capital expenditure was 30.1 per cent, exceeding the stipulated minimum target of 20.0 per cent under the WAMZ secondary convergence criteria. The data speaks volume that the economy does not grow at a fast rate as the growth rate of government expenditures. It is expected that as the public expenditure expands output is expected to expand also, because public expenditure should be translated into output growth. Or does it imply that much of the public expenditure find their ways into some other paths different from the intended routes?

However, in 2009, the aggregate expenditure of general government fell by 5.1% from its level in 2008, which represented 29.4% as compared with 31.5% in 2008, while GDP growth rate, at 1990 constant prices, was 6.7%, which exceeded the 6.0% recorded in 2008 and annual growth rate of 6.4% for the period of 2005 – 2009 (CBN Annual Report, 2009:74). In 2010, the aggregate expenditure of general government increased by 15.3% from the level in 2009. As a proportion of GDP, it represented 28.4% as compared with 28.8% in 2009, while the growth rate of GDP was 7.9% which exceeded the 7.0% recorded in 2009 and the average annual growth rate of 6.7% but lower than the target growth rate of 10% for the year (CBN, 2010).

From these data, the rate at which the output grows has been lower than that of the growth of public expenditure. This simply means that there is need to investigate
whether the rises in public expenditure have been accompanied by rise in the output of Nigerian economy. The data on the fluctuations of the GDP and public (government) expenditure are inexhaustible. This makes it expedient to understand the nature of such fluctuations in the macroeconomic variables and how they impact on the output of the economy.

1.2.1 Research Questions

The following research questions formed the central focus of this study:

i. What are the determinants of public expenditures?
ii. What is the impact of the public expenditures on economic growth of Nigeria?
iii. Are public expenditures causing the output changes?
iv. Are shocks from public expenditures distorting the output growth in Nigeria?
v. What are the impacts of sectoral public expenditures on the output growth in Nigeria?

1.3 Objectives of Study

The broad objective of the research work is to determine the macroeconomic impact of the Nigerian public (government) expenditures. It is also of interest to ascertain which expenditure item of the government affects the output. However, the specific objectives are as follows:

i. To estimate the determinants of public expenditure
ii. To determine the impact of public expenditure on output growth in Nigeria.
iii. To determine the direction of causality between public expenditures and output growth.
iv. To investigate if output growth responds significantly to public expenditures shocks in Nigeria.

v. To determine the impact of public expenditure by sector on economic growth.

1.4 The Hypotheses

The hypotheses of this research work are tacitly stated as follows:

i. $H_{o1}$: The determinants of the public expenditures cannot be determined.

ii. $H_{o2}$: The Public expenditure has no significant impact on economic growth in Nigeria.

iii. $H_{o3}$: Public expenditures do not Granger cause output changes.

iv. $H_{o4}$: The shocks from public expenditures do not significantly affect output growth in Nigeria.

v. $H_{o5}$: The sectoral spending of the government does not impact significantly on output growth.

1.5 Justification of the Study

Even though the public expenditure has increased rapidly in the last two centuries in every nation and even though its growing role and importance cannot be neglected in national economies, the area of public (government) expenditure remains a complex and debated area of study. This is true especially when we look at the existing literature in Nigeria and other countries. Existing studies have produced conflicting results and no consensus has been reached about the nature of the relationships between public expenditure and economic performance.

Nigerian government expenditure has been consistently rising and after each year, the budget would increase and so, the expenditure would do the same. One might be tempted to assume that the public expenditure is consistent with Wagner’s law. Does it mean that the expenditure of the government of Nigeria is rising because
the economy is improving? What are the determinants of the rising trend of the public sector? To answer these questions entails a lot of insights and investigation into the nature of the links between public expenditure and the performance of the Nigerian economy. This means that there should be a thorough investigation into the government spending attitude and methods and their relationships with national growth.

In spite of huge expenditure programmes undertaken by the government, most of our infrastructures are in decay. The roads are bad, hospitals poorly rehabilitated and equipped with the necessary resources; the schools are in disrepair and in poor conditions, etc. the energy sector is not optimally supplied to support and boost the industrialization strategies designed by the government. We need to investigate which of these sectoral expenditure programmes that are significantly affected by the public expenditure programmes. A great effort has been made to carry out an in-depth study of what determines the size of government in Nigeria and the impact of public expenditure on economic growth. There is also the need to find the how shocks from public expenditures transmit to other macroeconomic variables. The capacity of the models used in this research to determine these areas of research interests in the links between public expenditures and economic growth justifies the strength of this research for policy advocacy and policy making.

1.6. Scope of the Study

The research is basically for the economy of Nigeria. The study dwelt mainly on the public expenditure of Nigeria – aggregate expenditure of all tiers of government in Nigeria; output growth – measured from the supply side and not
from the demand side. In some of the analysis, there was the need to divide the aggregate expenditure into capital and recurrent and in some others, the disaggregation of public expenditure into sectors became germane (the sectors include defence, health, education, agriculture, building and construction, transport and communication). Where it became necessary, other macroeconomic variables were introduced as may be required at a particular point in time. The time frame for the study ranged from 1961 – 2012.

1.7 Organisation of the Study

This thesis is divided into chapters. This thesis is divided into six chapters. Chapter one serves as introduction, with background of the study, statement of the problem, objectives of study, hypotheses, the significance of the study, and scope of study following one another. Chapter two dwelt on literature review. Detailed discussion of both theoretical literature and empirical literature were reviewed, while the chapter ended with the limitations of the previous studies.

Chapter three dwells on the theoretical framework of public expenditure, which discussed in details the theories of government expenditure, factors that influence government expenditure, theories of economic growth, and the links between economic growth and government expenditure. In chapter four, the methodology for this study was discussed. Four models were used for this thesis which corresponded with the research questions and objectives of the study.

In chapter five, a detailed discussion of the research findings was done. The results of stationarity tests, determinants of public expenditure, the impact of public spending on economic growth, the result of the vector autoregressive (VAR) model, the impact
of public expenditure by sector on output growth of Nigeria and their interpretations were all discussed extensively here. The evaluation of the hypotheses and the policy implications of the research findings were also discussed.

Finally, in chapter six the summary of research findings, conclusion and policy recommendations were all discussed. The contributions of this thesis to the body of knowledge and suggestions for further studies were the last sections of the thesis.
CHAPTER TWO
LITERATURE REVIEW

2.1 Conceptual Framework

The concept of public expenditures arises from the thinking that expenditures undertaken by the government is public. Government expenditures are also called public sector spending or government purchases. Government expenditure has been growing over the years and is very large. Therefore, the determination of the size of the public sector is done by dividing the total expenditures of government by the total national output (GDP). This ratio is defined as the size of the public sector; it is this ratio that was used in this thesis. Also, the data for public expenditures used in this research (thesis) was the expenditures of all the three tiers of government in Nigeria.

Public expenditures can be disaggregated or classified into subheadings, such as recurrent expenditures and capital expenditures. The recurrent expenditures are expenditures or purchases of stationeries, wages and salaries of workers, fuel, electricity bills and other bills, etc. Capital expenditures are constructions undertaken by the government on roads, bridges, health centres, military installations and hardware, etc.

2.2 Theoretical Literature

2.2.1 Neoclassical Growth Theory – The Growth Accounting Theory

Growth theory is an important part of modern macroeconomics. The analysis of growth has long been based on the Solow’s (1956) “growth accounting” approach, also termed as neoclassical growth theory, which has two important predictions about growth in the long run: first, that the long-run growth rate is driven by population growth; and second, that of the rate of technical progress. Solow (1956) and Swan (1956) viewed the accumulation of physical capital, associated with a permanent low of technical progress, as the driver of economic growth. The basic assumptions of the
model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. Technological progress, though important in the long-run, is regarded as exogenous to the economic system and therefore it is not adequately examined by this model (Petrakos, et. al., 2007). In the standard neoclassical growth model, economic growth depends on the increase in the capital and labour and the pace of technological progress.

The most basic proposition of growth theory is that in order to sustain a positive growth rate of output per capita in the long run, there must be continual advances in technological knowledge in the form of new goods, new markets, or new processes, which was demonstrated by the neoclassical growth model which shows that if there were no technological progress, then the effects of diminishing returns would eventually cause economic growth to cease (Aghion and Howitt, 1998). Public policies in general and public expenditures specifically, do not affect growth. In the extended Solow model, however, human capital is an important input to growth (Mankiw et. al., 1992).

In the endogenous models, public policies can affect both human capital formation and technological progress and therefore public policies can also have an effect on economic growth. Endogenous growth models such as those of King and Rebelo, (1990), on the other hand, predict that distortionary taxation and productive expenditures do affect the long-run growth rate. The implications of endogenous growth models for fiscal policy have been particularly examined by Barro, (1990), Jones et. al., (1993), Stokey and Rebelo, (1995) and Mendoza et. al., (1997). In testing whether the historical evidence supports the neoclassical or the endogenous growth model, several major difficulties arise. One is that there may be only limited data on
government expenditures and revenues, particularly at the required level of disaggregation, and the definition of particular expenditures as productive or unproductive, or particular taxes as distortionary or non-distortionary (Bleaney et. al., 2000)

Recent literature on endogenous growth theory predicts that fiscal policy changes can affect the long-term growth rate by influencing the determinants of growth (physical and human capital, technological changes, employment and savings) (Hjerpe et. al., 2006). As to the government expenditure, public educational and health expenditure are two of the most important public expenditure items which can contribute to the formation of the human capital; and consequently, there is, in principle, a channel from government expenditure to economic growth. Changes in public expenditures and taxes could boost (or depress) employment and human capital accumulation and change investment externalities that then would have effects on growth rate of output. This contrasts with the basic neoclassical growth model, where fiscal policy is unable to affect the long-term growth.

The theoretical relationship between government expenditure and economic growth is well-documented in the literature. There are two major divergent theories in economics concerning the relationship between government expenditure and economic growth. While conventional macroeconomic theory has generally assumed that increased government expenditure tends to lead to high aggregate demand and in turn, rapid economic growth, Wagnerian theory (1883), however, leans toward the opposite view. The latter contends that an increase in national income causes more government expenditure. The relationship between government expenditure (to be
proxy for government activity) and economic growth is not without controversy in the empirical literature.

The theory of government expenditure cannot be discussed without the mention of Wagner (1883)’s discussion on this. He said that there are inherent tendencies for the activities of different levels of government to increase both intensively and extensively. He further maintained that there is a functional relationship between the growth of an economy and government activities (expenditure) with the result that the government sector grows faster than the economy. From the original version of the theory it was not very clear whether Wagner was referring to growth in (a) absolute level of public expenditure, (b) the ratio of government expenditure to GNP, or (c) proportion of public sector in the economy (Bhatia, 2006). According to Wagner (1890), as quoted in Cheng and Lai, (1997), increased government activity and the corresponding increase in government expenditure is an inevitable result of economic growth due to (a) increased friction in society causing greater demand for government services, (b) as the society is growing richer, it requires the government to provide quality goods and services, and (c) the demand for such goods and services is highly income elastic. Regularly known as Wagner’s law (1883), it states that demand for government services tends to rise as countries become richer (Motu, 2003). This is corroborated by the finding of a positive correlation between government share and national income (Kolluri et. al., 2000). This indicates that change in national income can cause change in government expenditure.

Nitti (1903) in his “Principidi Scienza delle Finanze” not only supported Wagner’s Law but also enunciated the theory with empirical evidence that the Law is applicable to all nations. He went down to history to explain that all governments, irrespective of
the levels and types, intentions (whether peaceful or warlike), and size had exhibited
the tendency of increasing public expenditure.

The long-run relationship between real output and public expenditure has attracted
considerable attention in economic research. In particular, the ability of public
expenditure to influence national income is questioned in two levels. First, the nature
of the causality pattern is disputed: a number of public finance studies adopt the
Wagner’s law approach which states that national income causes public expenditure,
mainly through an increase in demand for public services. One of the frequently
quoted stylised facts of public sector economics is that of “Wagner’s Law” about the
long-run tendency for public expenditure to grow relative to some national income
aggregate such as GDP. In this case, the causality runs from national income to public
expenditure. This implies that public expenditure can be treated as an outcome, or an
endogenous factor, rather than a cause of growth in national income. Within this
framework, public expenditure is treated as a behavioural variable, similar to private
consumption. On the other hand, Keynesian propositions treat public expenditure as
an exogenous factor, which could be utilised as a policy instrument. A number of
macroeconomic models adopt, in which case, causality runs from public expenditure
via domestic demand to national income. According to Singh and Sahni (1984:630), if
the causality pattern were Wagnerian, public expenditure is delegated to a passive
role, and if Keynesian it acquires the status of an important policy variable.

We should note that even if we exclude the possibility of a causality pattern running
from national income to public expenditure, it is not quite clear that increased public
outlays will have lasting positive output effects. This is because the money financed
deficits would cause positive output effects only if they remain unanticipated by the
private sector. In similar manner, repeated and predictable monetary accommodation
of deficits would result in a higher inflation rate without any long-run output gain. By resulting in a higher inflation rate, money-financed budget deficits could then imply real costs for the economy through the well-documented real costs of inflation.

The four main hypotheses based on the relationship between government expenditure and revenue such as Tax-and-Spend hypothesis, Spend-and-Tax hypothesis, Fiscal Synchronization and taxes and expenditure are independent of each other. The Tax-and-Spend hypothesis suggests that a change in government revenue is followed by a change in government expenditure. Friedman (1978) and Buchanan and Wagner, (1977) have shown that an increase in government revenue causes an increase in government expenditure and therefore the Tax-and-Spend approach does not play any role in reducing budget deficit.

Second, the Spend-and-Tax hypothesis suggests that a change in government expenditure is followed by a change in government revenue. Peacock and Wiseman, (1979) have argued that temporary increase in government expenditure due to emergency purposes lead to increase in permanent increase in government taxes or other types of revenue. Barro (1974, 1978) has argued that the result suggested by Buchanan-Wagner on the relationship between government expenditure and tax due to fiscal illusion does not exist. Barro (1974) has used the Ricardian equivalence proposition. According to Barro (1974), if government meets its expenditure through borrowing, then it results in an increase in tax liabilities in future. The third kind of relationship that may appear between these two variables is defined as Fiscal Synchronization hypothesis, which suggests that revenue and expenditure are determined simultaneously. This argument is mainly developed by Musgrave (1966) and Meltzer and Richard (1981). According to them, government expenditure and
revenue are determined in the process of equalizing marginal benefit to the marginal cost of government services by the population of the country. The fourth hypothesis as mentioned by Baghestani and McNown, (1994) and highlighted by Darrat, (1998), relates to the institutional separation of the expenditure and revenue decisions of the government. Here, expenditure would be defined on the basis of requirements expressed by the citizenry and revenue would depend on the maximum tax burden tolerated by the population. As a result, the achievement of fiscal equilibrium would merely be a matter of coincidence.

On the other hand, bond-financed public expenditure may involve expansionary effects of a more lasting nature provided that the anticipation of future interest payments causes positive wealth effects on current and future consumption (Blinder and Solow, 1973). However, such outcomes may be mitigated by crowding-out effects which can take place through two channels. First, through portfolio effects: an increase in the stock of bonds may necessitate a similar increase in interest rates to maintain equilibrium in the bonds’ market. Such an increase may imply a shift of the LM curve (to the left), which could reduce the expansionary impact of the bond financed deficit. Second, through an upwards-sloping aggregate supply curve: given a certain level of nominal money, increasing prices caused by a fiscal expansion would lead to a reduction in real money stock. That would cause an increase in interest rates and negative wealth effects reducing private investment and consumption. By causing an increase in interest rates, bond-financed deficits may actually result in a worse inflation performance than money-financed deficits in the lines suggested by Sargent and Wallace, (1981). Finally, a bond-financed budget deficit would have no expansionary effects at all (not even in the short-run) if the Ricardian Equivalence hypothesis was valid.
Theory also discusses the role of public expenditure as an output-promoting control variable as highlighted in the framework of the endogenous growth literature pioneered by the seminal papers by Romer, (1986) and Lucas, (1988). Endogenous growth models postulate that the economy's output is conditioned not only on the level of physical capital and labour stock (as it was the case in Solow's (1956) neoclassical growth model) but also on additional production factors which may enter the production function with constant returns to scale. Therefore, composition of public spending is also a relevant issue, and if the aim is to promote growth, the focus should be put on the more productive items of the budget, even if the balance between the various functional items of the budget can vary according to the particular circumstances and priorities of each country.

The advent of the class of growth models developed by Romer , (1986), Lucas (1988), Barro, (1990) and Rebelo, (1991), which in essence constitute a new, endogenous growth theory, has caused that the view on the role of government in growth process changed. According to this theory, both transition and steady state growth rates are endogenous, implying that also long-run economic growth rates are endogenous. There are several factors that should be important for determining long run growth, although in all endogenous growth models, government can influence growth, either directly or indirectly (Brons, de Groot and Nijkamp, 1999). As a result, long-term growth rates can differ across nations, and there is no necessity that convergence in income per capita should occur. More significantly, as Dar and AmirKhalkhali, (2002) report, a major implication of endogenous growth models is that government policy can have wide-ranging implications for a country's long-run growth performance. Namely, the three main fiscal instruments, being taxation, expenditure, and the aggregate budgetary balance, affect long-term growth through their effects on
the efficiency of resource use, the rate of factor accumulation and the pace of technological progress.

In the macroeconomic literature, the relationship between government size and output volatility has been analyzed both theoretically and empirically. In the old Keynesian economics the attention was focused on automatic fiscal stabilizers associated with the income taxes, but these models are not based on optimizing behaviour. Christiano (1984) has provided a survey and further research of automatic stabilizers in the partial equilibrium context an optimizing consumer choice model. He shows among others that the more the economic shocks are perceived as idiosyncratic, the more the income tax will serve as an automatic stabilizer for insurance reasons. There are also some attempts to provide a theoretical analysis of automatic stabilizers in stochastic dynamic general equilibrium models. Gali (1994), for instance, has studied the effects of government size on output variability (volatility) in the context of a real business cycle in which government size is parameterized by the income tax rate and the share of government purchases in output. In his theoretical model, income taxes are destabilizing, while for most specifications government purchases are stabilizing.

In Neck and Schneider (1988), public expenditures fluctuate when any intervention of the government is needed to re-equilibrate the economic activity. The government uses fiscal policy to fight inflation, it would respond by reducing public spending when inflation increases; also, when the share of unemployment rises, the government is inclined to raise public spending. Cameron (1984) and Lybeck (1986) stipulate that unemployment influences public spending in short-run, but since unemployment does not rise trend wise, it is difficult then to see what it has to do in a long-run study. Counter-cyclical policies would also make governments reduce public spending in periods where the budget deficit is significant. According to Aubin et. al., (1988), the
relation between unemployment and public expenditure may reflect some mechanical link between social transfers and the number of unemployed or some Keynesian economic policy, which is designed to restore full employment. In any case, an increase in the rate of unemployment leads to a higher public spending. Another factor is the growth of population since it indicates more need of health care and education commodities, and leads then to an increase of public spending.

Understanding the reasons for government spending growth has been a central concern of public economists going back at least as far as Wagner, (1893) and beginning in more recent times with Downs, (1957). An “excessive” size of government is often alleged to be the cause of many economic ills in both developed and developing countries, including slow economic growth, large government deficits, internal imbalances (e.g., inflation, rising interest rates), and external imbalances (e.g., trade deficits, falling exchange rates).

Theories of why government spending grows can be broadly classified into “institutional” and “a-institutional” approaches (Borcherding and Lee, 2004). Institutional approaches focus on political/public choice considerations, such as the roles of government bureaucrats, voter-taxpayers, and special interests as they engage in rent-seeking; institutional approaches also rely upon structural changes (e.g., voter suffrage) and major shocks (e.g., war, economic crises) to the political system. A-institutional theories emphasize the impacts of changing market conditions (e.g., income and price effects) on the demands for government services.

One of the earliest and probably most frequently mentioned determinants of public spending is the economic growth which is famously known as Wagner's “law".
Wagner's law of expanding state activity" (Wagner 1883, pp.1-8) has been elaborated by many scholars of Public Economics (for example, Bird (1971), Musgrave (1969) and Gupta (1968)). The law argues that peoples' demand for service and willingness to pay is income-elastic hence the expansion of public economy is influenced by the greater economic affluence of a nation (Cameron, (1978)). In other words, the scope of government tends to improve with the greater level of income and often said to imply that the income elasticity of demand for government is larger than unity (Folster and Henrekson, (2001)).

### 2.2.2 Determinants of Public Expenditure

Several factors have been found in theory to be responsible for public expenditure rise. These factors could be briefly discussed below:

**Growth in Per Capita Income**

Rises in the national income of economies has been found to be responsible for the increasing spate of public expenditure. This stems from the Wagner’s law of increasing state activities. As the national income rises the government spends more in order to meet up with the demands of the people.

The rise in per capita income, seen in historical context, records the development of the economy from agricultural and low-income state to an industrial and high income state. As the economy grows and income rises, the demand for goods, including public goods will rise, which as a consequence pushes the public expenditure (government purchases) up.
With rise in per capita income, public provision of consumer goods also rises. A smaller share of consumers’ income is spent on certain goods, such as food or work clothing, and a larger share on others. As average income increases, similar changes in the consumption pattern for the economy as a whole may be expected to occur.

The relationship is more observable with regard to public provision for capital goods. In the earliest stages of economic development, a particular need exists for the creation of overhead capital, such as roads, airports, harbours, power installations, etc (Musgrave and Musgrave, 1989). Many of these items are such that the benefits are largely external, or they require large amounts of capital the returns on which are spread over a long period of time, and thus do not lend themselves for private provision. This is the reason to expect that the public share in the provision for capital goods should be larger at the earlier stages of development. As these basic facilities are built up and capital markets develop, the path is cleared for capital formation of the manufacturing sector to go into place and for industrial development in the private sector to occur.

**Technical Change**

Technological changes can significantly affect the share of social good in an efficient product mix. Technological change in particular has a major bearing on the development of the expenditure share. As technology changes, so do the processes of production and the product mix which is efficient to produce. These changes in technology may be such that they increase or decrease the relative importance of goods whose benefits are largely external, and which must therefore be provided by the government.
Relative Costs of Public Services: Inflation

In discussing the rising ratio of expenditures to GNP, it is necessary to note that the cost of public services has risen relative to that of private goods. This increase, especially in recent times, may have reflected differential rates of inflation. The more rapid rate of inflation in the price of inputs or goods purchased by the public sector resulted in an increase in the nominal expenditure-to-GNP ratio ahead of that recorded by the deflated ratio.

Public services will become more costly, but it does not follow that the share of public expenditure for GNP must rise. As the relative price of public goods rises, consumers will substitute private goods. The outcome will depend on the elasticities of demand for public and private goods. Only if demand is inelastic can we predict that the public share will increase.

Population Change

Population changes may also be a major determinant of the public expenditure share. Changes in the rate of population growth generate changes in age distribution, and this trend is reflected in expenditures for education as well as care for the aged. The growth of population has frequently been cited as a factor that contributes to the growth of public expenditures. Changes in the general population might affect some services, such as defence, police protection or fire protection, whereas in other cases it is a specific section of the population that is of importance to the provision of the service, for example the school-age population in the case of education.

Population size and other population characteristics such as age structure and population density can be thought of as a subset of the environmental variables
influencing the size of public expenditure. Intuitively, it would be expected that as population increases, then the level of activity produced by the public sector would have to expand in order to serve the larger population (Brown and Jackson, 1994). As an example, as the number of children of school age expands, the number of teachers and other inputs in the education process increase also if existing class sizes and other service conditions are to be maintained with the new larger population. These increases in the derived demand for total inputs are reflected as an increase in total expenditure in the public sector budget.

The nature of the relationship between population size and the public expenditure depends upon the nature of the good or service that is being supplied. Thus, in the case of a pure public good, the marginal social cost of an additional member to the population is by definition zero; and there is no reason to expect, for pure public good case, that an increase in population will result in an increase in expenditure.

