KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

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DEPARTMENT OF ECONOMICS

GOVERNMENT SIZE AND ECONOMIC GROWTH IN GHANA

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BY

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DECLARATION

I hereby declare that the submission is my own work towards the Master of philosophy (Economics) degree and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

This work is dedicated to my father, Mr. Obeng Antwi and mother Mary Owusu-Manu and all my sisters' especially Maame Afia. Without their enormous support I wouldn't have reached this height in education. I also dedicate it to all my family members in Takoradi especially Mr Owusu-Manu and family.

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ABSTRACT

The duties of government undeniably transcend the making laws in Ghana. Government spends to provide social amenities, as well as ensuring growth. But while these expenditures have their own benefits, they equally could have shocking ramifications on the economy. The study set out to investigate the impact of government expenditure on economic growth at the aggregate, disaggregated and the sectoral level, determine the appropriate level of government expenditure and to test whether government expenditure plays any catalytic role for the growth of private investment as well as testing for the existence of the Wagnerian hypothesis in Ghana by employing both the ARDL and OLS model with data spanning from 1970 to 2010. At the aggregate level, the study concluded that, in the long run government expenditure has a significant positive impact on economic growth but has a negative impact on economic growth in the short run. At the disaggregated level, government recurrent expenditure turned out to be growth enhancing whiles capital expenditure was surprisingly negatively related to economic growth in both the long run and the short run. Finally at the sectoral level, government expenditure on education was negatively related to economic growth whiles government expenditure on health was positively related to economic growth. The study also found out that, recurrent government expenditure in Ghana should not exceed and 12.89% of GDP and that, government expenditure does not play any supporting role for private investment in Ghana. The study also demonstrated that the Wagnerian hypothesis is valid for Ghana. The study therefore advocates for fiscal discipline and control to keep the government

recurrent spending at the optimal level so as to trigger positive ripple effect to other sectors of the economy and avoid the crowding out effect in the Ghanaian economy.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Background Study

The role of government in a developing country like Ghana indeed cannot be overemphasized. Government spends to provide social amenities, merit goods, social interventions or transfer payment as well as ensuring growth (Keynes 1936). But while these expenditures have their own benefits, they equally could have dire consequences on the economy. It is widely appreciated by scholars that, economic analysis can explain the behaviour of governments in addition to the response of consumers and firms to their policies as such; there has been an increasing interest in developing economies that have exhibited rapid growth about the nature of the relationship between government (expenditure) size, and economic growth. The huge infrastructure gap in the country coupled with the high subsidization of various government programmes necessitate that, government increases its expenditure size in the development process of the country.

In light of the foregoing, government expenditure is seen as crucial for the development of any economy. According to the World Bank development indicators (2011), in the year 2011, the government of Ghana budget deficit equalled 5% of the country's GDP. Total government expenditure was around US$23billion, US$27 billion and US$33 billion in the years 2008, 2009 and 2010 respectively. In the same years, the annual growth rates of GDP were 8.43%, 4.66% and 6.62%. There is an on-going but yet unresolved argument among scholars and various policy circles about the exact behaviour of these variables (government expenditure and economic growth). To Olaiya et al (2012)

the critical question revolving around various world policy circles is; does the increasing public expenditure have the tendency to enhance economic growth? While some economists concur with this assertion, others are of the view that government intervention reduces the overall performance of the economy in terms of economic growth through the crowding out effect and this consequently impact negatively on the general price level as Milton Friedman (1969) and the classical school have made us believe.