**The Quality of Publicly Supplied Goods**
From the foregoing, it has been implicitly assumed that the voter (median) consume a level of public good of a given quality. That is, the quality dimension of public goods has always been held constant. Thus, a congested service (road network, for example) could be thought to be of an inferior quality to one that is less congested. Quality if difficult to define clearly, but a useful approximation to what is implied by the use of it that a good that requires the efficient use of more inputs in its production (all else being the same) is of a superior quality to one that requires less (Brown and Jackson, 1994).
An education system that has a low pupil-teacher ratio is generally assumed to be superior to one that has a high pupil-teacher ratio. An education system that provides the most modern equipped classrooms is considered superior to one that has no equipment. A hospital fully equipped with capital equipment and with a low patient-personnel ratio is considered superior to one that has little in the way of equipment or personnel.

Products possessing different qualities are, however, different product, and that is where the problem lies. Public expenditures will rise if the consumers demand a more expensive product which is of a higher quality. Public expenditures therefore may change as a result of changes in the product.
2.3 Empirical Literature

The relationship between government expenditure and economic growth is not without controversy in the empirical literature. On the one hand, Singh and Sahni (1984), Ram (1986), and Holmes and Hutton (1990) conclude that government expansion has a positive effect on economic growth. This implies that government expenditures can promote economic growth. Public infrastructure, education, health expenditure can in principle be complementary to private activities and therefore have positive effects on GDP. For instance, the new transport infrastructure save travel time and therefore bring positive effects on private agents. Alternatively, public expenditure can be substitutes for private expenditures and therefore crowd out private activities (Hjerpe, et. al., 2006: 4). Landau (1983, 1986), Barth, Keleher, and Russek (1990) find that rather than contributing positively to growth, the opposite is true that government expansion tends to exert a negative impact on economic growth for many developed and less-developed countries.

As summed up in Sideris (2007), the empirical works on Wagner’s Law can be divided in two groups, based on the different types of the econometric methodology they apply: (a) early studies which are performed until the mid 1990s, assume stationary data series and apply simple OLS regressions to test alternative versions of the law (Ram, 1987; Courakis et. al., 1993); (b) cointegration-based studies, which are performed from the mid 1990s and on, test for cointegration between government expenditure and national income (and occasionally population). Early studies of this group use the Engle and Granger, (1987) methodology, whereas more recent works apply the Johansen, (1988) technique. Most of the recent studies also perform Granger causality tests to indicate the direction of causality between the variables (Henrekson, 1993; Murthy, 1994; Ahsan et. al., 1996; Biswal et. al., 1999; Kolluri et al., 2000;
Islam, 2001; Al-Faris, 2002; Burney, 2002; Wahab, 2004). However, the empirical studies have produced mixed and sometimes contradictory results. Some of these conflicting findings (which are well documented in Bohl, 1996), have been attributed to the different econometric methodologies used, and to the different features characterizing different economies during alternative time periods.

Similarly, Halicioglu (2005) tests the validity of Wagner’s Law for Turkey, and his empirical results show that Wagner’s Law does not hold in the case of the adopted traditional form, since neither co-integration nor causality tests were in line with the proposed implications of the law. Yet, he finds a positive long-run relationship between the share of government in GDP and real per capita income growth, which supports the law. However, further analysis on the basis of the block Granger causality test reveals that the law does not hold for Turkey, or at least the direction of flows has been rejected.

Grossman (1988) investigated the size of the American government and its effect on economic growth using data for 1929 to 1982. He hypothesized that government spending would initially contribute positively to overall economic growth but that the decision-making processes of government would lead to incremental expenditures that result in an inefficient quantity of public goods. Grossman’s analysis confirmed his hypothesis that there was indeed a negative relationship between growth in government and the rate of economic growth (Grossman, 1988). Also, Vedder and Gallaway (1998) investigated the size of the US government and its effects on economic growth for the Joint Economic Committee of the US Congress. Among their many findings were that large transfer payments had negative consequences for
economic growth, and commented that the moderate downsizing of the federal government between 1991 and 1997 had resulted in increased rates of economic growth. They further said that the marginal effect of government activities is negative, and that further downsizing of government would be growth-enhancing (Vedder and Gallaway, 1998). In fact, Vedder and Gallaway recommended reducing the size of the US government to 17.45% of GDP in order to gain sizable and permanent increases in GDP.

Peden and Bradley (1989: 239) examined the effect of the size of government on economic output and productivity using US data between 1949 and 1985. They concluded that the “level of government activity in the economy has a negative effect on both the economic base (GDP) and the economic growth rate (GDP growth)”. They further concluded that increases in the size of government relative to the overall size of the economy had long-lasting negative effects on GDP growth. Finally, they found that “permanent increases in the share of output devoted to the government result in a significant erosion in productivity” (pp. 241). Peden and Bradley (1989) concluded that the size of government, “beyond the optimal point” (pp. 243) resulted in lower GDP, lower rates of GDP growth, and significant deterioration in productivity.

Folster and Henrekson (2001) examined the growth effects of government spending and taxation in “rich” countries. Folster and Henrekson (2001) limit their study to rich countries due to differences in the composition of government spending between rich and poor countries. Covering the period from 1970 to 1995, Folster and Henrekson (2001) find a robust negative relationship between government expenditure and economic growth. In addition, they conclude that a 10% increase in government expenditure as a percent of GDP is associated with a decrease in the economic growth
rate by 0.7 to 0.8 percentage points (Folster and Henrekson, 2001). To Saad and Kalakech (2009), defence and health spending do not show statistical significance which indicates the absence of any impact on economic growth in the short run. Previous studies on developing countries have reported conflicting results regarding the association between defense spending and growth. This association is sometimes found to be positive and significant (Benoit, 1978; Frederiksen and Looney, 1982) or negative and significant (Deger and Smith, 1983; Knight et. al., 1996). Other studies have reported insignificant effect of defense expenditure on economic growth (Biswas and Ram, 1986).

Heitger (2001) also investigated this phenomenon and discovered that growth in government size has negative impact on physical capital formation through the "investment channel", implying that government also crowds out private investment in physical capital.

Dar and AmirKhalkhali (2002) studied the impact of government size on productivity in 19 OECD countries between 1971 and 1999. They found that total factor productivity growth and the productivity of capital are weaker in countries where the size of government is larger. They also found that those countries with smaller governments enjoyed efficiencies resulting from fewer policy-induced distortions (e.g. burden of taxation), greater market discipline, which fosters more efficient use of resources, and the absence of crowding-out effects that weaken incentives for capital investment.

A larger government share of GDP is detrimental for economic growth (Gwartney et. al., 1998). They argue that the expansion of the size of the public sector results in government moving into areas beyond its traditional roles, with resulting negative impacts on economic growth. They acknowledge that government expenditures on
core functions (which they refer to as “protection of property rights, the provision of a legal structure for settling disputes and the allocation of funds for investment in infrastructure and human capital”) may enhance economic growth. Mackness (1999) examined government spending in Canada and concluded that the optimal level of government spending was in the area of 20% to 30% of GDP, substantially below the levels currently maintained by government.

Cheng and Lai (1997) examine the causality between government expenditure and economic growth in South Korea by applying the techniques of Sims, (1980), Johansen's co-integration (1988), and Hsiao's (1981) version of the Granger causality method to post-Korean war data. They choose one single country –Korea -with an attempt to make a more in-depth investigation and analysis. The methodology employed in this study is that of vector autoregressive (VAR)/Granger causality analysis developed by Sims (1980) and Granger (1969). The estimated VAR model in this study consists of three related macroeconomic endogenous variables: economic growth, government expenditure, and money supply. They find that government expenditure and money supply Granger-cause real GDP. By the same token, RGDP Granger-cause government expenditure, but money supply does not cause government expenditure. In sum, they find that both economic growth and government expenditure Granger-cause money supply in Korea. Government expenditure and economic growth are related by a feedback causal mechanism, which is fully consistent with conventional macroeconomic theory as well as Wagnerian hypothesis.

Cameron (1978) was the most influential in establishing a robust relationship between trade openness and government expenditure. Using the sample of 18 OECD countries, he found evidence of countries having large expenditure increase with more trade openness from the period of 1960 and 1975. He argued that more open economies
will have higher rates of industrial concentration, lead to more unionized labor markets which, through collective bargaining, influence the public spending for social protection and social infrastructure. Improving on Cameron's work, which was limited to 18 wealth rich countries, Rodrik (1998) demonstrated a significant positive correlation between openness and government size using 100 country samples. Rodrik argued that Cameron's explanation of collective bargaining and labor unionization is somewhat unlikely to explain the relationship since the labour organizations are not well organized hence less influential in developing countries. Rodrik explained such correlation between openness and government expenditure as social insurance against external risk; but in developing countries, lack of administrative capacity mitigate such risk through simpler solution like public employment, in-kind transfers or public work programs.

Public debt impacts on the allocation of the public budget to the extent that it favours government spending in some sectors and not others. As suggested by Alesina and Tabellini (1990), debt accumulation is very instrumental in the allocation of the public budget. This is supported in the literature by Mahdavi, (2004), who found that external debt has an important role to play in the allocation of the public budget. He found that external debt impacts on the structure of the public budget by increasing some shares of the public budget while starving other sectors.

This relationship, as argued in the literature, (Mahdavi, 2004), reflects a greater role for the government as the economy becomes more complex and the demand for public goods and social programmes rises. On this basis therefore, we may infer certain changes in the composition of public spending as the role of the public sector changes in the process of development. At the early stages of a nation’s development,
the government gets involved in almost everything (every sector) of the economy. But when the economy begins to develop and private sector expands, the government usually divests from some sectors and concentrates in the provision of pure public goods.

The demographic characteristics of the population are important in the internal allocation of the public budget. For example, a population structure with a high proportion of 0-14 years suggests that the government will be compelled to channel more budget allocation to education to provide the necessary educational resources; and health spending to provide for the primary health care. On the other hand, a high proportion of the population above 65 years will occasion a shift of the budget to the social services to provide for old age pension and grants. Other aspects such as the population size and density; and urban population are also important in the internal distribution of the budget. Since government spending specially health care and social security tends to be related with the demographic structure of any economy, we need to take into account the variations of dependency ratio of the population (Sanz and Velzquez, (2002); Remmer, (2004)). The dependency ratio is measured as the percentage of population that is 65 years of age or older.

Size of government as proxied by the share of government expenditure to GDP to measure the burden of government on the economy is also found to influence the direction of public expenditures (Nyamongo and Schoeman, 2007). As observed by Mahdavi (2004), the relative size of government serves to capture the effects of more cyclical factors, such as changes in the tax base and government non-tax revenues. It is also argued that the size of government is also associated with factors that may impact on the composition of total spending. These may include the level of
corruption, exposure to external risks such as trade shocks, and internal risks such as political instability and social conflicts.

Advocates of aid argue that aid helps developing countries to release binding revenue constraints, strengthening domestic institution, pay better salaries to public employees, help in poverty-reducing spending and improve the efficiency and effectiveness of governance (Brautigam and Knack, (2004)). On the contrary, higher aid inflows could promote rent-seeking behavior by domestic vested interests that outcry for tax exemptions or seek to avoid paying taxes which leads the revenue to decline (Clements et. al., (2004)). Also, critics argued that aid could lead to increased public and private consumption rather than investment, and could have contributed less to growth (Please, (1967); Papanek, (1973); Weisskopf, (1972)). In his classic paper Heller (1975) showed that aid increases investment and simultaneously reduces domestic borrowing and taxes which eventually influence on public consumption. But the magnitude of such influence over public consumption depends on the type of aid as grants have strong “pro-consumption” bias whereas loans are more “pro-investment”. Improving on Heller (1975), Khan and Hoshino, (1992) concluded that aid generally increase government consumption and the marginal propensity to consume out of foreign aid is less than one, which means some public investment is also financed out of aid.

Most people support the reduction of the size of the public sector. According to McLeod (2003), “Economic research in recent years is pointing increasingly to the conclusion that the central factor in economic growth is better institutions and more limited government.” Tanzi and Schuknecht, economists with the International Monetary Fund (IMF), carried out a series of studies of the size of government and
social progress. They concluded that countries with “small” governments generally do not show worse indicators of social and economic wellbeing than countries with “big” government—and often they achieve an even better standard. Countries with “small” governments can provide essential services and minimum social safety nets while avoiding the disincentive effects caused by high taxes and large-scale redistribution on growth, employment, and welfare (Tanzi and Schuknecht, 1998:70, 1997).

Two different views exist on the effects of increased government expenditure on investment. The traditional view argues that government expenditure crowds out private investment. Higher government expenditure, whether financed with taxes or debt, increases the demand for goods and services, raising interest rates, making capital more expensive and, as such, reducing private investment. The non-traditional view sees government expenditure stimulating investment. The crowding in of investment occurs when the economy’s resources are un- and under-employed (Ahmed and Miller, 1999). This can occur in developing countries where government expenditure on infrastructure can improve private investment.

The impact of tax-financed expenditure on investment and output has been studied by Barro, (1990). To Barro (1990), higher income taxes reduce the after-tax return on private investment, and thus affect growth negatively by lowering investment. He divides tax-financed government expenditure into spending on unproductive (consumption) services and spending on productive services (e.g., building infrastructure). The expenditure on consumption services has a negative effect on growth, while the spending on productive services affects growth positively, if the growths resulting from private capital accumulation induced by higher public capital and enhanced property rights exceed the negative effect of higher taxes on growth. From the Barro’s (1990) study, the distinction between productive and unproductive
government services provides important information for an analysis of the effects of the government budget on capital formation and growth.

Several empirical studies have been conducted to examine the causal relationship between government revenues and expenditures with respect to the above four theoretical hypotheses, by using different types of econometric techniques. However empirical evidences have given mixed results. In the case of United States of America, Blackley (1986); Ram (1988a); Bohn (1991) and Hoover and Shefrin (1992) have provided evidence to support the Tax-and- Spend hypothesis, while Anderson et. al., (1986), Von Furstenberg et. al., (1986), Jones and Joulfain, (1991) and, Ross and Payne (1998) have reported findings that support the Spend and- Tax hypothesis. Manage and Marlow (1989), Miller and Russek (1990) and Owoye (1995) suggest that the Fiscal Synchronization hypothesis is valid for US while Baghestani and McNown (1994) have supported the institutional separation hypothesis. Similarly in case of Latin American countries, Ewing and Payne (1998) find evidences of a bi-directional causality between revenues and expenditures supporting the Fiscal Synchronization hypothesis in Chile and Paraguay. For countries like Colombia, Ecuador and Guatemala, they find evidences of causality directed from revenue towards expenditure supporting the Tax and- Spend hypothesis. Baffes and Shah (1990, 1994) have found that for Brazil, Mexico and Pakistan a strong bi-directional causality exists between revenue and expenditure, while for Argentina and Chile the Spend-and-Tax hypothesis is validated. For South Africa, Nyamongo et al. (2007) has investigated the relationship between revenue and expenditure in the framework of Vector Autoregression (VAR) approach and concluded that revenue and expenditure are linked bi-directionally in the long-run, indicating Fiscal Synchronization
hypothesis, while no evidence of causality is seen in the short-run, which leads to fiscal separation hypothesis.

Empirical evidence on the government spending-growth relationship is diverse, mostly based on cross-section studies that often include a sample of both advanced and developing countries. The main conclusion in most of these studies is that government consumption spending has a negative impact on growth (Barro, 1991: 430; Tanninen, 1999). Other studies have investigated the impact of particular (functional) categories of public expenditure. For example, Devarajan et. al., (1993), using a sample of 14 OECD countries, found that spending on health, transport and communication have positive impacts (spending on education and defence did not have a positive impact). In the majority of studies, total government spending appears to have a negative effect on growth (Romer, 1990; Alexander, 1990; Folster and Henrekson, 1999).

Kweka and Morrissey’s (2000) results suggest that, however growth is measured and using alternative measures of government consumption, public consumption spending impacts positively on growth whereas public investment impacts negatively on growth. From the results it appears that a significant share of government consumption spending impacts directly on private consumption, and presumably through this on growth. Chan and Gustafson (1991) found that government expenditure has a positive impact on private consumption in the United Kingdom.

Much empirical work exists that examines the effect of government expenditure on economic growth. Kormendi and Meguire (1985), Grier and Tullock (1989), and Landau (1983) employ government consumption expenditure as a share of GDP and
find either a negative or no effect on the growth of real per capita GDP. Most recent papers examine the effects of components government expenditure on the growth of real per capita GDP without assigning the components of government expenditure either to productive or unproductive categories, a priori (Devarajan et. al., 1996, and Miller and Russek ,1997). Devarajan, et al (1996) consider a sample of developing countries from 1970 to 1990 and discovered that all candidates for productive government expenditure either have no or a negative effect on the growth of real per capita GDP; only current expenditure has a positive effect. Miller and Russek (1997) consider a sample of developed and developing countries from 1975 to 1984. They find that both the method of financing and the component of government expenditure can have different effects. Debt financed increases in defence, health, and social security and welfare have negative effects on the growth of real per capita GDP in developing countries, while debt-financed increases in education expenditure has a positive effect in developed countries. Easterly and Rebelo (1993) discover that public transportation and communication investment leads to higher growth in real per capita GDP in developing countries. Although this finding seems to support the work of Aschauer, (1989) on the linkage between public and private investment, Easterly and Rebelo (1993), interestingly, could not find any significant relationship between public transportation and communication investment and private investment.

The question of source through which the expenditure is financed was posed by Miller and Russek, (1997), - whether tax or debt. Levine and Renelt (1992) use different fiscal measures which include the government consumption share of GDP, the government consumption share less the defense and educational expenditure share, and the central government budget surplus in order to determine their effects on
investment. They conclude that none of the fiscal variables possess a robust correlation with investment. While Levine and Renelt (1992) employ cross-section regressions, Fischer (1993) performs cross-section and pooled cross-section time series regressions and finds that the budget surplus associates with greater capital formation.

Ahmed and Miller (1999) found that the openness variable has a significant positive effect on investment in the full sample of both developed and developing countries. Second, while debt-financed total government expenditure has no significant effect for the full sample, it has a positive effect in developing countries and a negative effect in developed countries. Expenditure on social security and welfare crowds out investment for both tax- and debt-financed increases and in both developed and developing countries, while expenditure on transport and communication crowds in investment. Finally, they say that an increase in tax holding government expenditure steady (a higher surplus or lower deficit) reduces investment share in GDP of developing countries - developed countries exhibit a positive effect for an increase in taxes, although only at the 20 percent significance level. The implication of their findings is that tax-financed aggregate government expenditure crowds out investment for developing countries while debt-financed government expenditure has a positive effect on investment – a reversal impact as when the government expenditure is financed with taxes.

Bose, Haque and Osborn (2003) used panel data for thirty developing countries in their analysis of disaggregated government expenditure. Their study revealed that the share of government capital expenditure in GDP is positively and significantly
correlated with economic growth, while the growth effect of current expenditure is insignificant for our group of countries. They also found that at the sectoral level, government investment and total expenditures in education are the only outlays that remain significantly associated with growth throughout the analysis. Part of their findings is that the government investment and expenditures on other sectors (e.g. transport and communication, defence) initially have significant relationship with growth, they could not pass the test when government budget constraints are incorporated with other sectoral expenditures; there is strong evidence that a government budget deficit gives rise to adverse growth effects.

Saad and Kalakech (2009) disentangled governmental expenditures and used a multivariate cointegration analysis to examine the effect of each sector on economic growth. Four sectors were taken into account: defense, education, health, and agriculture. Their findings reveal that government spending on education has a positive effect on growth in the long-run and negative impact in the short-run. While spending on defense has a negative effect on economic growth in the long run and insignificant impact in the short-run. As to health spending, it is negatively correlated to growth in the long-run and there is insignificant linkage in the short-run.

Gwartney, Holcombe and Lawson (GHL, 1998), studied the impact of government size on the growth rate of 23 OECD countries. They found that a 10% change in government expenditure reduces economic growth by 1%. The R-squared of 0.42, according to them, indicates that government spending alone explains about 42 percent of the differences in economic growth among OECD nations during the sample period. They decomposed the impact of government expenditure on growth
through their analysis and adds that the investment share to GDP with a significant positive coefficient. The effect of government expenditure share of output (G/Y) is still significant, but now a little smaller in magnitude. The reason is that G/Y has a negative coefficient in the investment share equation and embodies the effect of G/Y on investment as well as the direct effect on growth holding the investment share constant. This literature has recently been the subject of meta-analysis by Nijkamp and Poot (NP, 2003). NP (p.8) examines what they term "the conventional prior belief" that "increases in government consumption, defence, or increases in tax rates, lower growth; while increases in government expenditure on education or infrastructure enlarge growth." They note that tests of the effect of government size on growth generally relate government consumption to GDP growth, but on some occasions relate consumption plus transfers or total government expenditure (as do GHL) to growth. NP's meta-analysis finds that "the evidence for the conventionally expected impact of policy on growth is rather weak" (p.9). This is especially the case for the posited negative relationships. Closely related to the above finding is that by Mankiw and others in that public expenditure on education may also improve growth performance by promoting human capital accumulation (e.g. Mankiw et al., 1992). Both public expenditure on education and public expenditure on infrastructure may be responsible for the creation of positive externalities with potentially important output implications.

According to Fic and Ghate (2003), the most widely accepted cause of the growth slowdown is a reduction in total factor productivity (Griliches, 1980; Nordhaus, 1982; Romer, 1987; Baumol et. al., 1989), a phenomenon now referred to as the “productivity puzzle”. In the last decade, however, a growing literature has begun to
focus on the growth implications of unproductive government spending, and whether such expenditures offer an alternative channel for structural breaks in growth (Levine and Renelt, 1992; Easterly & Rebelo, 1993; Barro & Sala-i-Martin, 1995; Turnovsky and Fisher, 1995; Tanzi and Zee, 1997; Ghate and Zak, 2002; Romer, 2003). The literature posits two channels whereby fiscal choices induce structural breaks in growth. First, unproductive government expenditures (government consumption and transfers) hinder growth because such expenditures are a less-than-perfect substitute for private consumption on the aggregate (or possibly even a complement). This makes private savings decline, affecting investment and growth in the long run. A complementary explanation takes the political economy approach and is more applicable to welfare state economies. Here, because politicians determine government expenditures, fiscal flows reflect their objectives.

On the optimal size of the government, it has come to mind that there should be the optimal level of government size. Recent research by Barro (1990) and Karras (1993, 1996, and 1997) provides a framework to examine whether the size of government consumption relative to national output is optimal. Barro (1990) suggests that government size is optimal when the marginal product of government consumption equals one. Using panel data, Karras (1996) examines the "Barro rule" for 118 countries and European economies, respectively. He finds that in all country groups, government services are productive in the sense that their marginal product is positive and significantly different from zero. Karras (1996) did not reject the hypothesis that government services are optimally provided in some world regions, but not in others. In the main, his findings indicate that government services are overly provided in Africa, under provided in Asia, and optimally provided everywhere else.
There are many studies on the size of government and output volatility. Fatás and Mihov (2001b) found that government size has a negative effect on output volatility. In addition to government size, there are other potential candidates for explanatory variable that account for output volatility, like the living standard (i.e. poor economies might have more volatile business cycles), and average output growth (Acemoglu and Ziliboti, 1997, and Koskela and Viren, 2003).

In Nigeria, there are fewer studies than elsewhere that studied the effects of government spending on economic growth. Longe (1984) examined the growth and structure of government expenditure in an attempt to establish the general patterns of government expenditure in Nigeria. His study did not find any structural shift for the study period since the ratio of government expenditure to GNP has been on the increase over the period. Ekpo (1995) disaggregated the capital expenditure into transport and communication, agriculture, health and education and studied how they affect private investment and invariably the entire economy. He finds that capital expenditure on construction and manufacturing crowds out private investment. In similar way, Ogiogio (1995) observed a long run relationship between economic growth and government expenditure. His findings showed that there exists a more significant link between contemporaneous government recurrent expenditures and economic growth than the capital expenditures.

The study by Aigbokhan (1996) was never intended primarily at testing Wagner’s Law. In fact, the analytical framework of Aigbokhan (1996) was not based on the conventional Wagner’s Law analytical framework(s). He investigated the impact of government size (measured as expenditure share of GDP) on economic growth
between 1960 and 1993 with emphasis on the effects of the structural adjustment programme. A regression analysis of a simple growth equation was carried out and augmented with Granger-Causality testing. Aigbokhan (1996) reported a bidirectional causality between government total expenditure and national income. In contrast, Essien (1997) using data from 1960-1994 found no causality between public expenditure and national income in the three models (of the interpretations of Wagner’s Law) tested. But he focused narrowly on government or public consumption expenditure. However, he agreed that it would be necessary to look at the total public sector expenditure in the context of overall economic growth.

In 1996, Odusola used a simultaneous equations model to capture the relationship between military expenditure and economic growth. He resorted to this model because he considered single equation inappropriate for this type of study that needed to find the causal link between government expenditure and economic growth. He finds that military expenditure related negatively to economic growth at 10% level of significance. Fajingbesi and Odusola (1999) studied the relationship between economic growth and public expenditure using Vector Error-correction (VEC) model and found that real capital expenditure positively and significantly affected the real level of output whereas the real recurrent expenditure was relatively marginal. Akpan (2005) used Error Correction Model (ECM) in his study of the impact of government expenditure on economic growth in Nigeria with two lags. He disaggregated the government expenditure according to the Central Bank (CBN) classification/heading. He discovered that government expenditures (recurrent and capital) on economic services, administration, social and community services and transfers are negatively impact on growth at various lag periods, while at some other lags they show positive links. He recommended that the government should concentrate more on the provision
of enabling environment for the private sector to thrive. Also, Oyinlola (1993) examined the relationship between the Nigeria’s defence sector and economic development, and reported a positive impact of defence expenditure on economic growth. Empirical analysis by Fajingbesi and Odusola, (1999), Aregbeyen, (2006) showed that government capital expenditure has a significant positive effect on real output, but that real government recurrent expenditure has insignificant effect on growth.

Olorunfemi (2008) in a study on the relationship between economic growth, proxied by GDP, and public expenditure in Nigeria surprisingly concluded that there is no link between gross fixed capital formation and GDP and that public expenditure affects GDP without elaborating the type of relationship. He also failed to analyse the relationship between the component of public expenditure and growth. Additionally, the study proxy of Gross Domestic Product for growth in their analysis instead of real GDP which is a better measurement of economic growth is misleading.

Nurudeen and Usman (2010) studied the impact of government expenditure on economic growth by disaggregating the government expenditures into capital expenditure, recurrent expenditure, defence, education, health, transport and communication and fiscal balance, using cointegration method. He found that total capital expenditure (TCAP), total recurrent expenditure (TREC), expenditures on transport and communication (TRACO), education (EDU), and health (HEA), including inflation (IFN) and overall fiscal balance (FISBA) are statistically significant in explaining changes in economic growth. However, expenditures on defence (DEF) and agriculture (AGR) are not significant in explaining economic
growth. The authors used the classifications of government expenditure in the same equation with the classification into sectors. This is inappropriate because they used the same variables (data) in different forms in a single equation.

2.4 Limitations of the Previous Studies

There are avalanche of researches done previously in this area of study. These researchers have done thorough study on the area. The basic flaw of most of these studies is that there is no country specific analysis.

Folster and Henrekson (2001) used rich countries in their study and found a negative relationship between government size and growth of those economies. They lumped together several countries in their study. Others like Landau (1983, 1986), Barth, Keleher, and Russek (1990), Grossman (1988), Dar and AmirKhalkhali (2002), Devarajan et. al., (1993), also lumped different countries together in their studies; there were no specific country analysis.

Most of the works did not categorize government expenditure into sectors. Few researchers did categorize the government expenditure into sectors, for instance, Devarajan et. al., (1993), Folster and Henrekson (2001), Romer, (1990); Alexander, (1990), Ahmed and Miller (1999), Bose, Haque and Osborn (2003), etc, but still did not have country specific study. The major criticism of all these researches is that there were no specific country studies except Kweka and Morrissey (2000).

Most studies in Nigeria were either lumping the government expenditures into capital expenditure or recurrent expenditure. Ekpo (1995) and Akpan (2005) disaggregated
the expenditure; Ekpo (1995) ran the model of the disaggregated variables on investment, while Akpan (2005) used the disaggregation according to CBN but not according to sectors. Nurudeen and Usman (2010) disaggregated the government expenditures into capital expenditure, recurrent expenditure, defence, education, health, transport and communication and fiscal balance, using cointegration method. He used capital, recurrent expenditures and sectoral expenditures in a single equation which is inappropriate. However, none of them tried to find the source of transmission of shocks and volatility in the economy.
CHAPTER THREE
THEORETICAL FRAMEWORK OF PUBLIC EXPENDITURE

3.1 Theory of Government Expenditure

The theory of public expenditure is the theory of the costs of providing goods and services through the public sector budget and/or the theory regulations and laws introduced that will result in private sector expenditure. There are two approaches to the question of growth of public sector, namely, the growth in absolute size of public expenditure, and the growth in public sector in relation to economic magnitudes.

According to Brown and Jackson (1994: 119 -120), public expenditures are represented in two broad categories, namely, exhaustive public expenditures and transfer public expenditures. Exhaustive public expenditures are government’s purchases of labour, consumables, etc. (current goods and services) and capital goods and services (i.e. public sector investment in roads, schools, hospitals, etc). To them, exhaustive public expenditures are purchases of inputs by the public sector and are calculated by multiplying the volume of inputs by the input prices. Economists have argued that the larger the size of exhaustive public expenditure the higher the size of the opportunity cost (crowding out effect) of private sector investment. Keynes (1940) argued that crowding out will only take place at full employment. This reasoning is the basis for assuming that if the private sector expenditures on investment, for example, are interest elastic, then a bond financed increase in public expenditure will crowd out private sector activities via its impact on capital markets.

The second category of public expenditure is the transfers – public expenditures on pensions, debt interests, subsidies, unemployment benefits, etc. Brown and Jackson (1994) say that these expenditures do not represent any claim on the society’s
resources by the public sector unlike the exhaustive public expenditures. Instead, transfers are a redistribution of resources between individuals in society with resources flowing through the public sector as intermediary.

In the macro-models of public expenditure analysis, there are three theories discussed, namely, Wagner’s Law, Peacock and Wiseman’s analysis and development models of public expenditure growth.

**Wagner’s Law**

The earliest theory of public expenditure could be traced to Adolph Wagner (one of the leading German economists of his time) who in 1883 propounded an interesting development thesis, which is loosely said that as a nation develops its public sector (and consequently public spending) will grow in importance. He was concerned with the share of GNP taken up by the public sector, hence as quoted in Brown and Jackson (1994), he states:

*The law of increasing expansion of public and particularly state activities becomes for the fiscal economy the law of the increasing expansion of fiscal requirements. Both the state’s requirements grow and, often even more so, those of local authorities, when administration is decentralized and local government well organized. Recently there has been a marked increase in Germany in the fiscal requirements of municipalities, especially urban ones. That law is the result of empirical observation in progressive countries at least in our Western European civilizations: its explanation, justification and cause is the pressure for social progress and the resulting change in the relative spheres of private and public economy, especially compulsory public economy. Financial stringency may hamper the expansion of state activities, causing their extent to be conditioned by revenue rather than the other way round, as is more usual. But in the long run the desire for development of a progressive people will always overcome these financial difficulties.*

He had observed the growth of the public sectors of a number of European countries and in the United States and Japan during the nineteenth century. To him, the forces determining those movements in the ratio of public expenditure to GNP were explained in terms of political and economic factors.
Wagner saw three factors which would cause state activity to grow proportionately faster than other sectors of the economy. First, he projected an expansion of the government’s traditional role in providing administration, law and order as the economy became more specialized and social and economic life more atomized as a consequence of the increased division of labour. Second, he foresaw an increase in the provision of “cultural and welfare” expenditures, most particularly education. His reasons for this expectation were not altogether clear, although it may do him little injustice to say he thought they behaved as superior goods with an income elasticity of demand greater than unity. Third, he saw that the increasing scale of technologically efficient production would cause the government to undertake certain economic services of which the private sector would be no longer capable. In this he had in mind the heavy investments associated with railroad construction (Diamond, 1977). In other words, Wagner’s Law states that government grows because there is an increasing demand for public goods and for the control of externalities.

Wagner’s work is based on empirical observations in a number of Western industrializing countries. Hence, his suggestion is not prescriptive, but rather explanatory in character (Peacock & Wiseman, 1967:16). It does not contain any a priori property. He put his model forward with regard to posterior results, i.e. he made his suggestion depending on empirical results observed in a number of industrializing countries. His main implication is that as community output increased in the past, public expenditure grew as well.

Based on these arguments, this law also implies causality running from national income to public sector expenditure. Hence, public expenditure is considered as
endogenous to the growth of national income, in contrast to the Keynesian view, which considers public spending as an exogenous policy instrument which can affect growth in national product (Magazzino, 2010).

The validity of the law has been assessed empirically for a large number of developing and developed countries using both time series and cross sectional data sets. The role of the public sector is often criticized on the grounds that government is less efficient than market forces in allocating economic resources. In addition, the regulatory process and, for that matter monetary and fiscal policies, can potentially distort the incentive system. A rapid expansion of public expenditure can also lead to structural changes which favour a relative growth of the public service sector (Bacon and Eltis, 1978).

**Peacock and Wiseman’s Analysis**

Peacock and Wiseman’s (1961) study is assumed to be one of the best known analyses of the *time pattern of public expenditure*. The main thesis is that public expenditure does not increase in a smooth and continuous manner, but in jerks or step-like fashion. The analysis was founded on the political theory of public expenditure determination, ‘that governments like to spend more money, that citizens do not like to pay more taxes, and that governments need to pay some attention to the wishes of their citizens’. Peacock and Wiseman opened up the analysis that public expenditure is to be influenced at the ballot box.

They viewed the voter as an individual who enjoyed the benefits of public goods and services but who disliked paying taxes. They also saw taxation as setting a constraint on government expenditures. To them, as the economy and incomes grew, tax
revenue would rise, thereby enabling the public expenditure to grow in line with the GNP. In normal times, public expenditure would show a gradual upward trend, even though within the economy there might be a divergence between what people regarded as being desirable level of public expenditure and a desirable level of taxation. During the periods of social upheaval, this gradual upward trend in public expenditure would be disturbed, and would coincide with war, famine, or some large scale social disorder which would require a rapid increase in public expenditures. In order to finance the public expenditure rise, the government would be forced to raise taxation levels, which would, however, be regarded as acceptable to the electorates during the crisis periods. This is what Peacock and Wiseman called the *displacement effect*.

Public expenditure is displaced upwards and for the period of the crisis displaces private expenditures. Following the period of crises, public expenditure does not fall to its original level. A war is not fully paid for from taxes and countries borrow and debt charges have to be met after the event. Changes in social and political ideas and institutions, as such, may condition the evolution of the functions of government, and may also affect the nature and significance for public expenditures of such social upheavals as wars. Conversely, the displacement effect may be the origin of lasting changes in ideas and institutions; periods of war are, for example, a fruitful source both of new ideas about society and of new administrative procedures. In their own words, Peacock and Wiseman (1961:28) said, “All we suggest, therefore, is that in communities and over periods in which the economic activities of the state are in fact increasing in importance and in which social disturbances occur, the nature of political power will usually produce a time pattern of growth characterized by a displacement effect of the kind described”.
Another effect that they thought might operate is the *inspection effect*. They suggested that this arises from voters’ keen awareness of social problems during the period of upheaval. The government therefore expands the scope of services it provides to improve these social conditions, and because the electorate’s perception of tolerable levels of taxation does not return to its former level, the government is able to finance these higher levels of expenditure originating in the expanded scope of government and debt charges. The government and the people review the revenue position and agree to the required adjustments to finance the increased expenditure. They attain a new level of tax tolerance. They are now ready to tolerate greater burden of taxation and as a result the general level of expenditure and revenue goes up (Batia 2006). In this way the public expenditure and revenue get stabilized at a new level till another disturbance or upheaval occurs to cause displacement effect. Thus, each major social upheaval leads to the government assuming a larger proportion of the total national economic activity. Peacock and Wiseman’ hypothesis appears quite convincing and real.

**Musgrave and Rostow Development Model**

The development model of public expenditure could be traced to the works of Musgrave 1969 and Rostow (1971). Following these authors, in the early stages of economic growth and development, public sector investment as a proportion of the total investment of the economy is very high. At this level, the public sector provides social infrastructure, such as roads, transportation systems, sanitation systems, law and order, health and education and investment in human capital. The public sector, they argued, is necessary to gear up the economy for take-off into middle stages of economic and social development. In the middle stages of growth, the government
continues to supply investment goods but complementing the private sector investment.

Musgrave argues that over the development period, as the total investment-GDP ratio rises, the relative share of public sector investment falls. Rostow claims that when the economy reaches the maturity stage, the mix of public expenditures will shift from infrastructures to increasing expenditures on education, health and welfare services. At the stage of high mass consumption, income maintenance programmes and policies are designed to redistribute welfare, which will grow significantly relative to other public expenditures and also relative to GDP.

3.2 The Growth Theory

Much of modern growth theory builds on the neoclassical model of exogenous growth (Solow, 1956, 1957; Swan, 1956) which views the accumulation of physical capital, associated with a permanent low of technical progress, as the driver of economic growth. The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. Technological progress, though important in the long-run, is regarded as exogenous to the economic system and therefore it is not adequately examined by this model (Petrakos, et. al., 2007). The most basic proposition of growth theory is that in order to sustain a positive growth rate of output per capita in the long run, there must be continual advances in technological knowledge in the form of new goods, new markets, or new processes, which was demonstrated by the neoclassical growth model which shows that if there were no
technological progress, then the effects of diminishing returns would eventually cause economic growth to cease (Aghion and Howitt, 1998). Turning to the issue of convergence/divergence, the model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones. The neoclassical model predicts that countries with low per-capita incomes grow faster than those with high output \( (y) \), so that over time per-capita incomes converge.

The neoclassical growth model assumes the Cobb-Douglas production function that, in its intensive form, is expressed as:

\[
y = Ak^\alpha
\]

where, \( y \) and \( k \) are the output-labour ratio and the capital-labour ratio respectively, \( \alpha \) is the capital elasticity of output, and \( A \) is the total factor productivity (TFP) representing technological capacity of the productive system. Under the model, \( A \) grows either as a purely exogenous process or through exogenous technical innovations which are embodied in capital goods (Solow, 1960). Diminishing returns to capital, combined with assumptions of constant savings rate and constant growth of labour, generate a steady state growth rate depending only on the rate of exogenous technical progress.

As Palley (1996) said, the most important feature of the model is that the steady-state growth rate depends exclusively on the rates of population growth and labour augmenting technical progress, and as long as these variables are exogenous, the steady state growth is also exogenously determined. The second important feature of the neoclassical growth model is that the rate of capital accumulation is dependent
solely on the household saving behavior and independent of the firm’s investment spending. The implication this feature is that household saving is translated automatically into investment. Third, there is no mention of any demand constraints. According to Palley (1996), the model implicitly embodies a dynamic version of Say’s law where all output growth is willingly demanded and that demand expands in line with the supply.

A key feature of the neoclassical growth theory is that the steady-state growth rate is exogenously determined. The exogeneity assumption was the key to the old growth theory and greatly diminished its policy content. The principal contribution of new endogenous growth theory is the resolution of the impasse (in old growth theory) by introducing mechanisms that render the steady-state amenable to endogenous variation. Endogenous growth is long-run economic growth at a rate determined by forces that are internal to the economic system, particularly those forces governing the opportunities and incentives to create technological knowledge. In the long run the rate of economic growth, as measured by the growth rate of output per person, depends on the growth rate of total factor productivity (TFP), which is determined in turn by the rate of technological progress. The neoclassical growth theory of Solow (1956) and Swan (1956) assumes the rate of technological progress to be determined by a scientific process that is separate from, and independent of, economic forces. Neoclassical theory thus implies that economists can take the long-run growth rate as exogenously determined by the technological improvement.

Endogenous growth theory challenges this neoclassical view by proposing channels through which the rate of technological progress, and hence the long-run rate of economic growth, can be influenced by economic factors. It starts from the
observation that technological progress takes place through innovations, in the form of new products, processes and markets, many of which are the result of economic activities. The endogenous growth model is a model in which the long-run growth rate of technology depends on the basic parameters such as the investment rates in physical and human capital, the population growth rate, or other fundamental characteristics of the economy (Sørensen and Whitta-Jacobsen, 2010). The endogenous growth theory proposes that the introduction of new accumulation factors, such as knowledge, innovation, etc., will induce self-maintained economic growth. There is good reason, however, to believe that technological change depends on economic decisions, because it comes from industrial innovations made by profit-seeking firms and depends on the funding of science, the accumulation of human capital, and other such economic activities (Aghion and Howitt, 2009).

Arrow (1962) found a solution to the problem exogeneity of technological progress by supposing that technological progress is an unintended consequence of producing new capital goods, a phenomenon dubbed “learning by doing”. Learning by doing was assumed to be purely external to the firms responsible for it. To him, if technological progress depends on the aggregate production of capital and firms are all very small, then they can all be assumed to take the rate of technological progress as being given independently of their own production of capital goods. In this case, each firm maximizes profit by paying $K$ and $L$ their marginal products, without offering any additional payment for their contribution to technological progress.

Learning by doing formed the basis of the first model of endogenous growth theory, which is known as the AK model. The AK model assumes that when people accumulate capital, learning by doing generates technological progress that tends to
raise the marginal product of capital, thus offsetting the tendency for the marginal product to diminish when technology is unchanged. The model results in a production function of the form $Y = AK$, in which the marginal product of capital is equal to the constant $A$. According to Aghion and Howitt (2009), the AK model predicts that a country’s long-run growth rate will depend on economic factors such as thrift and the efficiency of resource allocation.

There has been argument as the superiority of AK model over the neoclassical growth theory. A first argument in favor of the AK approach is that, it can account for the persistently positive growth rates of per capita GDP that we observe in most countries worldwide, whereas the neoclassical model cannot explain it. However, advocates of the neoclassical model can argue that the AK model cannot explain cross-country or cross-regional convergence. Two main types of convergence appear in the discussions about growth across regions or countries. Absolute convergence takes place when poorer areas grow faster than richer ones whatever their respective characteristics. There is conditional convergence when a country (or a region) grows faster if it is farther below its own steady state; or equivalently, if we take two countries or regions with identical savings rates, depreciation rates, and aggregate production technologies, the country that begins with lower output per capita has a higher growth rate than the country that begins with higher output per capita (Aghion and Howitt, 2009). This latter form of convergence is definitely the weaker.

However, due to the increase in saving rate, the main conclusion from the AK model is that a higher savings (investment) rate gives rise to a permanently higher growth rate in GDP and consumption per worker. This differs from the earlier conclusions since a higher savings rate no longer just gives a higher level of output per worker in
the long run and a temporary higher transitory growth rate in the intermediate run, but it results in a permanently higher rate of growth in output per worker (Sørensen and Whitta-Jacobsen, 2010). According to them, a decrease in depreciation parameter, $\delta$, has an effect similar to that of an increased savings rate, $s$, but it may be difficult to achieve through economic policy (pp. 227). More effective aggregate investment should, however, lead to a lower rate of depreciation, and a lower rate of depreciation leads, in the endogenous growth model, to a permanently higher growth rate in GDP per worker.

The pioneer of “endogenous growth theory” is Romer’s (1986) paper in the Journal of Political Economy (a seminal work) that led to the modern revitalization of growth theory. The principal engine behind endogenous growth is the elimination of the assumption of decreasing returns to “capital.” In order to justify this radical departure from a long-established assumption of microeconomic theory (decreasing returns), Romer (1996) and his followers have broadened the definition of capital to include human capital and/or knowledge capital. By human capital, we mean acquired characteristics that make workers more productive. Although it encompasses such characteristics as health, strength, and stamina, the most commonly analyzed sources of human capital are the education, training, and experience that a worker embodies. Since education and training involve the transmission of knowledge, it might seem like human capital is the same as the knowledge capital we study in the research and development (R&D) model. However, there is a crucial difference. Knowledge capital is potentially a public good whereas human capital is not. Our human capital is personal to us—the fact that we have obtained knowledge may make us more productive but it does not usually raise anyone else’s productivity. Thus, human capital does not have the public-good characteristics of knowledge capital.
In the growth models developed by Romer, (1990), Grossman and Helpman, (1991a), and Aghion and Howitt, (1992), the output of the production function were assumed to be goods producing sector (where output is produced) and the R&D sector (where R&D is produced). In the goods sector, it is assumed to have constant returns to scale (similar to Solow-Swan growth model), whereas in the R&D sector, increasing returns to scale obtained (Romer 1996:97). This growth theory also states that output growth is an increasing function of population growth. This implies that positive population growth is necessary for sustained growth of output per worker. According to Jones (1998: 95), higher population increases the number of researchers and more researchers mean more ideas, thus sustaining growth in the model. In this case, growth in ideas is clearly related to the growth in population. Again, people are the key inputs to the creative process. A larger population generates more ideas, and because ideas are non-rivalrous, everyone in the economy benefits.

This theory also emphasized that although the rate of population growth affects long-run growth, the fraction of the labour force engaged in R&D may not necessarily do so. Romer (1996:100) said that it might seem surprising since growth is driven by technological progress and technological progress is endogenous, it is natural to expect an increase in the fraction of the economy’s resources devoted to technological progress to increase long-run growth. Another scenario showed here is that when knowledge becomes so useful in the production of new knowledge that each marginal increase in its level results in so much more new knowledge that the growth rate of knowledge rises rather than falls. Thus, once the accumulation of knowledge begins – which it necessarily does in the (endogenous) model – the economy embarks on a path of ever-increasing growth.
Another idea put forward by the modern growth theory is human capital. Human capital consists of the abilities, skills and knowledge of particular workers. The model of human capital differ from the Solow model by implying that moderate changes in the resources devoted to physical and human capital accumulation may lead to large changes in output per worker. This has been able to account for the potential differences across countries in income (Romer, 1996: 126). Human capital is the main source of growth in several endogenous growth models as well as one of the key extensions of the neoclassical model. Since the term ‘human capital’ refers principally to workers’ acquisition of skills and know-how through education and training, the majority of studies have measured the quality of human capital using proxies related to education (such as, school-enrolment rates). A large number of studies has found evidence suggesting that educated population is a key determinant of economic growth (Barro, 1991; Mankiw et. al., 1992; Barro and Sala-i-Martin, 1995; Brunetti et. al., 1998, Hanushek and Kimko, 2000). However, there have been scholars who have questioned these findings and, consequently, the importance of human capital as substantial determinant of economic growth (e.g. Levine and Renelt, 1992; Benhabib and Spiegel, 1994; Topel, 1999; Krueger and Lindahl, 2001; Pritchett, 2001).

An important assumption in the growth theories is that investment rates and the time people spend in acquiring skills are exogenously given. If this assumption is relaxed, we discover the role of infrastructure in the growth process. And this is the major reason why some countries are rich while others are poor, because rich countries invest more in capital and spend more time learning the use of technologies than others. The profitability of investment project depends on the extent to which the rules and institutions in an economy favour production or diversion. Government enforces laws of the society and is also in control of the institutional framework of nations. The
extent to which these are enforced determines the level of production in the economy.

An infrastructure that favours production encourages individuals to engage in the creation and transaction of goods and services; diversion takes the form of theft or expropriation of resources from production. Diversion may correspond to illegal activity, such as theft, corruption or the payment of “protection money,” or it may be legal as in the case of confiscatory taxation by the government, frivolous litigation, or the lobbying of government by special interests (Jones, 1998: 132). Diversion affects production.