1.2 Problem Identification

Economic growth has featured prominently in the development plans of Ghana. Worthy of note is the vision 2020 and the Ghana Poverty Reduction Strategy I and II and more recently the Ghana Shared Growth and Development Agenda (GSGDA). The Vision 2020 programme launched in 1991 stipulated that, Ghana was to become an upper middle income country by the year 2020. According to Vision 2020 Report (1995) in Patrick (2009), for this objective to be achieved, the country needed to grow at an average rate of 8% for the period. According to the specifics of the vision, GDP ought to grow between 7.1% and 8.3% in the period 1996 to 2000 but the actual growth rate was only between 4.2% and 5.0%. The Ghana Poverty Reduction Strategy Programme II (GPRSII) postulated that Ghana will become a middle income earning nation by the year 2015. However, for the goal to materialize the growth rate of the economy should be above an average of 8.5% but from the year 2004 to 2011 the average real growth rate was 7.3% far below the expected average (GPRS II Annual Progress Report, 2007).

Ghana over the years has made significant efforts to reduce poverty, increase income and provide greater access to education and health services to its citizens. The central government has increased its expenditure size by absorbing school fees in all basic schools in the northern part of the country and building new classroom blocks, implementing the National Health Insurance Scheme (NHIS), the implementation of the Livelihood Empowerment Against Poverty (LEAP), and construction of major roads etc. all with the intention of fostering economic growth and development in Ghana. According to the Republic of Ghana joint review of public expenditure and financial management (2011), " in the year 2010, Ghana was on track to meet poverty, nutrition, school, gender parity and safer water related Millennium Development Goals, while recording accelerated progress in terms of child mortality since 2003". Such progress wouldn't have been possible without any rapid fiscal expansion.

According to the joint review (2010) between 2004 and 2008, public expenditure grew from 20% to 24% of GDP, to finance the extension of, and access to, health, education, public networks, and to close the infrastructure gap in the country. All these expenditures were made by government with the intention of generating higher economic growth through the creation of jobs and by injecting money into the economy that generates series of expenditures in the country but the rate of economic growth in Ghana has not been satisfactory. Though Keynesians have asserted that, an increment in government expenditure will boost economic growth in the short run, the behaviour of economic growth and government expenditure casts a lot of doubt in the minds of many economists.

Over the years, particularly after the implementation of the single spine salary structure for government workers, there has been a sharp rise in the recurrent component of government expenditure thereby spearheading an overall rise in total government expenditure (refer to figure 2.4 in chapter two for a pictorial view of the trend). Though recurrent expenditure is needed for the smooth functioning of government machinery, it equally has the capacity to put inflationary pressures on the economy hence the need to control it.

The main problem spearheading this study is to address the issues of the nature of the relationship between government expenditure and economic growth in the Ghanaian economic setting.

1.3 Research Questions

The pertinent questions that the study hopes to address are, does government expenditure at the aggregate level feature prominently in the economic growth process of Ghana in the short run, the long run or both?

Since government expenditure has a recurrent component and a capital component, the study probes further by asking, what sort of relationship exist between these various components and economic growth? The effect of most capital expenditure on growth is felt in the long run rather than the short run.

Human capital has been identified by Shultz (1974) as a vital component of growth in economics. Study inquires again about the effect of expenditure on two sectors of the Ghanaian economy that develops the human capital of the country (health and educational sector). The study therefore asks, does the increasing expenditure on these sectors have any significant positive impact on economic growth in Ghana?

Lastly the study realises that expenditure on government investment is identified in capital expenditure but government recurrent expenditure is made up mainly of emoluments and administrative cost which is not directly related to the productivity of the country. The critical question that arises from the recurrent expenditure component is, how much of government revenue should be committed into recurrent expenditure or what is the optimal level of government recurrent expenditure? Since this expenditure component is not on productive areas it is vital that expenditure is kept at the optimum level to avoid waste in the system.

Ghana experienced fluctuating trends in economic growth since it gained independence. A look at the World Bank's World development indicators (2011) and data from the Ministry of Finance revealed that, while government expenditure is increasing at an increasing rate, the level of economic growth has stagnated until 2011 where the government recorded economic growth rate of about 14.5%. Available data suggest that while some years have recorded positive growth others recorded negative growth rates. A time series plot of the growth rate of Ghana suggests that it has been stationary since 1965. Real government expenditure on the other hand has been trending upwards. If

average economic growth rate is anything to go by, since 1965, Ghana has been growing annually at a rate of 4.5% compared to the annual average growth in real expenditure of 8.5%. From the year 1995 to 2010 the economy has grown at an average rate of 5.8 instead of the average of 8% as desired in the vision 2020 in the same years real government expenditure grew at 13% clearly we could see that the disparity is wide.