The extent to which the infrastructure of an economy favours production or diversion is primarily determined by the government. The government makes and enforces the laws that provide the framework for economic transactions. In economies with infrastructures that favour diversion, the government itself is often the agent of diversion. Taxation is a form of diversion, although necessary to provide the rules and institutions associated with an infrastructure that favours production, the power to tax can be abused. Red tapism and bureaucratic regulation enable government officials to use their influence to divert resources. The power to make and enforce laws conveys an enormous power to the government to engage in diversion.

### 3.3 Public Expenditure and the Growth Theory

The link between government and economic growth has been emphasized in literature as coming through the channels of factor accumulation. Government affects the accumulation of physical capital directly through investment in government capital – for example, infrastructure such as roads – and indirectly through its budget – because budget deficits absorb saving that would otherwise be invested in physical capital.
Beyond factor accumulation, government policy can significantly affect the speed of technological progress, both through direct government funding of research, and through government administration of the patent system, which allows researchers to reap rewards and thus provides an incentive for inventive activity.

According to Weil (2009), government can influence the economic growth in three ways, namely, the maintenance of the rule of law, the overall size of government, and the practice of planning. One of the most important public goods that government provides is the rule of law. Firms sign contracts with one another – for delivery of merchandise, for repayment of loans, for business arrangements, etc; inventors rely on the enforcement of patent laws.

The rule of law cannot be taken for granted in most of the countries of the world. In many countries, judicial systems are weak, and legal cases are as likely to be settled on the basis of who has better political connections as on legitimate legal terms (Weil, 2009). Economic freedom, in the form of free markets and small governments that focus on the maintenance of property rights, are often thought to encourage economic growth. Friedman, (1962) believes that political and economic freedom are mutually reinforcing. In this way, an expansion of political rights – i.e. more democracy – fosters economic rights and thereby tends to stimulate economic growth. But the growth retarding features of democracy have also been emphasized. Autocracy and dictatorship most often do not pursue these growth-enhancing policies that bring development to their countries, although some dictators have been seen to bring economic growth to their countries. Good institutions create an environment that promotes economic activity, inventiveness, and growth and development. Bad institutions typically result in economic stagnation. Two characteristics that typify
most developed economies are democracy and maintenance of the rule of law. While related, these two institutional characteristics are not identical. Maintenance of the rule of law is not necessarily unique to democratic societies. However, these two institutional characteristics are highly correlated (Butkiewicz and Yanikkaya, 2004). The effect of autocracy on economic growth can be adverse, if the dictator uses his power to steal the nation’s wealth and to carry out unproductive investments (Barro, 1996). Barro (1996) enunciated that there is an inverse relationship between growth rate and level of per capita output and that leads to a well-known convergence property (from growth theory): poor economies tend to grow per capita than rich ones and tend to catch up with them (Solow- Swan growth model). But a poor country that has a low steady-state level of per capita output – because it has political institutions that are inhospitable to investment – need not growth faster than the rich country. In his view, since countries are likely to be poor (or rich) precisely because the underlying determinants of their steady states are unfavourable (or favourable), the model (neoclassical) does not predict any pattern of simple correlation between growth rates and starting positions.

There is a resurgence of law and development that corresponds with renewed interest in the rapid postwar (World War II) growth of economies in East and Southeast Asia and other countries. The new wave of law and development activity corresponds with a shift toward market-oriented economic policies in the developing world (Chua, 1998). Reform of legal institutions is now seen as one pillar of a tripartite package of reforms that also includes democracy and economic liberalization. The relationships between law and politics on one hand and law and economy on the other are not well understood, but they are usually seen to be mutually reinforcing (Ginsburg, 2000). In both the political and economic spheres the task of law is to constrain the state and
empower private economic actors. Thus, liberal notions of autonomous law are at the core of the new law and development activity. Weber argued that a rational system of law played a crucial role in the economic development of the Protestant West by allowing individuals to order their transactions with some predictability (Weber, 1979). Scholars who draw from Weber’s (1979) theory come to conclude that because rational law played an important role in the early development of capitalism, modern-day policymakers concerned with sustaining the conditions of economic growth should promote the rule of law (Trubek, 1972). Weber's view of the discrete role of law as facilitative of capitalism has been revitalized by the research of economic historian Douglass North (1990, 1991; North and Thomas, 1973). North (1991) examined long-term differences in economic performance among nations and concluded that countries that protect property rights and establish predictable rules for resolving contract disputes provide a better environment for economic growth than those that do not. "How effectively agreements are enforced," North asserts, "is the single most important determinant of economic performance" (North, 1991:477).

Although the important role institutions play in shaping economic performance has been acknowledged long time ago (Lewis, 1955; Ayres, 1962), it is not until recently that such factors have been examined empirically in a more formal way (Knack and Keefer, 1995; Mauro, 1995; Hall and Jones, 1999; Acemoglu et. al., 2002, 2005; Rodrik et. al., 2004). Rodrik (2000) highlights five key institutions (property rights, regulatory institutions, institutions for macroeconomic stabilization, institutions for social insurance and institutions of conflict management), which not only exert direct influence on economic growth, but also affect other determinants of growth such as the physical and human capital, investment, technical changes and the economic growth processes. On these grounds Easterly (2001) argues that none of the traditional
factors would have any impact on economic performance, if there had not been developed a stable and trustworthy institutional environment. According to Mitchell, (2005), if government spending is zero, presumably there will be very little economic growth because enforcing contracts, protecting property, and developing an infrastructure would be very difficult if there were no government at all.

Interest in the relation between political factors and economic performance was raised by Lipset, (1959) triggering the conduction of numerous studies which conclude that the political environment plays an important role in economic growth (Kormendi and Meguire, 1985; Scully, 1988; Grier and Tullock, 1989; Brunetti, 1997; Lensink et. al., 1999; Lensink, 2001). Researchers usually assess the political environment using variables such as political stability and degree of democracy. At the most basic form, political stability would reduce uncertainty, encouraging investment and eventually advancing economic growth (Arvanitidis et. al., 2009). The degree of democracy is also associated with economic growth, though the relation is much more complex, since democracy may both retard and enhance economic growth depending on the various channels that it passes through (Alesina et. al., 1996).

The government can influence the growth of the economy through the size of public sector. Big government – the size of government - depends on the size of the revenue and the revenue size on its own depends on the amount of taxes imposed on the public. These taxes may invariably affect the efficiency of economic activity. The conjecture that resources are allocated less efficiently by larger governments, leading to lower economic growth is supported by several reports (Landau, 1985; Peden and Bradley, 1989; Dar and AmirKhalkhalim, 2002; Fölster and Herekson, 2001).
It is widely acknowledged that bureaucrats in the government sector have an incentive to maximize their budget (Niskanen, 1971). The absence of profit incentive induces government organizations to be less efficient (Buchanan and Wagner, 1977). As a consequence, a government tends to become oversized and produce (sometimes) an oversupply of unnecessary public goods. The cost for the supply of public goods is financed through taxation. People are thus likely to criticize government policy when the cost of public goods outweighs their benefit. Nevertheless, a government has abundant information, which ordinary people encounter difficulty in accessing.

There appears to be a positive association between tax revenue and growth because a state typically succeeds in collecting taxes when successful at providing the stability necessary for economic activity to start growing (Besley and Persson, 2009). The most basic tasks for government, such as protecting property rights and the rule of law, can be accomplished at low levels of taxation. When such a minimal Hobbesian state expands to providing things like infrastructure, basic health care and education, the effect of government size on growth is more likely positive than negative (Bergh and Henrekson, 2011). However, if productive government expenditures are characterized by decreasing returns, the negative effect of taxes to finance public expenditure may at some point dominate the positive effect of growth-promoting government activities.

There are also reasons to expect the marginal negative effect of government size to increase in absolute terms as government grows. For example, Agell (1996) noted that the distortionary effect of taxation is proportional in size to the squared tax rate. Distortions are small for low levels of taxation, but as taxes increase they grow rapidly, beyond a certain point becoming extremely large. An additional reason to
expect rich countries to show a negative correlation comes from the mechanism suggested by Olson, (1982): Organized interest groups tend to evolve, and strive to obtain advantages for themselves in the form of legislation or transfers which have a side effect, retarding the normal functioning and growth of the market economy. The scope for interest group action of this kind is likely to be greater in countries with larger public sectors. This situation is compounded as the public sector grows, as the potential profits from rent-seeking activities are larger. This may lead to a greater diversion of resources into unproductive use (Buchanan, 1980).

The higher taxes or further borrowing that is required to finance growing government size will have a negative effect on economic growth. Incentives for household to invest, take risk and to find jobs decrease as the government takes more and more of their earnings. Borrowing can also have a negative effect on private investment since the government receives funds that could otherwise have been invested in the private sector. These could possibly raise taxes because the government now has higher interest payments (Gallaway and Verder, 1998).

A large government size increases the potential profits from rent-seeking activities, which might lead to a movement of resources into more unproductive use (Fölster and Henrekson, 1997). Rent-seeking occurs when people try to obtain income by having the government transfers to themselves rather than providing goods and services to others. They benefit the recipient but are a drain on the economy as a whole and economic growth suffers.

Continuous expansion of the government will move expenditure into less and less productive activities. Eventually the government becomes too large and will carry out
more activities for which it is not used to. When this happens negative returns will set in which might retard growth. This is likely to be the case when governments become involved in the provision of private goods.

However, when government spends on productive activities economic growth can be enhanced. For example, expenditures on education and health improve human capital, which improve the productive capacity of labour; also government expenditures on infrastructure that provide congenial environment for private sector investment generate more output growth, and thus economic growth. Infrastructure raises the economy’s ability to produce health services; in turn, greater access to health services enhances workers’ productivity, and therefore output. Thus, the accumulation of human capital results not only from the acquisition of knowledge, but from better quality of effective labour. Agenor (2010) assumed that there exists a nonlinear relationship between the efficiency of public capital and its level can be motivated in two ways. The first is based on the view that infrastructure investment is lumpy, that is, a certain quantity of infrastructure assets must be accumulated before it begins to contribute at all to the production activities of the private sector. However, lumpiness can explain piecewise-linear threshold effects, but not necessarily non-convexities. The second is based on network effects. Economies of scale due to network externalities are a widely recognized imperfection in infrastructure services (World Bank, 1994)).

Keynes (1936) and his supporters, however, raise the thought that during recession times the use of fiscal policies boosts economic activities, i.e. expansionary fiscal policies, expanding public expenditures etc., increase community output. While according to Wagner’s approach causality runs from growth in community output to
public expenditure, the Keynesian approach assumes that causality runs from public expenditure to growth in community output in times of recessions.

The third way in which government can influence growth of the economy is through planning and other industrial policies (Weil, 2009). After the World War II, governments in the newly independent countries (in the developing world) experimented with various policies to improve their backward conditions. The motivations for government intervention in these countries were taken by many as being salient for the developing world. These policy tools used in these periods include: state-owned enterprises, marketing boards, trade restrictions, etc. In most of the cases, the policies failed as state enterprises, for example, were woefully inefficient. The managers of these enterprises, facing neither competition from other firms nor from shareholders to produce profits, had little incentive to strive for efficiency in production (Weil, 2009:352).

3.4 Methodological Framework

Macroeconomic modeling is generally motivated by two objectives: forecasting and more significantly, policy analysis. In pursuit of these objectives, every model should ideally satisfy four criteria. First and foremost, it must fit into a theoretical framework. Second, the actual specification of the model must reflect a clear understanding of the contextual framework within which policies are formulated and executed along with an envisaged process of adjustment. Third, it is essential that the model is built on a firm and rich data base and, finally, the estimated structural model must adequately utilise the rigours and sophistications of econometric methodology.

Dwelling on the theme of macro-econometric modeling Klein (1986) asserts that:
Econometric Models are based on theories and estimates of the way people do behave, not on the way they ought to behave under some hypothesized decision making rules. Statistical evidence on expected prices contradict the hypothesis of rationality, as one might expect... (p. 2069).

The theories of public expenditure recognize the fact that when the national income increases, the public expenditure also increases. Theory also supports the fact that when there is a social disorder, disaster, etc, the government expenditure usually rises. There are different reasons, as drawn from theory, which could cause the public expenditure to rise. These factors cause the public expenditure to change, but they do not tell us how these changes affect the economy. These changes in the public spending have the capacity to either undermine progress of the entire economy or act as a catalyst to growth.

There are two divergent views to explaining the scenarios above. While some researchers conclude that increase in the government expenditure raises the output of the economy, others maintain that increasing government purchases retards growth of the economy. The endogenous growth theory adds government purchases as a factor for growth (Agenor, 1999) although some authors have modified this by adding that the productive aspects of government expenditure should be increased. Other researchers argue that when the size of the government is very large, it crowds out private investment (Kweka and Morrissey, 2000; Barro, 1991; Tanninen, 1999).

Looking at the spending pattern for Nigeria over the years it suggests that public expenditure has been rising over time. What rather remains a puzzle is that the causes of public expenditure rise have not been investigated for Nigeria; such increases in public spending are associated with fluctuation, and calls for an empirical examination. To measure or capture this fluctuation (volatility) in the system, we need the volatility models that will be able to capture the effects of such shocks. On this
basis, the Vector Auto-Regressive Model (VAR) with it attendant charts and tests is suitable for estimating and analyzing the effects of such volatility on output in Nigeria.
CHAPTER FOUR
METHODOLOGY

4.1 Model Specification

We adopted four techniques in order to capture the hypotheses and achieve the four objectives for which our study is poised to achieve as stated in chapter one. First, in order to capture the determinants of the size of public sector, short-run Error Correction Model and long-run static equation were used for comparing the influence of those variables on the size government spending. Second, to capture the impact of public expenditure on economic growth in Nigeria, short-run ECM and long-run ECM Robust Models were used to compare the short-run ECM and Long-run ECM Robust. These were used to observe how the macroeconomic variables used affect the output growth in the short-run and how that reacts as the economy moves in into the longer periods. Third, to answer the question of the volatility and fluctuations arising from the public spending and their impact on output growth, a VAR model was used. Granger-Wald tests were conducted to identify the directions of causality between and among the variables. The impulse response charts were used to identify the source of shocks and their impact on output growth. The efficiency of the model was also tested using the stability test. Finally, in order to capture the impact of public sectoral spending on Nigeria’s economic growth, the short-run ECM models were used. Three equations were used to compare different results after controlling for Heteroskedasticity and auto-correlation, using Newey-West Covariance matrix estimation. Three long-run Static equations were also used to check the robustness and efficiency of both the short-run and long-run results.
4.2 Model 1: Determinants of public Expenditures

The technique adopted for the determinants of public expenditure in Nigeria is the Error correction model. The choice of the ECM is based on the necessity to understand the link between the public expenditure (or rather the size of the public sector) and its determinants in the short-run and how this relationship is transmitted into the long-run. After testing for unit roots, the error correction model was used to link the short-run dynamics with the long-run equilibrium, which is made possible with the correction factor called error correction term.

The long-run static equation served as a test to compare the short-run dynamics with that of the long-run relationships. This equation is given as:

\[ y = \alpha_0 + \alpha_1 \text{rev}_\text{ratio} + \alpha_2 \text{gross}_\text{invest} + \alpha_3 \text{gdp}_\text{grate} + \alpha_4 \text{extdebt} + \alpha_5 \text{domdebt} + \mu_t \] \hspace{1cm} 4.1

The short-run model was used to determine how those economic variables influence the size of the public sector (in the short period) and how they are transformed into the long-run equilibrium. The error correction equation is stated as follows:

\[ y = \alpha_0 + \alpha_1 \Delta \text{rev}_\text{ratio} + \alpha_2 \Delta \text{gross}_\text{invest} + \alpha_3 \Delta \text{gdp}_\text{grate} + \alpha_4 \Delta \text{extdebt} + \alpha_5 \Delta \text{domdebt} + \alpha_6 \mu_{t-1} + \varepsilon \] \hspace{1cm} 4.2

where, \( \text{rev}_\text{ratio} \) = government revenue-gdp ratio.
\( \text{gross}_\text{invest} \) = gross domestic private investment
\( \text{gdp}_\text{grate} \) = GDP (national output) growth rate
\( \text{extdebt} \) = external debt
\( \text{domdebt} \) = domestic debt
\( \mu_{t-1} \) = the error correction term that shows the speed of adjustment to the long-run equilibrium
\( \varepsilon \) = error term.
### Table 4.1: Expected Signs for the Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>a priori Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>rev_ratio</td>
<td>government revenue-gdp ratio</td>
<td>(+)</td>
</tr>
<tr>
<td>gross_invest</td>
<td>gross domestic private investment</td>
<td>(+)</td>
</tr>
<tr>
<td>gdp_grate</td>
<td>GDP (national output) growth rate</td>
<td>(+)</td>
</tr>
<tr>
<td>extdebt</td>
<td>external debt</td>
<td>(+)</td>
</tr>
<tr>
<td>domdebt</td>
<td>domestic debt</td>
<td>(+)</td>
</tr>
</tbody>
</table>

Source: A priori Signs of the variables

#### 4.3 Model 2: The Impact of Public Expenditure on Economic Growth

In the second model on the impact of public expenditure on economic growth, the short-run dynamics (ECM) of the influence of economic variables on output growth of Nigeria was compared with the long run static technique. In each of the techniques, robust tests were carried out to take care of Heteroskedasticity and auto-correlation. The robust estimates would appear to be better results because the influence of Heteroskedasticity and auto-correlation has been removed. The long-run static equation is stated as follows:

\[
y = \beta_0 + \beta_1 \text{inf} + \beta_2 \text{exr} + \beta_3 \text{open} + \beta_4 \text{gfcap} + \beta_5 \text{pub exp} + \mu \]

The short-run error correction equation is therefore stated as follows, with error correction term to determine the speed of adjustment from the short-run to long-run equilibrium:

\[
y = \beta_0 + \beta_1 \Delta \text{inf} + \beta_2 \Delta \text{exr} + \beta_3 \Delta \text{open} + \beta_4 \Delta \text{gfcap} + \beta_5 \Delta \text{pub exp} + \beta_6 \nu_{t-1} + \epsilon \]

where: inf = inflation rate  
exr = nominal exchange rate  
open = degree of trade openness
gfcap = gross fixed capital formation

pubexp = public expenditure (comprising the expenditures of all the tiers of government in Nigeria)

μ = stochastic error term.

**Table 4.2: The a priori Signs of the Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition of Variable</th>
<th>a priori Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inf</td>
<td>inflation rate</td>
<td>+/-</td>
</tr>
<tr>
<td>Exr</td>
<td>nominal exchange rate</td>
<td>+</td>
</tr>
<tr>
<td>Open</td>
<td>degree of trade openness</td>
<td>+</td>
</tr>
<tr>
<td>Gfcap</td>
<td>gross fixed capital formation</td>
<td>+</td>
</tr>
<tr>
<td>pubexp</td>
<td>public expenditures</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: Expected signs of the parameters

In the estimation, robust estimates were found with the interest to cater for the autocorrelation and Heteroskedasticity which are inherent with most economic variables.

### 4.4 Model 3: Sources of Shocks to the Macroeconomic Variables

In order to analyse the volatility of some macroeconomic variables and to determine the sources of shocks to these macroeconomic variables, we estimated a vector autoregressive (VAR) technique. The estimations were designed to ascertain if output responds to public expenditure. In this research work, we used a VAR technique to determine the influence of public expenditure on the economic growth and also to determine the sources of shocks and their impacts. Here the public expenditure is divided into the recurrent and capital expenditures. The equations are thereby stated as follows:

\[ \ln dp_t = \alpha + \beta_1 \sum \ln dp_{t-1} + \beta_2 \sum \ln exp_{t-1} + \beta_3 \sum \ln lop_{t-1} + \beta_4 \sum \ln fc_{t-1} + \beta_5 \sum \ln ap_{t-1} + \varepsilon_t \] \hspace{1cm}(4.5)

\[ \ln exp_t = \alpha + \beta_1 \sum \ln exp_{t-1} + \beta_2 \sum \ln dp_{t-1} + \beta_3 \sum \ln lop_{t-1} + \beta_4 \sum \ln fc_{t-1} + \beta_5 \sum \ln ap_{t-1} + \varepsilon_t \] \hspace{1cm}(4.6)

\[ \ln exp_t = \alpha + \beta_1 \sum \ln exp_{t-1} + \beta_2 \sum \ln exp_{t-1} + \beta_3 \sum \ln dp_{t-1} + \beta_4 \sum \ln lop_{t-1} + \beta_5 \sum \ln fc_{t-1} + \beta_6 \sum \ln ap_{t-1} + \varepsilon_t \] \hspace{1cm}(4.7)
\[
\text{lopen}_t = \alpha + \beta_1 \sum \text{lopen}_{t-i} + \beta_2 \sum \text{dp}_{t-i} + \beta_3 \sum \text{rrr exp}_{t-i} + \beta_4 \sum \text{lc exp}_{t-i} + \beta_5 \sum \text{lg fcap}_{t-i} + \beta_6 \sum \text{ap}_{t-i} + \epsilon_{t-1} \tag{4.8}
\]

\[
\text{lg fcap}_t = \alpha + \beta_1 \sum \text{lopen}_{t-i} + \beta_2 \sum \text{dp}_{t-i} + \beta_3 \sum \text{rrr exp}_{t-i} + \beta_4 \sum \text{lc exp}_{t-i} + \beta_5 \sum \text{loopen}_{t-i} + \beta_6 \sum \text{ap}_{t-i} + \epsilon_{t-1} \tag{4.9}
\]

\[
\text{ap}_t = \alpha + \beta_1 \sum \text{lopen}_{t-i} + \beta_2 \sum \text{dp}_{t-i} + \beta_3 \sum \text{rrr exp}_{t-i} + \beta_4 \sum \text{lc exp}_{t-i} + \beta_5 \sum \text{loopen}_{t-i} + \beta_6 \sum \text{lg fcap}_{t-i} + \epsilon_{t-1} \tag{4.10}
\]

where:
- \( \text{gdp} \) = output growth rate
- \( \text{rrexp} \) = Public recurrent expenditures
- \( \text{cexp} \) = Public capital expenditures
- \( \text{open} \) = degree of trade openness
- \( \text{gfcap} \) = gross fixed capital formation (proxy for gross domestic private investment).
- \( \text{Ap} \) = average productivity of labour.
- \( \epsilon_i \) = error terms.

The variables are transformed into logarithms except for those already transformed.

We also tried to test the causality between these economic variables. The Granger causality test was used for this, which can be specified as follows:

\[
y_t = \phi + \sum_{i}^{n} \alpha_i x_{t-i} + \sum_{j}^{k} \beta_j y_{t-j} + \mu_{i1}, \tag{4.11}
\]

\[
x_t = \phi + \sum_{i}^{n} \lambda_i y_{t-i} + \sum_{j}^{k} \delta_j x_{t-j} + \mu_{i2}, \tag{4.12}
\]

where:
- \( y_t \) & \( x_t \) = the variables which are of interest to know the causal links. Included in the model are those variables used in equations 4.5 to 4.10, and \( \mu_i \) = error terms which are assumed to be uncorrelated. Three decisions could be discerned from the equations 4.11 and 4.12, namely:
  
  i. When equation 4.11 is statistically different from zero and equation 4.12 is not, we can call the relationship as unidirectional causality.
ii. When equation 4.11 is statistically different from zero and equation 4.12 is also statistically different from zero, there is bi-directional relationship.

iii. If equations 4.11 and 4.12 are not statistically different from zero, there is independence in the relationship between the variables.

**Impulse response charts** were also employed to observe how shocks transmit from one variable to another and how these shocks influence other variables. The impulse response functions (IRF) traces out the response of the dependent variable in the VAR equations to shocks in the error terms arising from the macroeconomic variables. Such a shocks or changes will change $y_t$ in the current as well as future periods. But since $y_t$ appears in the $x_t$ regression, the change in $\mu_t$ will also have an impact on $x_t$. Similarly, a change of one standard deviation in $\mu_z$ of the $x_t$ equation will have an impact on $y_t$. The IRF traces out the impact of such shocks for several periods in the future. Impulse response charts were used to check how the shocks in one variable affect the other variables and how long such impact would last.

### 4.5 Model 4: Sectoral Impact of Public Expenditures on Output Growth

In order to verify the impact of public expenditures by sectors on the output growth, we designed two models: the short-run error correction model and the long-run static model. In each model, several variants of the error correction – Newey-West standard error estimate which corrects for heteroscedasticity and autocorrelation, and the robust estimation (White’s heteroscedasticity-corrected standard errors). In the case of Newey-West standard error estimate, the corrected standard errors are known as HAC (heteroscedasticity- and autocorrelation-consistent) standard errors or simply as Newey–West standard errors (Gujarati, 2003:484).
In the case of the robust estimation, Wallace and Silver (1988 265) note:

*Generally speaking, it is probably a good idea to use the WHITE option [available in regression programs] routinely, perhaps comparing the output with regular OLS output as a check to see whether heteroscedasticity is a serious problem in a particular set of data.*

Once heteroskedasticity-robust standard errors are obtained, it is simple to construct a heteroskedasticity-robust t statistic. Recall that the general form of the t statistic is

\[
t = \frac{\text{estimate} - \text{hypothesized value}}{\text{standard error}}
\]

Since we are still using the OLS estimates and we have chosen the hypothesized value ahead of time, the only difference between the usual OLS t-statistic and the heteroskedasticity-robust t-statistic is in how the standard error is computed (Wooldridge, 2000:250).

The long run Static model can be formulated as follows:

\[
\begin{align*}
\log y &= \alpha_0 + \alpha_1 \log defence + \alpha_2 \log edu + \alpha_3 \log health + \alpha_4 \log agric exp \\
&+ \alpha_5 \log constr + \alpha_6 \log transcom + \alpha_7 \log gfcap + \mu
\end{align*}
\]

The short run error correction model is formulated as follows:

\[
\begin{align*}
\log \Delta y &= \beta_0 + \beta_1 \Delta \log defence + \beta_2 \Delta \log edu + \beta_3 \Delta \log health + \beta_4 \Delta \log agric exp + \beta_5 \Delta \log constr \\
&+ \beta_6 \Delta \log transcom + \beta_7 \Delta \log gfcap + \mu_{t-1} + \epsilon
\end{align*}
\]

where:
- \( y \) output growth
- defence = public expenditures on defence
- edu = public expenditures on education sector
- health = public expenditures on health sector
- agric exp = public expenditures on Agriculture sector
- constr = public expenditures on building and construction
- transcom = public expenditures on transport and communication
\( \omega_{t-1} \) = error correction term (which adjusts the short run to the long run equilibrium)

\( \epsilon \) = Stochastic error term.

Table 4.3: The a priori Signs of the Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition of Variable</th>
<th>a priori Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>defence</td>
<td>public expenditure on defence</td>
<td>+</td>
</tr>
<tr>
<td>edu</td>
<td>public expenditures on education sector</td>
<td>+</td>
</tr>
<tr>
<td>health</td>
<td>public expenditures on health sector</td>
<td>+</td>
</tr>
<tr>
<td>agric exp</td>
<td>public expenditures on Agriculture sector</td>
<td>+</td>
</tr>
<tr>
<td>constr</td>
<td>public expenditures on building and construction</td>
<td>+</td>
</tr>
<tr>
<td>transcom</td>
<td>public expenditures on transport and communication</td>
<td>+</td>
</tr>
</tbody>
</table>

Source: Expected Signs of the Parameters

4.6 Unit Root Test

To begin, it is necessary to test whether the underlying processes that generated the data series can be assumed to be invariant with respect to time. If the process is non-stationary, it will often be difficult to represent the time series with equations with fixed coefficients (Pindyck and Rubinfeld, 1998:493). To carry out this test, we used the Augmented Dickey-Fuller (ADF) test, due to its robustness and its capacity to remove autocorrelation from the model. While the Augmented Dickey-Fuller approach accounts for the autocorrelation of the first differences of a series in a parametric fashion by estimating additional nuisance parameters, the Phillips-Perron unit root test makes use of non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms (Gujarati and Porter, 2009). We used Phillips-Perron test in some models to complement the Augmented Dickey-Fuller Unit root test. We specify this as:

\[
y_a = \alpha_0 + \alpha_1 y_{a-1} + \alpha \sum_{t=1}^{n} \Delta y_{t-n} + \mu_i \]

where: \( y_{i,a} \) individual variables in the model.
\( \alpha_0, \alpha_1, \beta_1 \) are parameters of the model.

Each variable becomes stationary, if it is integrated at order zero \( \{I(0)\} \), or else it becomes stationary at order in which it is differenced \( \{I(d)\} \) (Gujarati, 2003: 814-821).

4.7 **Sources of Data and Software Package Used**

The data for this study were extracted from the Central Bank of Nigeria (CBN) publications, like Statistical Bulletin various years, Annual Reports for various years; National Bureau of Statistics (NBS) and the World Bank Publications. We used annual data that spanned from 1961 to 2012. For the estimation, STATA Version 10 software was used. This software proved very efficient in estimating most of the econometrics models. The choice of this package was chosen because it is user friendly and provides sophisticated techniques for data analysis, regression and forecasting.
CHAPTER FIVE
DATA ANALYSIS AND PRESENTATION OF RESULTS

5.1 Data Transformation
The data for this work were collected from the Central Bank of Nigeria Bulletin and Annual Reports for various years. Some of the variables used for the analysis were very large and therefore were transformed for ease of analysis. The transformation ranges from the use of log to the derivation of variables through division, multiplication, calculation of ratios and rates.

5.2 Time Series Characteristics
For variables used for the determinants of size public expenditures we tested stationarity of the time series data used. The Augmented Dickey-Fuller test and Phillips-Perron test of stationarity were used for the tests, one complementing (confirming) the other. Table 5.1 shows the stationarity of all the variables used as determinants of public expenditure.

Table 5.1: Results of the Stationarity Tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Augmented Dickey-Fuller test for unit root</th>
<th>Phillips-Perron test for unit root</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test Statistic Z(t)</td>
<td>1% Critical value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z(t) 0.646</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z(t) -1.175</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z(t) -2.507</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z(t) -4.591</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z(t) 0.431</td>
</tr>
</tbody>
</table>

Source: Stata Software Output
From Table 5.1, it could be seen that output growth is not stationary at the level form, but became stationary after the first difference. The calculated value for the output at stationary is 5.648 in absolute value, and is greater than the absolute values of the critical values for 1% (3.580), 5% (2.930), and 10% (2.600) levels of significance, respectively. The Phillips-Perron test also confirmed that the growth rate of output is not stationary at the level form.

The stationarity test for the external debt (by Augmented Dickey-Fuller) shows that it is not stationary at the level form, while with Phillips-Perron test it is also non-stationary at all level of significance. The P-value for the two tests shows high values of 0.6961 and 0.6842, which shows 70% and 68% respectively.

A closer look at the Table 5.1 for the domestic debt clearly indicates that the absolute values of the critical values for the 1%, 5% and 10% levels of significance are all greater than that of the calculated value, which implies that domestic debt is non-stationary at the level form. The Phillips-Perron test also confirms that Augmented Dickey-Fuller test.

The size of the public sector is stationary at level form for all levels of significance. The Phillips-Perron test also confirms this result at the same levels of significance. The P-value for the tests show their respective values of 0.0001 and 0.0001 for the Augmented Dickey-Fuller test and Phillips-Perron test, respectively. Finally, investment is stationary at first difference for Augmented Dickey-Fuller test and Phillips-Perron test at all levels of significance.

5.3 Results of the Determinants of the Size of the Public Sector

For the results of the determinants of public expenditures, these are stated in Table 5.2. The results of the Error Correction analysis for the determinants of the size of the
public sector show that some variables are significant in the short run while others are significant in the long run. The short-run analysis shows that the variables used are all non-stationary at their level forms but became stationary at their first difference. They entered the model in their first difference (their order of integration). Different models were estimated for this, but the discussion is based on the robust estimation. This is because it produced better and more reliable results. The government revenue/GDP ratio is statistically significant at 5% level of significance, and thus shows that a percentage change in the size of revenue will produce a large percentage change in the size of the public sector. This implies that the size of government revenue is positively and contemporaneously affecting the size of the public sector.

The nature of the relationship between gross private domestic investment and the public expenditure size is positive in short-run, and is statistically significant at 5% level of significance. In similar way, the growth rate of output is positively related with the size of the public sector and is statistically significant at 1% level, implying that increase in national output (income) will automatically raise the size of the public sector in Nigeria.

Domestic borrowing (debts) helps the size of government to expand. This is deciphered from the Table 5.2, which shows that as the domestic debts increase, the size of the public sector also rises. The variable (domestic debts) is statistically significant at 1%.
Table 5.2: Short Run Models of Determinants of Government Size in Nigeria

<table>
<thead>
<tr>
<th>Variables</th>
<th>ECM OLS</th>
<th>ECM robust</th>
<th>ECM newey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.138</td>
<td>0.138</td>
<td>0.729</td>
</tr>
<tr>
<td></td>
<td>(0.553)</td>
<td>(0.693)</td>
<td>(0.174)</td>
</tr>
<tr>
<td>D.rev ratio</td>
<td>2.699*</td>
<td>2.699*</td>
<td>2.199</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.150)</td>
</tr>
<tr>
<td>D.log gfcap</td>
<td>1.787*</td>
<td>1.787*</td>
<td>2.230</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.042)</td>
<td>(0.098)</td>
</tr>
<tr>
<td>D.gdp_grwth</td>
<td>0.186**</td>
<td>0.186**</td>
<td>0.122</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
<td>(0.174)</td>
</tr>
<tr>
<td>D.log_domdebt</td>
<td>2.563***</td>
<td>2.563***</td>
<td>3.409</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.007)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>D.log_extdebt</td>
<td>0.676*</td>
<td>0.676*</td>
<td>0.320</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.013)</td>
<td>(0.438)</td>
</tr>
<tr>
<td>L.Residuals</td>
<td>-1.112***</td>
<td>-1.112***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>L.Fitted values</td>
<td></td>
<td></td>
<td>-0.955</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.251)</td>
</tr>
<tr>
<td>Observations</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.758</td>
<td>0.758</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.725</td>
<td>0.725</td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>22.51</td>
<td>10.50</td>
<td>0.733</td>
</tr>
</tbody>
</table>

$p$-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Stata Software Output

External borrowing is also another factor that gives rise to increase in the size of the public sector, because it has a positive link with the latter, and is statistically significant at 5% level. The speed of adjustment of the model from the short-run to the long-run is statistically significant at 1% level, and takes about 112% to adjust from the short-run to the long period (equilibrium). This error correction term is statistically significant.

However, the long run analysis shows that the size of the revenue also affects the public sector. From Table 5.3, we see that the size of revenue is positively related.
with the size of the government and is statistically significant at 5% level. Similarly, private investment is also positively related with the size of public sector and is significantly different from zero at 1% level.

Table 5.3: Long-Run Determinants of the Size of Public Sector

<table>
<thead>
<tr>
<th>Variable</th>
<th>Long-run1</th>
<th>Long-run robust</th>
<th>Long-run newey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-2.242*</td>
<td>2.242*</td>
<td>-2.242*</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.301)</td>
</tr>
<tr>
<td>rev ratio</td>
<td>1.013*</td>
<td>1.013*</td>
<td>1.013</td>
</tr>
<tr>
<td></td>
<td>(0.137)</td>
<td>(0.137)</td>
<td>(0.301)</td>
</tr>
<tr>
<td>log_gfcap</td>
<td>0.790**</td>
<td>0.790**</td>
<td>0.790</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.167)</td>
</tr>
<tr>
<td>gdp_grwth</td>
<td>0.137</td>
<td>0.137</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>(0.157)</td>
<td>(0.157)</td>
<td>(0.257)</td>
</tr>
<tr>
<td>log_domdebt</td>
<td>-0.628</td>
<td>-0.628</td>
<td>-0.628</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.052)</td>
<td>(0.247)</td>
</tr>
<tr>
<td>log_extdebt</td>
<td>-0.156</td>
<td>-0.156</td>
<td>-0.156</td>
</tr>
<tr>
<td></td>
<td>(0.395)</td>
<td>(0.395)</td>
<td>(0.395)</td>
</tr>
<tr>
<td>Observations</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>R²</td>
<td>0.242</td>
<td>0.242</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.158</td>
<td>0.158</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2.873</td>
<td>2.873</td>
<td>0.724</td>
</tr>
</tbody>
</table>

p-values in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001
Source: Stata Software Output

The result from the Table 5.3 also show that growth rate of output is a determinant of the size of public sector in Nigeria. It shows that a percentage change in output growth will lead to 13.7 percentage rise in government expenditure, and also statistically significant at 5% level.

Public debts do not determine the size of the public sector as could be seen in Table 5.3. It is observed that domestic and external debts are respectively negatively and
insignificantly affecting the size of public sector. From this, it could be inferred that in short-run public debts can be growth-enhancing by positively influencing the government spending, whereas in the longer periods, public debts undermine economic progress by negatively affecting the public sector.

5.6 Results of the Impact of Public Expenditure on Economic Growth in Nigeria

5.6.1 Stationarity Tests

The results for the unit root tests for the variables used in this section are discussed here. Inflation is found to be stationary at the level form (i.e. I(0)) at both 5% and 10% levels of significance. The results are represented in the Table 5.4.1:

Table 5.4.1: Results of the Stationarity Tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test Statistic Z(t)</th>
<th>1% Critical value</th>
<th>5% Critical value</th>
<th>10% Critical value</th>
<th>MacKinnon approximate p-value for Z(t)</th>
<th>Level Form- I(0)</th>
<th>First Difference - I(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-3.315</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.0142</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Nominal exchange rate</td>
<td>0.0817</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.9919</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>-6.483</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of trade openness</td>
<td>-1.564</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.5018</td>
<td></td>
<td>Not Stationary</td>
</tr>
<tr>
<td></td>
<td>-9.037</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
<td>0.0000</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Growth rate of Output</td>
<td>0.836</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.9922</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>-5.648</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Expenditure</td>
<td>-1.147</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.6961</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>-11.550</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>0.691</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
<td>0.9896</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>-5.096</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Stata software Output
Nominal exchange rate has been found not stationary at the level form but became stationary at the first difference; therefore nominal exchange rate is stationary at order one (i.e. $I(1)$). The degree of trade openness is not stationary at the level form but became stationary at the first difference. The growth rate of output is stationary at the first difference. The variable, public expenditure is non-stationary at the level form but became stationary at the first difference (at all levels of significance). Investment proxy by gross fixed capital formation is not stationary at the level form but becomes stationary at the first difference. The probability value (P-value) is as low as 0.0000 which show a high level of significance.

5.6.2 Results of The Impact of Public Expenditures on Economic Growth in Nigeria

In order to determine the impact of public expenditures on economic growth in Nigeria, we used the Error Correction Model (ECM) to estimate the model. We distinguished the short-run and long-run with robust estimation, and the ECM and ECM with robust estimation. The robust models are used to control for Heteroskedasticity. A close look at Table 5.4.2 shows the analysis of the short-run dynamics and portrays that robust estimation (model) produced better and interesting results and were used in the discussion. The results show that inflation rate is not an important factor for economic growth. Although there appears to be a positive relationship (from the result) between inflation and output growth in the short-run dynamics (ECM), it is not statistically and contemporaneously influencing output growth. The results show that one percentage change in inflation produces 0.23 changes in output growth, over the study period. Inflation is not statistically
significant, thus showing that it is not an important variable for output growth in Nigeria.

Nominal exchange rate also has a positive relationship with output growth as can be seen in the Table 5.4.2. Just like the inflation rate, one percentage change in nominal exchange rate produces about 0.25 changes in output growth. However, in the short-run (using ECM models), it does not have any significant impact on the growth rate of output. This implies that changes in nominal exchange rates may not affect the output in the short-run, but could be used in macroeconomic adjustment of the economy.

Table 5.4.2: Results of Short-Run Impact of Public Expenditure on Economic Growth

<table>
<thead>
<tr>
<th>Variable</th>
<th>ECM (OLS)</th>
<th>ECM Robust</th>
<th>ECM newey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.138**</td>
<td>0.138**</td>
<td>0.138**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>D.inf</td>
<td>0.00226</td>
<td>0.00226</td>
<td>0.00226</td>
</tr>
<tr>
<td></td>
<td>(0.217)</td>
<td>(0.229)</td>
<td>(0.199)</td>
</tr>
<tr>
<td>D.exr</td>
<td>0.00252</td>
<td>0.00252</td>
<td>0.00252</td>
</tr>
<tr>
<td></td>
<td>(0.280)</td>
<td>(0.109)</td>
<td>(0.107)</td>
</tr>
<tr>
<td>D.open</td>
<td>0.335</td>
<td>0.335</td>
<td>0.335</td>
</tr>
<tr>
<td></td>
<td>(0.083)</td>
<td>(0.153)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>D.log_gfcap</td>
<td>0.241</td>
<td>0.241*</td>
<td>0.241*</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.013)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>D.log_pubexp</td>
<td>0.0692*</td>
<td>0.0692*</td>
<td>0.0692*</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.025)</td>
<td>(0.030)</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td>-0.0957</td>
<td>-0.0957*</td>
<td>-0.0957*</td>
</tr>
<tr>
<td></td>
<td>(0.238)</td>
<td>(0.086)</td>
<td>(0.106)</td>
</tr>
</tbody>
</table>

N                                        51                         51                               51
R²                                         0.285                    0.285
Adj. R²                                     0.187                    0.187
AIC                                       -31.57                   -31.57
BIC                                       -18.05                    -18.05
F                                           2.921                    3.068                         3.273
Rmse                                     0.167                    0.167

*p-values in parentheses  *p < 0.05, **p < 0.01, ***p < 0.001
Source: Stata Software Output
The degree of trade openness is another variable which has a positive relationship with output growth of Nigeria, implying that as the economy reduces the restrictive trade policies with other countries by one percent, the output of Nigeria expands by about 33.5 percent (a large change in output growth). However, the degree of trade openness is not statistically significant in the short-run, even though it has a large parameter coefficient.

From the results, it could be shown that investment (represented in the model by gross fixed capital formation) has a positive relationship with output growth, signifying that a percentage change in investment leads to about 24.1 percentage change in output growth. In the short-run, investment shows a significant impact at the 5% level. The implication is that investment is a key driver for economic growth in Nigeria.

The short-run analysis shows that public expenditure has a positive relationship with output growth and a percentage change in public expenditures produces about 6.9 percent change in output growth. The short-run analysis also shows that public expenditure is statistically significant at 5% level, signifying that in the short-run, public expenditures can be used to propel economic growth. In this sense, it means that government expenditures can be used to project growth of the economy in the short-run. The error correction mechanism shows the speed of adjustment from the short-run to the long-run is about 9.6% and is statistically significant at 5% level.

However, in the long run, the impact of these variables on the output growth appears somewhat different as could be observed in Table 5.4.3. The results show that inflation rate is not an important factor for economic growth. Although there appears
a positive relationship between inflation and output growth, it is not significantly affecting the growth rate of output.

Table 5.4.3: Result of Long-Run Impact of Public Expenditure on Economic Growth

<table>
<thead>
<tr>
<th>Variable</th>
<th>Long Run 1</th>
<th>Long Run robust</th>
<th>Long run newey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.695</td>
<td>-0.695</td>
<td>-0.695</td>
</tr>
<tr>
<td></td>
<td>(0.168)</td>
<td>(0.136)</td>
<td>(0.226)</td>
</tr>
<tr>
<td>inf</td>
<td>0.00613</td>
<td>0.00613</td>
<td>0.00613</td>
</tr>
<tr>
<td></td>
<td>(0.129)</td>
<td>(0.117)</td>
<td>(0.139)</td>
</tr>
<tr>
<td>exr</td>
<td>0.00349*</td>
<td>0.00349*</td>
<td>0.00349*</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.005)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>open</td>
<td>0.129**</td>
<td>0.129**</td>
<td>0.129**</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.020)</td>
<td>(0.288)</td>
</tr>
<tr>
<td>log_gfcap</td>
<td>0.965***</td>
<td>0.965***</td>
<td>0.965***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>log_pubexp</td>
<td>0.185</td>
<td>0.185</td>
<td>0.185</td>
</tr>
<tr>
<td></td>
<td>(0.202)</td>
<td>(0.230)</td>
<td>(0.130)</td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>R²</td>
<td>0.989</td>
<td>0.989</td>
<td>0.989</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.988</td>
<td>0.988</td>
<td>0.988</td>
</tr>
<tr>
<td>AIC</td>
<td>46.41</td>
<td>46.41</td>
<td>46.41</td>
</tr>
<tr>
<td>BIC</td>
<td>58.12</td>
<td>58.12</td>
<td>58.12</td>
</tr>
<tr>
<td>F</td>
<td>822.7</td>
<td>1542.3</td>
<td>996.0</td>
</tr>
<tr>
<td>rmse</td>
<td>0.358</td>
<td>0.358</td>
<td>0.358</td>
</tr>
</tbody>
</table>

*p-values in parentheses  * $p < 0.05$,  ** $p < 0.01$,  *** $p < 0.001$

Source: Stata Software Output

Nominal exchange rate also has a positive relationship with output growth, but unlike the short-run, it is an important factor for economic growth, being statistically significant at 5% level of significant with the long-run robust estimation. This implies that changes in nominal exchange rates could be used in macroeconomic adjustment of the economy in the short-run; however, it could be a policy for economic growth in the longer period. The degree of openness is another variable which has a positive relationship with output growth of Nigeria in the long run, implying that as the economy reduces the restrictive trade policies with other countries by one percent, the output of Nigeria expands by about 12.9 percent (a relatively large change in output
growth). However, the degree of trade openness is statistically significant at 1% in the long-run.

As could be seen from Table 5.4.3, private domestic investment is positively related to output growth of Nigeria, and show again that one percentage change in investment produces about 96.5 percentage change in output growth. Because investment is statistically significant, we can unequivocally say that investment is an important factor (driver) for economic growth in Nigeria.

Public expenditure has a positive link with economic (output) growth in Nigeria, but not statistically significant in the long run. In this sense, it means that government expenditures can be used to project growth of the economy in the short-run, whereas when the economy stabilizes in the long-run, public expenditures rise would not be used to grow the economy but to coordinate economic activities and would not raise growth. It might be that the bulk of public expenditure is on the recurrent part of expenditures, which are mostly on administration.

5.5 Results of the Vector Autoregressive (VAR) Model

In order to analyse the volatility of some macroeconomic variables, we estimated a vector autoregressive (VAR) model. Because VAR models produce results that are difficult to interpret (that do not have much economic meaning), we therefore went on to discuss other results ancillary to the VAR estimation (however, the results of the VAR estimation can be seen in the appendix).
5.5.1: Causality Relationships between Public Expenditure and other Macroeconomic Variables

Here, public expenditure was divided into recurrent and capital expenditures to observe how they would behave in the face of other macroeconomic indicators. In this model we tested the Granger-Wald Causality Tests to observe the interaction among the variables used. The results of the Granger causality are shown in Table 5.5.1.

From Table 5.5.1, we observe that all the variables are significantly causing the recurrent expenditure to expand. These variables include capital expenditures, degree of trade openness, investment (i.e. gross fixed capital formation), average productivity, national output growth (represented by GDP), and inflation. An increase in capital expenditure can cause the recurrent expenditure to expand because an increase in expenditures on capital projects will necessitate the expenditure on those administrative efforts to coordinate, monitor, appraise, and evaluate the projects. Also, an increase in trade openness (the more open the Nigerian economy becomes) will lead to the cost of administration, managing trade policies, controlling the nature and types of goods coming into the country. In similar way, a rise in private domestic investment does not lead to increase in the cost of administration (wages of possible new employees, cost of maintaining healthy environment, etc). When the national output (national income) expands, there is the tendency for the recurrent expenditure to expand also. This finding leads credence to Wagner’s Law of public expenditure that a rise in national income tends to raise the expenditure of the government.

Average productivity acts like output growth by raising the latter when the former is increased. Finally, inflation has the capacity to raise the recurrent expenditure of the economy due to the fact at inflationary periods more money is spent to procure the same quantity of goods. Therefore, inflation tends to increase the expenditures of which recurrent is part.
Table 5.5.1: Granger causality Wald tests of Recurrent Expenditures and some Macroeconomic Variables in Nigeria.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>Chi^2</th>
<th>df</th>
<th>Prob&gt;chi^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_lrexp</td>
<td>d_lcexp</td>
<td>4.1971</td>
<td>2</td>
<td>0.123</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>d_open</td>
<td>11.814</td>
<td>2</td>
<td>0.003</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>d_lgfcap</td>
<td>5.5139</td>
<td>2</td>
<td>0.063</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>d_ap</td>
<td>9.7668</td>
<td>2</td>
<td>0.008</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>d_lgdp</td>
<td>8.0523</td>
<td>2</td>
<td>0.018</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>inf</td>
<td>11.209</td>
<td>2</td>
<td>0.004</td>
</tr>
<tr>
<td>d_lrexp</td>
<td>ALL</td>
<td>36.735</td>
<td>12</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

The causality relationship between public capital expenditures and other economic variables indicates that recurrent expenditure causes the capital expenditure to expand. From this result, we can infer that there is bi-focal (bi-directional) causality between recurrent and capital expenditures. The degree of openness of Nigerian economy does not cause the capital expenditure to expand. In other words, the more open Nigerian economy is the less the government tends to spend on capital projects, because many of these projects may be taken up by foreign investors who would like to create conducive environment for more profits to flow from their investment. The more investment rises in Nigeria, the more the capital expenditure expands to boost the positive benefits of investment growth. This implies that private domestic investment cause the public expenditures on capital goods to rise. When private domestic investment is rising, output start rising and the need to provide facilities (like electricity, good roads, and other social services) become germane. The productivity of labour is also another factor which causes the public expenditures on capital goods to rise. When labour is productive (per unit output of labour), output (national income) rises and the economy expands leading to the need for the
expansion of social capital. National output also causes public capital expenditures to rise as we can see in Table 5.5.2 below. As the economy grows and expands, public expenditures rise (capital expenditure is an aspect of it) following the Wagner’s Law. From the result inflation is not good for capital expenditure of government. Inflation erodes the value of money and the true value public capital expenditures declines during the periods of inflation.

Table 5.5.2: Granger causality Wald Tests of Capital Expenditures and some Macroeconomic Variables in Nigeria.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi²</th>
<th>df</th>
<th>Prob &gt; chi²</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_lce xp</td>
<td>d_lrrep</td>
<td>2.721</td>
<td>2</td>
<td>0.257</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>d_open</td>
<td>0.46197</td>
<td>2</td>
<td>0.794</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>d_lgfcap</td>
<td>2.0968</td>
<td>2</td>
<td>0.350</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>d_ap</td>
<td>1.5852</td>
<td>2</td>
<td>0.452</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>d_lgd p</td>
<td>7.4569</td>
<td>2</td>
<td>0.024</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>Inf</td>
<td>0.22827</td>
<td>2</td>
<td>0.892</td>
</tr>
<tr>
<td>d_lce xp</td>
<td>ALL</td>
<td>21.901</td>
<td>12</td>
<td>0.039</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

The relationship between degree of trade openness and these macroeconomic variables is also accounted for in the Granger causality tests carried out. Apart from the private domestic investment, average productivity of labour, and inflation, other macroeconomic variables (recurrent and capital expenditures, national output) support the degree of trade openness. From this we can infer that both the recurrent and capital expenditures support the degree of trade openness, implying that there is public expenditure rise when the economy is opening up for trade with other countries. As the average labour productivity (per unit output of labour) of the economy rises, national output expands, exports tends to rise in the economy but might not help the economy to open up for trade. National output also expands the
chances for an economy to open its borders to move the output which could not be consumed locally, to other countries. Inflation worsens the domestic currency, makes domestic output costly and imported output cheaper. Because the prices of output in home country are higher than those of foreign countries, inflow of goods and services begins to rise and citizens will have several/varieties of goods to choose from. As can be seen in Table 5.5.3, on the average, these variables are significantly causing Nigerian economy to open up for trade.

### Table 5.5.3: Granger Causality Wald Tests of Trade Openness and some Macroeconomic Variables in Nigeria

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi^2</th>
<th>df</th>
<th>Prob &gt; chi^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_open</td>
<td>d_lrrexp</td>
<td>13.402</td>
<td>2</td>
<td>0.001</td>
</tr>
<tr>
<td>d_open</td>
<td>d_lcexp</td>
<td>2.9219</td>
<td>2</td>
<td>0.232</td>
</tr>
<tr>
<td>d_open</td>
<td>d_lgfcap</td>
<td>0.86484</td>
<td>2</td>
<td>0.649</td>
</tr>
<tr>
<td>d_open</td>
<td>d_ap</td>
<td>3.5135</td>
<td>2</td>
<td>0.173</td>
</tr>
<tr>
<td>d_open</td>
<td>d_lgdp</td>
<td>6.1067</td>
<td>2</td>
<td>0.047</td>
</tr>
<tr>
<td>d_open</td>
<td>Inf</td>
<td>3.1138</td>
<td>2</td>
<td>0.211</td>
</tr>
<tr>
<td>d_open</td>
<td>ALL</td>
<td>21.71</td>
<td>2</td>
<td>0.041</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

All the macroeconomic variables used (capital expenditures, average productivity, degree of trade openness and national output) except recurrent expenditure, and inflation, are all important factors for investment growth. Appropriate and effective recurrent and capital expenditures are necessary for private domestic investment growth, because they provide enabling environment for speedy growth of investment. Degree of trade openness is also causing the private domestic investment to expand because as the economy opens up her borders some foreigners might be interested in investing (foreign direct investment and portfolio investment) in the domestic economy. Average productivity is another variable that cause private domestic investment to rise due to the fact that high productivity per worker raises the total
output which leads to more investment as profits made could be reinvested. As a corollary or follow up, a rise in national output spurs private investors to increase their investment opportunities in order to reap the benefits of rising output in the economy. Inflation does not support investment growth as can be seen in Table 5.5.4. The implication of this is that moderate inflation might be good for investors since they recoup the cost of investment easier during moderate rising price than at low and/or declining price. From the table, it could be observed that all the variables except inflation support (lay credence to) investment growth.

Table 5.5.4: Granger Causality Wald Tests of Private Domestic Investment and some Macroeconomic Variables in Nigeria

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi²</th>
<th>df</th>
<th>Prob &gt; chi²</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_lgfcap</td>
<td>d_lrrexp</td>
<td>2.635</td>
<td>2</td>
<td>0.041</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>d_lcexp</td>
<td>15.88</td>
<td>2</td>
<td>0.000</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>d_open</td>
<td>2.19</td>
<td>2</td>
<td>0.051</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>d_ap</td>
<td>2.23</td>
<td>2</td>
<td>0.039</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>d_lgdp</td>
<td>13.15</td>
<td>2</td>
<td>0.001</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>Inf</td>
<td>2.35</td>
<td>2</td>
<td>0.308</td>
</tr>
<tr>
<td>d_lgfcap</td>
<td>ALL</td>
<td>52.44</td>
<td>12</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

With the exception of recurrent expenditure, national output and inflation, all other variables are seen to cause the average productivity to increase. Output growth does not cause per unit output of labour to rise, rather it should be the reverse (i.e. average productivity causing the output growth to rise). It therefore follows that this result supports common sense. However, all other variables (capital expenditures, investment growth, and trade openness) contribute positively to the growth of productivity of labour.
Table 5.5.5: Granger Causality Wald Tests of Average Productivity of Labour and some Macroeconomic Variables in Nigeria

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>Prob &gt; ( \chi^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_ap</td>
<td>d_Irrexp</td>
<td>0.19516</td>
<td>2</td>
<td>0.907</td>
</tr>
<tr>
<td>d_ap</td>
<td>d_lcexp</td>
<td>5.45044</td>
<td>2</td>
<td>0.028</td>
</tr>
<tr>
<td>d_ap</td>
<td>d_open</td>
<td>3.40795</td>
<td>2</td>
<td>0.015</td>
</tr>
<tr>
<td>d_ap</td>
<td>d_lgfcap</td>
<td>4.66296</td>
<td>2</td>
<td>0.018</td>
</tr>
<tr>
<td>d_ap</td>
<td>d_lgdp</td>
<td>0.44112</td>
<td>2</td>
<td>0.802</td>
</tr>
<tr>
<td>d_ap</td>
<td>inf</td>
<td>0.45065</td>
<td>2</td>
<td>0.798</td>
</tr>
<tr>
<td>d_ap</td>
<td>ALL</td>
<td>12.345</td>
<td>12</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

The causality relationship between the output growth and other macroeconomic indicators can be analysed with the help of Table 5.5.6 below. Most of the variables under study have been causing output growth to rise as could carefully be observed in Table 5.5.6. These variables, private domestic investment, recurrent and capital expenditure, degree of trade openness and inflation, have been found to be causing the output to grow. Only average productivity of labour does not Granger-cause output to rise, a surprising result. However, in Table 5.5.5 output growth does not Granger cause average productivity to rise, implying that there is no causal link between the former (output growth) and the latter (average productivity of labour), and vice versa. As can be seen in Table 5.5.6, recurrent and capital expenditures cause output growth to increase whereas in Tables 5.5.1 and 5.5.2 output growth is seen to granger cause recurrent and capital expenditures. This means that there is bi-directional causality relationship between output growth and recurrent expenditures on one hand, and bi-directional relationship between capital expenditure and output growth, on the other. Similarly, trade openness and output growth have bi-directional causality (Table 5.5.3 compared with Table 5.5.6), and investment and output growth also have bi-focal causality with each other. The causal link between inflation and output growth shows
that Nigerian output growth requires moderate inflation; hence the causality runs from output growth to inflation.

Table 5.5.6: Granger Causality Wald Tests of Output Growth and some Macroeconomic Variables in Nigeria

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi²</th>
<th>df</th>
<th>Prob &gt; chi²</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_lgdp</td>
<td>d_lrexp</td>
<td>6.4097</td>
<td>2</td>
<td>0.041</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>d_lexp</td>
<td>2.202</td>
<td>2</td>
<td>0.333</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>d_open</td>
<td>1.7848</td>
<td>2</td>
<td>0.410</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>d_lgfcap</td>
<td>2.8296</td>
<td>2</td>
<td>0.243</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>d_ap</td>
<td>1.0064</td>
<td>2</td>
<td>0.605</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>inf</td>
<td>5.2882</td>
<td>2</td>
<td>0.071</td>
</tr>
<tr>
<td>d_lgdp</td>
<td>ALL</td>
<td>21.379</td>
<td>12</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

Only recurrent expenditure is the economic indicators used in this model that causes general price level to rise and all others which include capital expenditure, the degree of trade openness and average productivity of labour, output growth, and private investment do not as could be seen in Table 5.5.7. When an economy opens, more output will flow into the country; goods will be available for consumers to choose from, which eventually reduce prices (inflation). Recurrent expenditures of government cause inflation, which means that increase in public expenditures, can be inflationary if they are not controlled. Output growth does not cause inflation and implies that when output is not growing few goods will be available in the market and therefore create inflationary trend.
Table 5.5.7: Granger Causality Wald Tests of Inflation and some Macroeconomic Variables in Nigeria

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi²</th>
<th>df</th>
<th>Prob &gt; chi²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inf</td>
<td>d_lrrexp</td>
<td>6.0858</td>
<td>2</td>
<td>0.048</td>
</tr>
<tr>
<td>Inf</td>
<td>d_lcexp</td>
<td>0.9587</td>
<td>2</td>
<td>0.828</td>
</tr>
<tr>
<td>Inf</td>
<td>d_open</td>
<td>0.87091</td>
<td>2</td>
<td>0.647</td>
</tr>
<tr>
<td>Inf</td>
<td>d_lgfcap</td>
<td>0.90655</td>
<td>2</td>
<td>0.871</td>
</tr>
<tr>
<td>Inf</td>
<td>d_ap</td>
<td>0.76376</td>
<td>2</td>
<td>0.885</td>
</tr>
<tr>
<td>Inf</td>
<td>d_lgdp</td>
<td>0.97681</td>
<td>2</td>
<td>0.815</td>
</tr>
<tr>
<td>Inf</td>
<td>ALL</td>
<td>3.949</td>
<td>12</td>
<td>0.035</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

5.7.2: Results of Volatility (Response) of output to Shocks in Macroeconomic Variables

In order to determine the source of shocks to the output of Nigerian economy, the following impulse response charts were used. In Figure 5.1, it is observed that at the initial period, output growth is affected positively by the shocks from average productivity which lasts for about six years before dying out. Similarly, private domestic investment produces positive shocks initially which does not last long before dying out. Public expenditure also produces shocks which remain positive up to five years before dying out. Inflation and degree of trade openness do not produce much shock that could affect the output growth as could be seen in the Figure 5.1.
When the public expenditure is decomposed into recurrent and capital expenditure, we observe different structures in the shapes of the impulse response functions. The shocks from the capital expenditure (a component of public expenditure) are very strong on output growth. This variable (capital expenditure) transmits positive and strong shocks which take long time of about seven years before dying out.
Recurrent expenditure transmits positive and strong shocks to output growth from the initial period which diminishes gradually until it dies out after about 7 years. This is shown in the impulse response charts in Figure 5.2 above.

**5.5.3: Result of the Companion Matrix**

The stability test carried out, as shown in Table 5.5.8, shows that all the Eigen values lie inside the unit circle, and this satisfies the stability condition of the vector autoregressive (VAR) model
Table 5.5.8: Eigen value stability condition

<table>
<thead>
<tr>
<th>Eigen value</th>
<th>Modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.07975932 + .760161i</td>
<td>.764334</td>
</tr>
<tr>
<td>-.07975932 - .760161i</td>
<td>.764334</td>
</tr>
<tr>
<td>.6249544 + .599674i</td>
<td>.486794</td>
</tr>
<tr>
<td>.6249544 - .599674i</td>
<td>.486794</td>
</tr>
<tr>
<td>-.5046913 + .418179i</td>
<td>.410363</td>
</tr>
<tr>
<td>-.5046913 - .418179i</td>
<td>.410363</td>
</tr>
<tr>
<td>-.083345 + .418179i</td>
<td>.410363</td>
</tr>
<tr>
<td>-.083345 - .418179i</td>
<td>.410363</td>
</tr>
<tr>
<td>.3735566 + .373557i</td>
<td>.373557</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

Also, from the Figure 5.3 below, we observe that all the roots are outside the unit circle and/or the Eigen values are all inside the circle, which implies that the VAR process is stationary. The result confirms the fact that the VAR model estimated passed the Eigen value stability test.
5.6 Results of the Sectoral Impact of Public Expenditure on Economic Growth

Two models were run to make a comparison between two scenarios, namely, the Short-run Error Correction model and the Long-run Static model. The former is to be able to capture the short run dynamics in the sectoral public expenditures, whereas the long run model is to show how the sectoral public expenditures have behaved in relation to the output growth in the long-run. In each model different situations were posed to check on the results in order to ascertain actually the efficacy and the strength of the models used. These conditions include controlling for Heteroskedasticity in the robust equations and that of controlling for auto-covariance using Newey-West covariance matrix estimation.
5.6.1 Results of Short Run Error Correction Model of Sectoral Impact of Public Expenditure on Economic Growth

The Error-Correction model was analysed here to verify the short-run dynamics of the sectoral impacts of public expenditure. Just like the long-run analysis different equations were involved or estimated to take care of some problems that might be encountered. The different equations were estimated with Newey-West standard errors to control for unknown Heteroskedasticity and autocorrelation. However, the interpretation and analysis of the results is done with reference to the Newey-West estimation because it has been found to correct for unknown Heteroskedasticity and autocorrelation.

A close look at the Table 5.6.1 shows that the public expenditure on defence is not significantly affecting the output growth in Nigeria, even though it has a positive relationship with it. The explanation to this is that the impact of the expenditure on defence might not be felt in the short-run due to the intangible nature of this variable. For example, we may not feel the impact of improvement in security, peace and orderliness on output growth, especially in the short-run because these are intangible services. Unlike the defence expenditure, the public expenditure on education sector is statistically and significantly impacting on the output growth of Nigeria. A cursory look at Table 5.6.1 shows that expenditure on education is significant at 5%, and also shows that for all the estimations, the variable is important to the explanation of the improvement of output growth.

The public expenditure on health shows no statistical significance (at 5% level) for the estimated Newey-West equation, and also has a negative relationship with output.
growth, a sign that is not consistent with the a priori condition. This implies that public expenditure on education has no short-run impact on economic growth.

Table 5.6.1: Short Run Error Correction Model of Sectoral Impact of Public Expenditure on Economic Growth

<table>
<thead>
<tr>
<th>Variable</th>
<th>ecmols1</th>
<th>ecmnewey</th>
<th>ecm2robust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.121**</td>
<td>0.121***</td>
<td>0.121***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>D.log_defence</td>
<td>0.0257</td>
<td>0.0257</td>
<td>0.0257</td>
</tr>
<tr>
<td></td>
<td>(0.709)</td>
<td>(0.557)</td>
<td>(0.609)</td>
</tr>
<tr>
<td>D.log_educ</td>
<td>0.130**</td>
<td>0.130***</td>
<td>0.130***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>D.log_health</td>
<td>-0.0559</td>
<td>-0.0559</td>
<td>-0.0559</td>
</tr>
<tr>
<td></td>
<td>(0.158)</td>
<td>(0.155)</td>
<td>(0.167)</td>
</tr>
<tr>
<td>D.log_agricexp</td>
<td>0.0532</td>
<td>0.0532</td>
<td>0.0532</td>
</tr>
<tr>
<td></td>
<td>(0.079)</td>
<td>(0.015)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>D.log_constr</td>
<td>0.0541</td>
<td>0.0541**</td>
<td>0.0541**</td>
</tr>
<tr>
<td></td>
<td>(0.139)</td>
<td>(0.006)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>D.log_transcom</td>
<td>0.00845</td>
<td>0.00845</td>
<td>0.00845</td>
</tr>
<tr>
<td></td>
<td>(0.794)</td>
<td>(0.773)</td>
<td>(0.744)</td>
</tr>
<tr>
<td>D.log_gfcap</td>
<td>0.339</td>
<td>0.339</td>
<td>0.339</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>L.ecm</td>
<td>-0.164</td>
<td>-0.164</td>
<td>-0.164</td>
</tr>
<tr>
<td></td>
<td>(0.156)</td>
<td>(0.086)</td>
<td>(0.085)</td>
</tr>
<tr>
<td>Observations</td>
<td>51</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.351</td>
<td>0.351</td>
<td>0.351</td>
</tr>
<tr>
<td>adj. $R^2$</td>
<td>0.227</td>
<td>0.227</td>
<td>0.227</td>
</tr>
<tr>
<td>$AIC$</td>
<td>-32.51</td>
<td>-32.51</td>
<td>-32.51</td>
</tr>
<tr>
<td>$F$</td>
<td>2.837</td>
<td>7.285</td>
<td>4.681</td>
</tr>
</tbody>
</table>

*p-values in parentheses  * p < 0.05, ** p < 0.01, *** p < 0.001
Source: Stata software Output

Table 5.6.1 also shows that public expenditure on agricultural sector has a positive link with the output growth and also is significantly affecting the output growth in Nigeria at 5% level of significance. The public expenditure on building and construction is also positively related with output growth as the result explains. The results also show that in the Newey-West estimation, the variable is an important variable in explaining the expansion of the output in Nigeria.
However, the public expenditure on transport and communication is seen to have a positive link with output expansion, although the variable (transport and communication) is not statistically and significantly influencing output expansion, also shocking news in spite of the immense expansion in the sector. The level of investment has a positive relationship with the output growth of Nigeria and is significantly affecting (or promoting) the latter. The variable (investment) is statistically and significantly promoting the output growth at 1% level of significance. The error correction term is 0.164 and shows that it takes about 16.2% for the error in the past to be corrected and is statistically significant at 5% level of significance.

5.6.2 Results of Long Run Static Equation of Impact of Sectoral Government Expenditure on Growth

The long-run static model was estimated so as to compare the impact of sectoral public expenditures on the output growth in the long-run and that of the short-run discussed above. The log of defence sector has a positive relationship and impact on the output of Nigerian economy. A cursory look at the results in Table 5.6.2 shows that the defence expenditure is not statistically significant at any level of significance. With long-run Newey-West model, the defence expenditure shows no significant impact on growth rate of output, similar to Nurudeen and Abdullahi (2010) finding that military expenditure in Nigeria in the years 1970-2008 has not led to growth and development of the country. However, Adewara and Oloni (2012) found that expenditure on defence is positively related with economic growth, though not at a significant level, in line with Hewitt (1991a). Education expenditure does not show any significant impact on output growth in Nigeria. The implication of this finding is that public expenditure on education sector has not been impacting much on the output growth. This may be due to massive unemployment and migration of the youth.
to other countries. As a corollary to this is that the proportion of budget that goes to education sector is less compared to the other sectors. In other words, education expenditure receives less allocation than other sectors, thus receiving less impact from such expenditure. This finding supports that of Adewara and Oloni (2012) that education expenditure does not support economic growth due mass rent seeking behavior and brain drain of the youth.

Public expenditure on health is significantly affecting the growth of output. The results shown in Table 5.6.2 explains that the long-run static model identifies the significant impact of public health expenditure on output growth for the Newey-West covariance matrix estimation at 5% level. This finding supports the result of Prasetya and Pangestuty’s (2012) study of Indonesian economy that public expenditure on health has positive and significant influence on the variables of economic growth.

**Table 5.6.2: Long Run Static Model of Sectoral Impact of Public Expenditure on Economic Growth**

<table>
<thead>
<tr>
<th>Variable</th>
<th>longrunOls</th>
<th>Longrunnewey</th>
<th>longrun1rob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.720 ***</td>
<td>2.720 ***</td>
<td>2.032 ***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.001)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>log of defence exp</td>
<td>0.116</td>
<td>0.116</td>
<td>0.116</td>
</tr>
<tr>
<td></td>
<td>(0.161)</td>
<td>(0.067)</td>
<td>(0.097)</td>
</tr>
<tr>
<td>log of educ exp</td>
<td>0.154</td>
<td>0.154</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td>(0.423)</td>
<td>(0.516)</td>
<td>(0.606)</td>
</tr>
<tr>
<td>log of health exp</td>
<td>0.145 *</td>
<td>0.145 *</td>
<td>0.156</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.039)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>log of agric expen</td>
<td>0.0121</td>
<td>0.121</td>
<td>0.281</td>
</tr>
<tr>
<td></td>
<td>(0.146)</td>
<td>(0.048)</td>
<td>(0.336)</td>
</tr>
<tr>
<td>log of contraction exp</td>
<td>0.0203</td>
<td>0.0203</td>
<td>0.0203</td>
</tr>
<tr>
<td></td>
<td>(0.688)</td>
<td>(0.719)</td>
<td>(0.657)</td>
</tr>
<tr>
<td>log of transport exp</td>
<td>0.591 *</td>
<td>0.591 *</td>
<td>0.591</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.006)</td>
<td>(0.684)</td>
</tr>
<tr>
<td>log of capt formation</td>
<td>0.559 *</td>
<td>0.559 *</td>
<td>0.599</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.994</td>
<td>0.994</td>
<td>0.993</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.993</td>
<td>0.993</td>
<td>0.993</td>
</tr>
<tr>
<td>AIC</td>
<td>-17.47</td>
<td>-17.47</td>
<td>-17.47</td>
</tr>
<tr>
<td>BIC</td>
<td>-33.08</td>
<td>-33.08</td>
<td>-33.08</td>
</tr>
<tr>
<td>F</td>
<td>1064.5</td>
<td>1522.9</td>
<td>2096.5</td>
</tr>
</tbody>
</table>

**p-values in parentheses:** * p < 0.05, ** p < 0.01, *** p < 0.001
Source: Stata software Output
The Table 5.6.2 also shows that public expenditure on agricultural sector is significantly affecting the growth of output in Nigeria at 5% level. The implication of this is that the public expenditure on agriculture is significantly boosting the productivity of output in Nigeria, signifying that agricultural policies are correctly implemented.

The result shows that public expenditure on building and construction sector is not statistically and significantly affecting output growth at any level. It might be explained that the expenditure on construction does not significantly affect the output growth, possibly due to ineffective use of resources. Most of the constructions being undertaken are either left uncompleted or abandoned before the projects reach any progressive stage. One might conclude that corruption might be the cause of the non-implementation and non-completion of most of all the projects (constructions) which are undertaken by the public.

The public expenditure on transport and communication, unlike building and construction, is statistically significant. The result shows that transport and communication sector is an important sector that has a lot of contribution to the productivity of Nigerian economy. Gross fixed capital formation (proxy for private domestic investment) is statistically significant for the models at 1% level of significance. This implies that investment is a key variable influencing the output growth in Nigeria.

The coefficient of multiple determination ($R^2$) is 0.994 with the adjusted $R^2$ of 0.993 showing that the model explains about 99% of the variation in the output growth in
Nigeria. The F-statistic of 1522.9 shows that the model is significantly robust and the model is a good fit.

5.7 Evaluation of Research Hypotheses

**Hypothesis 1:** The size of the public sector cannot be determined.

**Decision Rule:** Reject $H_{01}$ if $t_{cal} > t_{tab}$, accept $H_0$ otherwise.

**Conclusion:** From the result discussed in section 5.3 (Table 5.2, p.86 and Table 5.3, p. 87) the ratio of government revenue to GDP, output growth rate (national income), external debt, and domestic debt are the determinants of the size public expenditure in the short run, but in the longer period, all the variables except public debts (domestic and external) are not important determinants of the size of the public sector. These factors have been identified (in this research) to influence the size of the public expenditure. From this, we can conclude that the size of the public sector can be determined, and we therefore reject the null hypothesis that the size of the public sector cannot be determined.

**Hypothesis 2:** The Public expenditure has no significant effects on the macroeconomic indicators.

**Decision Rule:** Reject $H_{01}$ if $t_{cal} > t_{tab}$, accept $H_0$ otherwise.

**Conclusion:** Following the results shown in Table 5.5.3 (p. 92), it was found that in the long-run the public expenditure does not significantly affect the output growth of Nigerian economy, whereas in the short-run (Table 5.4.2, p. 90) public expenditure contemporaneously and significantly influences the output growth. For the long-run model, we accept $H_0$ and conclude that public expenditure has no significant effect on
economic growth. In the short-run, we reject $H_o$ and conclude that public expenditure significantly affect output growth (economic growth).

**Hypothesis 3**: There is no transmission of structural shocks between public expenditure and the macroeconomic indicators.

**Decision Rule**: Reject $H_{01}$ if $t_{cal} > t_{tab}$, accept $H_o$ otherwise.

From the impulse response charts, it was observed that shocks transmit from average productivity, private investment, aggregate public expenditure and degree of trade openness to output growth in Nigeria, although the shocks from degree of trade openness do not have impact on output growth. Also, from Figure 5.2 (p. 103), shocks from both recurrent and capital expenditures affect the output growth.

**Conclusion**: From the above, we can conclude that shocks are transmitted from public expenditure to some other macroeconomic variables. We therefore reject $H_o$ and conclude that shocks pass from public expenditures to output growth in Nigeria. Also, from the stability test we observe that all the roots are outside the unit circle and/or the Eigen values are all inside the circle, which implies that the VAR process is stationary and efficient. The result confirms the fact that the VAR model estimated passed the Eigen value stability test.

**Hypothesis 4**: The sectoral spending of the government has no significant effects on output growth.

**Decision Rule**: Reject $H_{01}$ if $t_{cal} > t_{tab}$, accept $H_o$ otherwise.

**Conclusion**: From the results in Table 5.6.1 (p. 107), we have seen that, in the short-run, public expenditures on defence, health and, transport and communication are not significantly promoting output growth in Nigeria, whereas expenditures on education and agriculture, building and construction, and private domestic investment have
significant contribution to output growth. And, in Table 5.6.2 (p.109), we see that expenditures on health, agriculture, transport and communication, and private domestic investment are statistically and significantly affecting the growth of output in Nigeria, but public expenditure on defence, education, agriculture, and building and construction do not. We can conclude that with the exception of education sector and other insignificant variables, we reject $H_0$ for all other variables and conclude that they are significantly affecting the output growth in Nigeria.

### 5.8 Policy Implications of the Research Findings

From the analysis of the determinants of the size of the public sector, we have seen that the size of revenue is an important factor in determining the size of the government. The implication is that for government expenditure to expand there is necessity to expand the revenue base also. The private investment is also a key factor for public expenditure growth in Nigeria. There is the need to provide congenial environment for private investment growth so as to boost both public expenditure and output growth.

The growth rate of output of the economy is positively influencing the size of the government. The higher the output growth (national income), the higher will be the size of the public sector. The implication is that when the output (income) expands, the government should direct its expenditure programmes to those areas that would expand the output further.

National debts (both domestic and external) are important factors in explaining the variation in the size of public expenditure in Nigeria in the short run. External debts
have a negative relationship with the size of the public sector in the long-run and a positive relationship in the short-run, but do not significantly affect the latter only in the long-run and do so in the short-run. This shows that debts are incurred to offset some imbalances in the short-run, but in the long-run due to the some commitments in the debt obligations, the influence of accumulated debts could crowd out public expenditure. Similarly, the domestic debts affect the size of public spending in the short-run; however, it has no significant impact on the long-run spending of the government. When the government consistently accumulates these debts, they tend to affect the government’s spending capacity, and therefore affect the size of the spending of the government. This could be in the form of debt services, payment of interest rates on these debts, and other expenses that could be made on the accumulated debts, which usually affect the resources available for government to spend in the long-run.

On the impact of public expenditure on output growth, the non-significance of inflation shows that though inflation has a positive sign, it does not significantly influence output growth. This implies that moderate inflation does not affect output growth in Nigeria, which supports the findings of Gary Moser (1995). Exchange rate is positively but insignificantly related to output growth as can be seen from the result, implying that changes in exchange rate affect the growth rate of output significantly; therefore, any policy directed toward exchange rate should be carefully handled because it would seriously affect output. The degree of trade openness is another factor (from the finding) that has a positive link with economic growth, although it is not significant. But the implication of this is that, adjustment (reduction) in the trade barriers would go a long way in fostering growth of the economy.
The results also show that private investment is a key driver for economic growth both in the short-run and long-run. The implication is any policy that is directed to improving investment will have significant improvement on economic growth of Nigeria. It is also found that public expenditure has a lot of impact on economic growth of the economy only in the short-run. In this sense, it means that government expenditure can be used to project growth of the economy in the short-run, whereas when the economy stabilizes in the long-run, public expenditure rise would have helped to grow the economy and to coordinate economic activities and raise growth.

The VAR model was used to determine how the two classifications of public expenditure (recurrent and capital expenditures) relate with other macroeconomic variables. The Granger-Wald causality test conducted shows that capital expenditure (of government), degree of trade openness, average productivity of labour, national output, and inflation respectively cause the recurrent expenditure to rise, while only the private investment does not. The implication is that, with an increase in capital expenditure, the recurrent expenditure expands because an increase in expenditures on capital projects will necessitate the expenditure on those administrative efforts to coordinate, monitor, appraise, and evaluate the projects undertaken through capital expenditure. In similar manner, a reduction in trade restriction (the more Nigeria becomes more open), there will be an increase in recurrent expenditures such as the cost of administration, managing trade policies, controlling the nature and types of goods coming into the country. When the national output (income) rises, the public expenditure is bound to rise, thus supporting Wagner’s Law that income is a key factor that causes expenditure of government to rise. Inflation also causes the
recurrent expenditure to rise, due to the fact at inflationary periods, more money is spent to procure the same quantity of goods.

The Wald’s causality relationship shows that only the national output Granger cause the public expenditures on capital goods to change, still lending credence to Wagner’s Law. From the test on the degree of trade openness, public expenditures on recurrent and capital goods, and output growth cause the degree of trade openness to change. The implication is that, rises in public expenditures, which the nation has produced output growth can lead to opening up of borders for movement of goods and services to and fro other countries.

The test also confirms that public expenditures on capital goods, average productivity of labour, and output growth cause the private investment to rise. This implies that expenditures on infrastructure and other social capital goods improve the environment for private domestic investment to thrive. In similar way, when per unit of labour output and national output are respectively rising, output expands and the private sector makes more profits and tends to plan for more investment.

The causal link between inflation and recurrent expenditures shows bi-directional relationship and as such, when recurrent expenditure rises, the general price level is bound to rise, and that rising price level could also raise the level of public recurrent expenditure. This signifies that the government should be careful in her expenditures on non-tangible output (recurrent) as they could produce inflation. The output growth and inflation have bi-focal causal relationship signifying that the nation needs moderate inflation for economic growth to take place.
From the analysis of impulse response function using the charts show that fluctuations in average productivity of labour affects the output growth significantly. Also, the shocks from private domestic investment significantly and positively affect the output growth for about four years before dying out. In the same way, there exist some positive and strong shocks transmitting from public expenditure and economic growth. The implication of this is that any shock emanating from any of these variables will definitely affect the output movement in Nigeria. It also means that policy makers should be cautious of certain rapid adjustments that are at times made to these variables or policies that could affect these variables because they could bring growth if such policies intend to achieve positive results, otherwise they would become inimical (harmful) to the economy.

When the aggregate public expenditure is decomposed between recurrent and capital, we observe that capital expenditure exerts a very strong and large impact on the output growth. The magnitude of such impact is such that it even stays long before dying off. In the same vein, recurrent expenditure exerts even similar, if not more, impact on the growth rate of output than the capital expenditure. This implies that even at the decomposition of the public expenditures, the influence of shocks from the public sector is large on the output growth in Nigeria. The shock from the private domestic investment is also positive and strong, and oscillates from the beginning, which means that such a shock has a lot of impact in determining the movement of the output of the nation.

On the sectoral impact of public expenditures, the implication of the non-significance of the defence expenditure in the short run shows that such expenditure does not
contribute much to the growth of Nigerian economy, while in the long run, when the nation has peace and stability, growth can be enhanced. Education and agriculture sectors have shown to be significantly contributing immensely to the growth of output of Nigerian economy. This implies that policies implemented toward achieving the growth of the two sectors would also achieve the growth of the entire output of the economy in the short run.

Health expenditures have negative sign, meaning that as expenditures on the sectors increase, the output growth declines. This result also shows the non-statistical significance of the variable, implying that such expenditures are not growth enhancing in the short-run. However, in the long-run, health, agriculture, transport and communication, and private domestic investment expenditures are all significantly affecting national output growth and promote growth, while building and construction, defence and education are found to be insignificantly affecting output growth. It could mean that either the policies are well not implemented or that corruption is at work, and therefore policy makers should look into the expenditure programmes of the sectors so as to find the causes of non-significance of the variable.
CHAPTER SIX

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

6.1 Summary of Research Findings

The results of this thesis have been extensively discussed in chapter five as can be found above. These results of the research have four major sections, namely, the determinants of the size of the public sector results, the impact of public expenditure on the output growth results, volatility model result, and the impact of sectoral public expenditure on the output growth results. In the discussion of the determinants of the size of the public sector, both the short-run error correction model and the long-run static equations were estimated to observe whether there would be differences in the results from the short-run and long-run analyses. From the results of the determinants of the size of the public sector, it was found that the size of the government revenue is a key determinant of the size of the public sector, both in the short-run and in the long-run. Gross domestic private investment is also a key determinant of the size of the public sector both in the short-run and long-run, as the variable is found to be significantly affecting the latter. However, the output growth was found to be one of the key determinants of the size of government, both for the short term and long-run. The implication of this is that economic growth (growth in national income) propels the expansion of the public sector (government spending).

Public debts (external and domestic) showed negative signs contrary to the a priori and theoretically determined positive sign. In the short-run both the external and domestic debts are contemporaneously affecting the size of the public expenditure. This looks somewhat realistic because in the short-run, the government makes these domestic borrowings to offset some imbalances in its expenditure programmes. The
implication is that, government borrows for stabilisation policies, especially in the short-run, and may not have immediate impact on the public spending. However, in the long-run, both external and domestic debts have both negative and insignificant links with the size of the public spending. The negative signs imply that these debts might be reducing the government spending due to debts obligations like interest payments, debt servicing and other debt obligations.

On the impact of public expenditure on economic growth, error correction models (robust estimation) were used to observe the short-run dynamics and the long-run estimations (including robust estimation) to control for Heteroskedasticity. The relationship between inflation and output is positive and non-significant both in the short-run and long-run and both for the robust estimations, implying that inflation is not a factor affecting the output growth in Nigeria. This study shows that nominal exchange rate affects the output growth positively and significantly in the long-run, but is not significantly affecting the output in the short-run; and therefore can be used as a macroeconomic economic adjustment tool.

From the result, the degree of trade openness, although has positive relationship with economic growth (both in the short term and long-run), is significantly affecting the output of the economy in the long-run and not in the short-run. Private domestic investment and output relationship is positive. In the short term, only the robust model has significant relations with output growth; however, the long-run models have significant contributions to economic growth in Nigeria. Public expenditure has a strong and positive, but significant relationship with output growth in the short-run, while the relationship between them is also positive, but insignificant in the long-run.
This implies that public expenditure can be growth enhancing in the short-run, whereas it may not be propelling growth in the long-run, because public spending would serve as a coordinating instrument for economic activities rather than for growth.

In order to analyse the volatility of some macroeconomic variables, the VAR model, causality tests, impulse response charts were all used to determine how the volatility of public expenditures affect those of other variables. From the results, it was shown that government capital expenditure, degree of trade openness, output growth rate, average productivity of labour and inflation could cause recurrent expenditure to rise. The results also revealed that recurrent expenditure, private domestic investment and output growth rate cause government capital expenditure to rise. Similarly, recurrent expenditure, capital expenditure and national output growth cause the degree of trade openness to change as the latter changes, while government recurrent and capital expenditure, average productivity of labour, degree of trade openness and output growth rate cause private domestic investment to change. Only recurrent expenditure causes output growth to change, whereas only recurrent expenditures are inflationary.

The results showed that there are bi-directional relationships between recurrent and capital expenditures, private domestic investment and government capital expenditure, growth rate of national output and recurrent expenditure, and degree of trade openness and recurrent expenditure.
Using impulse response charts it was shown, in the results, that the volatility of aggregate public expenditures affects the output growth. In similar way, when this aggregate was decomposed into recurrent and capital expenditures, it was found that the shocks from each of the components have very significant impact on the volatility of output growth. The shocks from private domestic investment and the degree of trade openness also influence that of output growth rate. The result of the stability test of VAR model shows that the model is efficient in estimating the relationship between all the variables used.

In estimating the sectoral impact of public expenditure on output growth, two models were used, namely, the short-run error correction models to estimate the short-run dynamics of impact of sectoral public expenditure and the long-run static models, to estimate the long-run relationships. The short-run ECM shows that the public expenditure on defence is not significantly affecting the output growth in Nigeria, even though it has a positive relationship with it; unlike the defence expenditure, the public expenditure on education sector is statistically and significantly impacting on the output growth of Nigeria only in the short-run. Public expenditure on health sector has a negative sign in the short-run, contrary to the expected sign, but a positive sign, and is statistically significant only in the long run. The result also shows that public expenditure on agricultural sector has a positive and significant link with the output growth both in the short and long runs. The public expenditure on building and construction is also positively related with output growth in the long run but negative and significant in the short run. The results also show that model for Newey-West, the variable is important variable in explaining the expansion of the output in Nigeria in the short run. The transport and communication sector has shown significant
improvement in the country, it does reflect in the output growth because it is seen to have a positive link and significant relationship with output expansion in the long run. The level of investment has a positive and significant relationship with the output growth of Nigeria at both 5% and 1%, which signifies that private investment is an important factor for economic growth in Nigeria.

In the long-run, the defence expenditure of government also shows to be statistically insignificant in its relationship with output growth, implying that both in the short- and long-runs, defence expenditures do not affect national output. However, education expenditure does not affect output growth in the long-run, which means that the expenditures on (allocations to) education might not be enough to have significant impact on output. The long-run static equations show that health expenditures contribute significantly to output growth as opposed to what the short-run models portray. This signifies that in the short-run, the impact of expenditures on health may not be prominent to be noticed, whereas in the long term, it becomes glaring.

In similar manner, the public expenditure on building and construction shows it is significant only in the long run and statistically insignificant in the short run, although with mixed signs (negative in the short run and positive in the long run). The significance of the public expenditure on agricultural sector shows that the budget allocation to the agricultural sector is contributing positively the growth and expansion of output of Nigeria. Out of the static equations, public expenditure on construction sector is not statistically significant at any levels in the long run. A significant number of public projects are either left uncompleted or abandon before the projects reach any progressive stage. One might conclude that corruption might be
the cause of the non-implementation and non-completion of most of all the projects (constructions) which are undertaken at the public circles. Finally, private domestic investment is a key variable for output growth and expansion.

6.2 Policy Recommendations.

Following the discussions of research findings, it becomes expedient that deductions from the findings be made to support or advice policy makers and implementers on the best way(s) to handle policy issues and programmes. In the light of this, the following policy recommendations and suggestions are germane to ensure progress and growth of the Nigerian economy:

i. Since government revenue is a key factor in determining the size of public sector, the revenue base should be expanded beyond oil sector to include other unexploited solid minerals, agricultural exports and other avenues that could increase the revenue base.

ii. Conducive (Congenial) environment (Improvement in security, peace and order, low interest rate, social infrastructure, etc) should be provided so as to boost private domestic investment, which will increase domestic output and public expenditure.

iii. It is advisable that the governments at all levels be very cautious on the manner they accumulate debts. This is because external debts significantly reduces the size of the public sector both in the short and longer runs due to some debt obligations that are included in the schedules. Similarly, domestic debts affect the size of the public sector. The implication is that government should control its expenditure programmes so that it will not plunge itself into unsustainable debts.

iv. The monetary authorities should be watchful in manipulating the price targets as this would be helpful in controlling both inflation and exchange rates fluctuations. Policies that could generate moderate rise in prices is germane to
output growth since inflation does not affect output growth significantly.

v. Since public expenditure on capital goods cause private domestic investment to rise, it then implies that the provision of social infrastructures provides avenues for private investment to increase. The government at all levels should, as a matter of necessity, provide these social infrastructures so as to boost private investment and growth.

vi. The government should exercise some restraint in its use of recurrent expenditure because it is inflationary and can worsen the economic situations.

vii. Policy makers should re-examine and evaluate the policies and expenditures in defence, education, building and construction, sectors with a view to finding why the policies are not growth enhancing sectors.

6.3 Conclusion

This study has been able to unravel the puzzle of what determines the size of the public sector in Nigeria. From the findings, it was discovered that the revenue base is a key variable in the explanation of the size of the public sector. Also, growth rate of national output, external and domestic debts are other important factors that account for the size of the public sector. Public debts (external and domestic) affect the government spending negatively signifying that after using them (debts) to offset imbalances in the expenditure programmes, further borrowings would be counterproductive as government would be tied to face with some debt obligations – interest payments, debt servicing, repayments, rescheduling, etc.

This study also revealed that inflation does not affect the output growth, which implies that moderate inflation is good to ginger output growth. Exchange rate, trade openness and private domestic investment are seen to affect the output growth in the
long-run, but exchange rate does not in the short-run. Public expenditure has strong positive link with output growth in the short-run, but has insignificant relations in the longer period, which means that public expenditure is growth propeller in the short-run, but in the long-run public expenditure tends to crowd out other growth-enhancing indicators (variables).

Shocks from aggregate public expenditure do affect those of output growth but when decomposed into recurrent and capital expenditures, their shocks were observed also to influence other variables (indicators) such as output growth, private domestic investment, degree of trade openness, and average productivity of labour. It was also observed that the causality relationships between the recurrent and capital expenditures and other economic variables are interesting and worth observing and monitoring.

The impact of sectoral expenditures of government on output growth revealed a lot of ideas that defence expenditures do not affect the output growth both in the shorter and longer periods although it has positive link with output. Education expenditures have strong contributions to output growth in the short-run but weak in its action on the latter in the longer periods. The health expenditure is not important in explaining output growth in the short-run but become very important in the long-run. Expenditure on building and construction sector has not been important factor for economic growth having been contributing less significantly to growth of the economy, due to the influence of possible problems of improper implementation of the policies.
Conclusively, public expenditure in Nigeria has some mixed results. At some points it plays major key roles for growth but at other times it does not contribute much for economic growth.

6.4 Contributions to Knowledge

This thesis is unique because there are some positive contributions of this study to the existing body of knowledge. There are landmarks (break through) in the research findings as could be seen in the following:

i. This thesis has been able to classify the determinants of public expenditure into short run and long run. Some variables influence the government spending in the short run while some others affect it in the long run, while others still affect it at both periods.

ii. Public expenditure can significantly affect the output growth only in the short run when the economy is undergoing some adjustments to take off for growth and development. In the long run, when the economy stabilizes, increase in public spending does not significantly boost output.

iii. This thesis has also joined other scholars in finding the causal links between public spending and economic growth, and some other macroeconomic variables.

iv. This thesis has shown how volatility in public spending affects the output growth; through the use of charts, we have shown the influence of shock from public spending on output growth and other macroeconomic variables.

v. Again, the thesis has also made landmark in finding that contrary to the common beliefs some sectoral public spending do not significantly affect the growth rate of output in Nigeria.

6.5 Suggestions for Further Research

Now that the determinants, the impact of, the influence of shocks from, and the sectoral impact of public expenditures have been studied in this thesis, further
researches are necessary to determine which of the public spending is (are) productive and which is (are) pro-poor. These researches will have a lot policy relevance and input to the Nigerian economy.
References


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APPENDICES

APPENDIX I

DETERMINANTS OF THE SIZE OF THE PUBLIC SECTOR

A). STATIONARITY TESTS

Test of Stationarity of GDP Growth rate (Level Form)

\[ . \text{dfuller log\_rgdp\_growth} \]

Augmented Dickey-Fuller test for unit root \ Number of obs = 51

\[ \text{Test Statistic} \quad \text{Value} \]

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>1% Critical</th>
<th>5% Critical</th>
<th>10% Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z(t)</td>
<td>0.836</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
</tr>
</tbody>
</table>

MacKinnon approximate p-value for Z(t) = 0.9922

Source: Stata Software Output

Test of Stationarity of GDP Growth rate (order 1)

\[ \text{dfuller d.log\_rgdp\_growth} \]

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

\[ \text{Test Statistic} \quad \text{Value} \]

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>1% Critical</th>
<th>5% Critical</th>
<th>10% Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z(t)</td>
<td>-5.648</td>
<td>-3.580</td>
<td>-2.930</td>
<td>-2.600</td>
</tr>
</tbody>
</table>

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output

Test for Stationarity of real Investment (Level Form)

\[ \text{dfuller log\_gfcap} \]

Augmented Dickey-Fuller test for unit root \ Number of obs = 51

\[ \text{Test Statistic} \quad \text{Value} \]

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>1% Critical</th>
<th>5% Critical</th>
<th>10% Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z(t)</td>
<td>-0.691</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
</tr>
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Source: Stata Software Output
### Test of Stationarity of Real Investment (order 1)

```
\text{dfuller d.log\_gfcap}
Augmented Dickey-Fuller test for unit root Number of obs = 50

\begin{tabular}{llll}
Test & 1\% Critical & 5\% Critical & 10\% Critical \\
\hline
Statistic & Value & Value & Value \\
\hline
Z(t) & -5.096 & -3.580 & -2.930 & -2.600 \\
\end{tabular}

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output
```

### Test of Stationarity for public expenditure (Level Form)

```
\text{dfuller log\_pubexp}
Augmented Dickey-Fuller test for unit root Number of obs = 51

\begin{tabular}{llll}
Test & 1\% Critical & 5\% Critical & 10\% Critical \\
\hline
Statistic & Value & Value & Value \\
\hline
Z(t) & -1.147 & -3.579 & -2.929 & -2.600 \\
\end{tabular}

MacKinnon approximate p-value for Z(t) = 0.6961

Source: Stata Software Output
```

### Test of Stationarity for public expenditure (order 1)

```
\text{dfuller d.log\_pubexp}
Augmented Dickey-Fuller test for unit root Number of obs = 50

\begin{tabular}{llll}
Test & 1\% Critical & 5\% Critical & 10\% Critical \\
\hline
Statistic & Value & Value & Value \\
\hline
\end{tabular}

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output
```

### Test of Stationarity for external debt (Level Form)

```
\text{dfuller log\_extdebt}
Augmented Dickey-Fuller test for unit root Number of obs = 51

\begin{tabular}{llll}
Test & 1\% Critical & 5\% Critical & 10\% Critical \\
\hline
Statistic & Value & Value & Value \\
\hline
Z(t) & -1.231 & -3.579 & -2.929 & -2.600 \\
\end{tabular}

MacKinnon approximate p-value for Z(t) = 0.6599

Source: Stata Software Output
```
Test of Stationarity for external debt (order 1)

dfuller d.log_extdebt
Augmented Dickey-Fuller test for unit root Number of obs = 50

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<tr>
<th>Test</th>
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<th>5% Critical</th>
<th>10% Critical</th>
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</thead>
<tbody>
<tr>
<td>Statistic</td>
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<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Z(t)</td>
<td>-5.458</td>
<td>-3.580</td>
<td>-2.930</td>
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</tbody>
</table>

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output

Test of Stationarity for domestic debt (Level Form)

dfuller log_domdebt
Augmented Dickey-Fuller test for unit root Number of obs = 51

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<tr>
<th>Test</th>
<th>1% Critical</th>
<th>5% Critical</th>
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</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Value</td>
<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Z(t)</td>
<td>-2.533</td>
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MacKinnon approximate p-value for Z(t) = 0.1077

Source: Stata Software Output

Test of Stationarity for domestic debt (order 1)

Dfuller d.log_domdebt
Augmented Dickey-Fuller test for unit root Number of obs = 50

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<th>5% Critical</th>
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</thead>
<tbody>
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<td>Statistic</td>
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<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Z(t)</td>
<td>-6.353</td>
<td>-3.580</td>
<td>-2.930</td>
</tr>
</tbody>
</table>

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output

Test of Stationarity for the Size of Revenue (Level Form)

Dfuller log_revratio
Augmented Dickey-Fuller test for unit root Number of obs = 51

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<tr>
<th>Test</th>
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<th>5% Critical</th>
<th>10% Critical</th>
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</thead>
<tbody>
<tr>
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<td>Value</td>
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<td>Z(t)</td>
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MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output
B). RESULTS OF SHORT RUN AND LONG RUN MODELS OF DETERMINANTS OF GOVERNMENT SIZE IN NIGERIA

A: Short Run Impact of determinants of Size

<table>
<thead>
<tr>
<th></th>
<th>ECM0ls</th>
<th>ECMrobust</th>
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</thead>
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<td>D.rev ratio</td>
<td>2.699*</td>
<td>2.699*</td>
<td>2.199*</td>
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<tr>
<td></td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.150)</td>
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<tr>
<td>D.log_gfcap</td>
<td>1.787*</td>
<td>1.787*</td>
<td>2.230*</td>
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<tr>
<td></td>
<td>(0.011)</td>
<td>(0.042)</td>
<td>(0.098)</td>
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<tr>
<td>D.gdp_growth</td>
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<td>0.186**</td>
<td>0.122</td>
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<tr>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
<td>(0.174)</td>
</tr>
<tr>
<td>D.log_domdebt</td>
<td>2.563***</td>
<td>2.563***</td>
<td>3.409</td>
</tr>
<tr>
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<td>(0.000)</td>
<td>(0.007)</td>
<td>(0.067)</td>
</tr>
<tr>
<td>D.log_extdebt</td>
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<td>0.676*</td>
<td>0.320</td>
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<tr>
<td></td>
<td>(0.047)</td>
<td>(0.013)</td>
<td>(0.438)</td>
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<td>L.Residuals</td>
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<td>-1.112***</td>
<td>-0.955*</td>
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<tr>
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<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.251)</td>
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<td>L.Fitted values</td>
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<td>(0.174)</td>
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<tr>
<td>Constant</td>
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<td>0.138</td>
<td>0.729</td>
</tr>
<tr>
<td></td>
<td>(0.553)</td>
<td>(0.693)</td>
<td>(0.174)</td>
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<td>52</td>
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<tr>
<td>$R^2$</td>
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<td>0.758</td>
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</tr>
<tr>
<td>Adjusted $R^2$</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>BIC</td>
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</tr>
<tr>
<td>F</td>
<td>22.51</td>
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<td>MSE</td>
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*p-values in parentheses  * $p < 0.05$,  ** $p < 0.01$,  *** $p < 0.001$

Source: Stata Software Output

B: Long Run Equation of Determinants of Size

<table>
<thead>
<tr>
<th></th>
<th>longrun1</th>
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<tr>
<td>rev ratio</td>
<td>1.013*</td>
<td>1.013*</td>
<td>1.013*</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.301)</td>
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<td>0.790**</td>
<td>0.790</td>
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<tr>
<td></td>
<td>(0.003)</td>
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<td>gdp_growth</td>
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<td></td>
<td>(0.157)</td>
<td>(0.005)</td>
<td>(0.257)</td>
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<td>-0.628</td>
<td>-0.628</td>
</tr>
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<td>(0.247)</td>
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<td>log_extdebt</td>
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<td>-0.156</td>
<td>-0.156</td>
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<td>-2.242*</td>
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<td>(0.041)</td>
<td>(0.156)</td>
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<td>Observations</td>
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<td>52</td>
<td>52</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.242</td>
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<tr>
<td>Adjusted $R^2$</td>
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<td>AIC</td>
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</table>

*p-values in parentheses  * $p < 0.05$,  ** $p < 0.01$,  *** $p < 0.001$

Source: Stata Software Output
APPENDIX II

IMPACT OF AGGREGATE PUBLIC EXPENDITURE ON ECONOMIC GROWTH IN NIGERIA

A). UNIT ROOT TESTS

Test of Stationarity for inflation rate (Level Form)

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>Augmented Dickey-Fuller test for unit root</td>
</tr>
<tr>
<td>---------------- Interpolated Dickey-Fuller ----------------</td>
</tr>
<tr>
<td>Test</td>
</tr>
<tr>
<td>Statistic</td>
</tr>
<tr>
<td>Z(t)</td>
</tr>
<tr>
<td>MacKinnon approximate p-value for Z(t) = 0.00</td>
</tr>
</tbody>
</table>

Source: Stata Software Output

Test of Stationarity for Nominal exchange rate (Level Form)

<table>
<thead>
<tr>
<th>dfuller exr</th>
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</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test for unit root</td>
</tr>
<tr>
<td>---------------- Interpolated Dickey-Fuller ----------------</td>
</tr>
<tr>
<td>Test</td>
</tr>
<tr>
<td>Statistic</td>
</tr>
<tr>
<td>Z(t)</td>
</tr>
<tr>
<td>MacKinnon approximate p-value for Z(t) = 0.9919</td>
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</table>

Source: Stata Software Output

Test of Stationarity for Nominal exchange rate (order 1)

<table>
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<tr>
<th>dfuller d.exr</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>---------------- Interpolated Dickey-Fuller ----------------</td>
</tr>
<tr>
<td>Test</td>
</tr>
<tr>
<td>Statistic</td>
</tr>
<tr>
<td>Z(t)</td>
</tr>
<tr>
<td>MacKinnon approximate p-value for Z(t) = 0.0000</td>
</tr>
</tbody>
</table>

Source: Stata Software Output
Test of Stationarity for Degree of Trade Openness (Level Form)

\[
\text{dfuller log\_open}
\]
Augmented Dickey-Fuller test for unit root  Number of obs  =  51

\[\begin{array}{cccc}
\text{Test} & 1\% \text{ Critical} & 5\% \text{ Critical} & 10\% \text{ Critical} \\
\text{Statistic} & \text{Value} & \text{Value} & \text{Value} \\
Z(t) & -1.564 & -3.579 & -2.929 & -2.600 \\
\end{array}\]

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output

Test of Stationarity for Degree of Trade Openness (order 1)

\[
\text{dfuller d.log\_open}
\]
Augmented Dickey-Fuller test for unit root  Number of obs  =  50

\[\begin{array}{cccc}
\text{Test} & 1\% \text{ Critical} & 5\% \text{ Critical} & 10\% \text{ Critical} \\
\text{Statistic} & \text{Value} & \text{Value} & \text{Value} \\
Z(t) & -9.037 & -3.580 & -2.930 & -2.600 \\
\end{array}\]

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output

Test of Stationarity of GDP Growth rate (Level Form)

\[
. \text{dfuller log\_rgdp\_growth}
\]
Augmented Dickey-Fuller test for unit root  Number of obs  =  51

\[\begin{array}{cccc}
\text{Test} & 1\% \text{ Critical} & 5\% \text{ Critical} & 10\% \text{ Critical} \\
\text{Statistic} & \text{Value} & \text{Value} & \text{Value} \\
Z(t) & 0.836 & -3.579 & -2.929 & -2.600 \\
\end{array}\]

MacKinnon approximate p-value for Z(t) = 0.9922

Source: Stata Software Output

Test of Stationarity of GDP Growth rate (order 1)

\[
\text{dfuller d.log\_rgdp\_growth}
\]
Augmented Dickey-Fuller test for unit root  Number of obs  =  50

\[\begin{array}{cccc}
\text{Test} & 1\% \text{ Critical} & 5\% \text{ Critical} & 10\% \text{ Critical} \\
\text{Statistic} & \text{Value} & \text{Value} & \text{Value} \\
Z(t) & -5.648 & -3.580 & -2.930 & -2.600 \\
\end{array}\]

MacKinnon approximate p-value for Z(t) = 0.0000

Source: Stata Software Output
Test for Stationarity of Real Investment

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<tr>
<td>Test Statistic</td>
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<tr>
<td>Z(t)</td>
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Source: Stata Software Output
Test of Stationarity of Real Investment (order 1)

<table>
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<tbody>
<tr>
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<tr>
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<tr>
<td>Test Statistic</td>
</tr>
<tr>
<td>Z(t)</td>
</tr>
</tbody>
</table>

MacKinnon approximate p-value for Z(t) = 0.0000
Source: Stata Software Output

B). RESULTS OF SHORT RUN AND LONG IMPACT OF AGGREGATE PUBLIC EXPENDITURE ON ECONOMIC GROWTH IN NIGERIA

i. Short Run Model of Impact of Public Expenditure

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<th>ECMOls</th>
<th>ECMrobust</th>
<th>ECMnewey</th>
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<td>0.00226</td>
<td>0.00226</td>
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<td>(0.217)</td>
<td>(0.229)</td>
<td>(0.199)</td>
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<td>0.00252</td>
<td>0.00252</td>
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<tr>
<td></td>
<td>(0.280)</td>
<td>(0.109)</td>
<td>(0.107)</td>
</tr>
<tr>
<td>D.open</td>
<td>0.335</td>
<td>0.335</td>
<td>0.335</td>
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<tr>
<td></td>
<td>(0.083)</td>
<td>(0.153)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>D.log_gfcap</td>
<td>0.241</td>
<td>0.241*</td>
<td>0.241*</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.013)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>D.log_pubexp</td>
<td>0.0692*</td>
<td>0.0692*</td>
<td>0.0692*</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.025)</td>
<td>(0.030)</td>
</tr>
<tr>
<td>L.uhat</td>
<td>-0.0957</td>
<td>-0.0957*</td>
<td>-0.0957*</td>
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<tr>
<td></td>
<td>(0.238)</td>
<td>(0.086)</td>
<td>(0.106)</td>
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<tr>
<td>_cons</td>
<td>0.138***</td>
<td>0.138***</td>
<td>0.138***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

N = 51
R² = 0.285
adj. R² = 0.187
AIC = -31.57
BIC = -18.05
F = 2.921
rmse = 0.167

p-values in parentheses * p < 0.05, ** p < 0.01, *** p < 0.001
Source: Stata Software Output
### ii. Long Run Model of Impact of Public Expenditure

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<td>0.00613</td>
<td>0.00613</td>
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<tr>
<td></td>
<td>(0.129)</td>
<td>(0.117)</td>
<td>(0.139)</td>
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<tr>
<td>exr</td>
<td>0.00349*</td>
<td>0.00349*</td>
<td>0.00349*</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.005)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>open</td>
<td>0.129**</td>
<td>0.129**</td>
<td>0.129</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.020)</td>
<td>(0.288)</td>
</tr>
<tr>
<td>log_gfcap</td>
<td>0.965***</td>
<td>0.965***</td>
<td>0.965***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>log_pubexp</td>
<td>0.185</td>
<td>0.185</td>
<td>0.185</td>
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<tr>
<td></td>
<td>(0.202)</td>
<td>(0.230)</td>
<td>(0.130)</td>
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<td>-0.695</td>
<td>-0.695</td>
<td>-0.695</td>
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<tr>
<td></td>
<td>(0.168)</td>
<td>(0.136)</td>
<td>(0.226)</td>
</tr>
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<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.989</td>
<td>0.989</td>
<td></td>
</tr>
<tr>
<td>adj. $R^2$</td>
<td>0.988</td>
<td>0.988</td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>46.41</td>
<td>46.41</td>
<td></td>
</tr>
<tr>
<td>BIC</td>
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<td>58.12</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>822.7</td>
<td>1542.3</td>
<td>996.0</td>
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<tr>
<td>rmse</td>
<td>0.358</td>
<td>0.358</td>
<td></td>
</tr>
</tbody>
</table>

*p*-values in parentheses  
* $p < 0.05$  
** $p < 0.01$  
*** $p < 0.001$

**Source: Stata Software Output**
### APPENDIX II

**VAR OUTPUT WITH TWO LAGS**

<table>
<thead>
<tr>
<th></th>
<th>d_lrrexp</th>
<th>d_lcexp</th>
<th>d_open</th>
<th>d_lgfcap</th>
<th>d_ap</th>
<th>d_lgdp</th>
<th>inf</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.d_lrrexp</strong></td>
<td>-0.218</td>
<td>-0.338</td>
<td>-0.178</td>
<td><strong>-0.0228</strong></td>
<td>-0.00193</td>
<td>-0.100</td>
<td>0.192</td>
</tr>
<tr>
<td></td>
<td>(1.68)</td>
<td>(1.75)</td>
<td>(3.61)</td>
<td>(-0.24)</td>
<td>(-0.48)</td>
<td>(-0.96)</td>
<td>(0.03)</td>
</tr>
<tr>
<td><strong>L2.d_lrrexp</strong></td>
<td>-0.173</td>
<td>-0.00818</td>
<td>0.183***</td>
<td>0.146</td>
<td>0.00708</td>
<td>0.262*</td>
<td>17.15*</td>
</tr>
<tr>
<td></td>
<td>(-1.27)</td>
<td>(-0.04)</td>
<td>(3.53)</td>
<td>(1.46)</td>
<td>(1.69)</td>
<td>(2.39)</td>
<td>(2.41)</td>
</tr>
<tr>
<td><strong>L.d_lcexp</strong></td>
<td>0.152</td>
<td>-0.199</td>
<td>0.105**</td>
<td>0.288***</td>
<td>0.00155</td>
<td>0.122</td>
<td>-5.39</td>
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<tr>
<td></td>
<td>(1.49)</td>
<td>(-1.31)</td>
<td>(2.72)</td>
<td>(3.88)</td>
<td>(0.50)</td>
<td>(1.49)</td>
<td>(-1.04)</td>
</tr>
<tr>
<td><strong>L2.d_lcexp</strong></td>
<td>0.259</td>
<td>0.0725</td>
<td>-0.00312</td>
<td>0.153</td>
<td>-0.00902**</td>
<td>0.0552</td>
<td>-7.228</td>
</tr>
<tr>
<td></td>
<td>(2.42)</td>
<td>(0.46)</td>
<td>(-0.08)</td>
<td>(1.96)</td>
<td>(-2.75)</td>
<td>(0.64)</td>
<td>(-1.29)</td>
</tr>
<tr>
<td><strong>L.d_open</strong></td>
<td><strong>-1.020</strong></td>
<td>0.145</td>
<td>-0.436***</td>
<td>0.327</td>
<td>0.00841</td>
<td>0.165</td>
<td>-11.63</td>
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<tr>
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<td>(-3.02)</td>
<td>(0.29)</td>
<td>(-3.40)</td>
<td>(1.32)</td>
<td>(0.81)</td>
<td>(0.61)</td>
<td>(-0.66)</td>
</tr>
<tr>
<td><strong>L2.d_open</strong></td>
<td>0.194</td>
<td>0.0310</td>
<td>-0.413**</td>
<td>0.0285</td>
<td>-0.0301**</td>
<td>-0.218</td>
<td>-6.195</td>
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<tr>
<td></td>
<td>(0.55)</td>
<td>(0.06)</td>
<td>(-3.11)</td>
<td>(0.11)</td>
<td>(-2.80)</td>
<td>(-0.77)</td>
<td>(-0.34)</td>
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<tr>
<td><strong>L.d_lgfcap</strong></td>
<td>0.275</td>
<td>0.356</td>
<td>0.0000778</td>
<td>-0.220</td>
<td>-0.00716</td>
<td>-0.0872</td>
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<td></td>
<td>(1.44)</td>
<td>(1.25)</td>
<td>(0.00)</td>
<td>(-1.58)</td>
<td>(-1.22)</td>
<td>(-0.57)</td>
<td>(0.48)</td>
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<td><strong>L2.d_lgfcap</strong></td>
<td>-0.262</td>
<td>-0.146</td>
<td>0.0144</td>
<td>-0.188</td>
<td>0.0130**</td>
<td>0.180</td>
<td>21.61**</td>
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<tr>
<td></td>
<td>(-1.68)</td>
<td>(-0.63)</td>
<td>(0.24)</td>
<td>(-1.65)</td>
<td>(2.72)</td>
<td>(1.43)</td>
<td>(2.65)</td>
</tr>
<tr>
<td><strong>L.d_ap</strong></td>
<td><strong>-12.08</strong></td>
<td>-10.30</td>
<td>1.712</td>
<td>4.549</td>
<td>0.502***</td>
<td>-2.467</td>
<td>-259.8</td>
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<td></td>
<td>(-2.65)</td>
<td>(-1.52)</td>
<td>(0.99)</td>
<td>(1.36)</td>
<td>(3.58)</td>
<td>(-0.67)</td>
<td>(-1.09)</td>
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<td>(2.11)</td>
<td>(0.72)</td>
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<td>0.899**</td>
<td>0.189</td>
<td>0.559***</td>
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<td>0.169</td>
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<td>(2.36)</td>
<td>(2.77)</td>
<td>(2.28)</td>
<td>(3.50)</td>
<td>(0.26)</td>
<td>(0.96)</td>
<td>(2.23)</td>
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<tr>
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<td>-0.0582</td>
<td>0.342</td>
<td>0.00161</td>
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<td>(-0.58)</td>
<td>(1.79)</td>
<td>(0.20)</td>
<td>(-1.53)</td>
<td>(-1.27)</td>
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<td><strong>L.inf</strong></td>
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<td>0.000901</td>
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<td>- 0.0000361</td>
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<td>(1.91)</td>
<td>(0.22)</td>
<td>(-1.79)</td>
<td>(-0.95)</td>
<td>(0.42)</td>
<td>(2.15)</td>
<td>(4.32)</td>
</tr>
<tr>
<td><strong>L2.inf</strong></td>
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<td>0.00129</td>
<td>- 0.000199</td>
<td>-0.00199</td>
<td>-0.125</td>
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<td>(-0.32)</td>
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<tr>
<td><strong>Constant</strong></td>
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<td>(-1.21)</td>
<td>(0.06)</td>
<td>(1.95)</td>
<td>(1.12)</td>
</tr>
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</table>

Obs: 46  

_t statistics in parentheses  
* _p < 0.05, ** _p < 0.01, *** _p < 0.001

Source: Stata Software Output
### GRANGER CAUSALITY WALD TESTS

Granger causality Wald tests

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<th>Equation</th>
<th>Excluded</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
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<td>d_lcexp</td>
<td>4.197</td>
<td>2</td>
<td>0.123</td>
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<td>0.003</td>
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<td>d_lgfcap</td>
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APPENDIX V

IMPULSE RESPONSE AND SHOCKS IN MACROECONOMIC VARIABLES

| Source: Stata Software Output |

| Source: Author's Calculations |

---

**Figure A1: Shocks from Aggregate Public Expenditures**
FIGURE A2: SHOCKS FROM DISAGGREGATED PUBLIC EXPENDITURE

APPENDIX VI

STABILITY TEST FOR THE VAR MODEL

i. Eigenvalue stability Test

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<td>+ .760161i</td>
</tr>
<tr>
<td>-.07975932</td>
<td>- .760161i</td>
</tr>
<tr>
<td>.6249544</td>
<td></td>
</tr>
<tr>
<td>.4624656</td>
<td>+ .4053011i</td>
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<tr>
<td>.4624656</td>
<td>- .4053011i</td>
</tr>
<tr>
<td>-.5046913</td>
<td>+ .3238766i</td>
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<tr>
<td>-.5046913</td>
<td>- .3238766i</td>
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<tr>
<td>-.4103634</td>
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Source: Stata Software Output
Figure A3: Eigen Value Stability Test
APPENDIX VII
SHORT RUN ERROR CORRECTION MODEL OF SECTORAL IMPACT OF PUBLIC EXPENDITURE ON ECONOMIC GROWTH

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<th>ecmnewey</th>
<th>ecm1robust</th>
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<td>0.0257</td>
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<td></td>
<td>(0.709)</td>
<td>(0.557)</td>
<td>(0.609)</td>
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<td>D.log_educ</td>
<td>0.130**</td>
<td>0.130**</td>
<td>0.130*</td>
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<tr>
<td></td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.025)</td>
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<td>0.0532*</td>
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<td>-0.0541**</td>
<td>-0.0541**</td>
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<tr>
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<td>0.339**</td>
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<td>0.121***</td>
<td>0.121***</td>
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<td>(0.001)</td>
<td>(0.000)</td>
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<th>51</th>
<th>51</th>
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<td>0.351</td>
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<tr>
<td>Adjusted (R^2)</td>
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<td>0.227</td>
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<tr>
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<td>.</td>
<td>-32.51</td>
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<tr>
<td>F</td>
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<td>7.285</td>
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\(p\)-values in parentheses * \(p < 0.05\), ** \(p < 0.01\), *** \(p < 0.001\)

Source: Stata Software Output
APPENDIX VIII
LONG RUN STATIC EQUATION OF IMPACT OF SECTORAL GOVERNMENT EXPENDITURE ON GROWTH

Long Run Equation of Sectoral Impact of Public Expenditure

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<th>longrun1rob</th>
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<td>(0.097)</td>
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<td>0.154</td>
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<td>(0.423)</td>
<td>(0.516)</td>
<td>(0.606)</td>
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<td>0.145*</td>
<td>0.145*</td>
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Observations       52  52  52

$R^2$            0.994  0.994  0.994
Adjusted $R^2$  0.993  0.993  0.993
$AIC$            -17.47  .       -17.47
$BIC$            -33.08  .       -33.08
$F$              1064.5  1522.9  2096.5

$p$-values in parentheses  * $p < 0.05$,  ** $p < 0.01$,  *** $p < 0.001$

Source: Stata Software Output