One major issue that has featured prominently in our development plans is the desire to develop our private sector. Indeed the private sector has been taunted as 'the engine of growth' in Ghana. But with the spiral rise in government expenditure a lot of economists have become sceptical about the prospect of the sector. As indicated in Nketia-Amponsah (2009) the proponents of a smaller government size advance the argument that, larger government impedes economic growth because many government operations are inefficient and does not address the true public interests. The Keynesian tradition however believes in the use of government expenditure to empower and facilitate private sector performance. In this regard, several questions abound for example; can the private sector in Ghana generate high economic growth? What is the nature of the relation between economic growth and public expenditure in Ghana vis –a-vis private expenditure? What other variables affect economic growth in Ghana besides government expenditure. The study will therefore undertake a journey by employing the neoclassical growth model to unravel the nature of the variables that affects economic growth with government expenditure featuring as one of the determinants of economic growth.

1.4 Objectives of the study

Primary Objectives

The study's main objective is to estimate a growth function to assess the long run and the short run relationship between economic growth and government expenditure, within a partial framework of inflation, the political system, and the general life expectancy of the citizens of Ghana.

Secondary Objectives

The study's specific objectives are;

- to employ aggregate data on government expenditure to determine the empirical relationship between economic growth and government expenditure.
- to determine the relationship between government expenditure at the disaggregated level and economic growth.
- to assess the effect of sectoral government expenditure on economic growth in Ghana.
- to determine the optimal size of government recurrent expenditure in Ghana.
- to test whether government expenditure plays any catalytic effect on private investment in Ghana and whether the Wagner's hypothesis holds in Ghana through the pair wise granger causality test.

1.5 Justification of the Study

Every economy in the world has as its aim higher economic growth. It is an undisputable fact that higher economic growth leads to improvement in the welfare of the populace.

Various governments have been pursuing policies that will speed up the growth of their economies. It is in the hope of this objective that this study was undertaken.

Though authors such as Oteng- Abayie and Frimpong (2009) and Oteng- Abayie (2011) have studied the relationship between economic growth and government expenditure, their study was on a bi-variate level and considered more countries. The study improves upon their study by employing other independent variables into play and decomposing further government expenditure into capital and recurrent expenditure. Also to make the study more detailed expenditure on certain sectors of the economy is assessed on growth. Most works done also do not employ models that could forecast in this direction the present study employs the ARDL model which is more robust and a dynamic model that takes both the long run and the short run into account.

The study is expected among other things to inform policy makers on the variables they can rely on in their effort to stimulate economic growth in Ghana. The study is particularly helpful to policy makers since it informs them of the exact relationship that exist between economic growth and government expenditure. While Wagner (1863) in his law of increasing state activity postulated that it is economic growth that causes government expenditure to increase, Keynes (1936) in his general theory saw the direction of causality as being from government expenditure to economic growth. The study also adds to knowledge by concluding on the nature of the relationship between the two variables in the Ghanaian economy.

Since the study is carried out within the framework of the neoclassical growth model, other variables such as labour, capital, inflation, the political system and a variable used as a proxy for human capital will all be included in the model. It also helps in knowing the relationship that exists between these variables. Worthy of note is the ability of this study to resolve the ongoing debate among political economists about the nature of the relationship between the political system and the level of economic growth in Ghana.

1.6 Hypothesis statement

Four hypotheses are tested in the study as indicated by the following statements

1) Hypothesis about long run relationship between economic growth and government expenditure

H_0: There is a long run stable relationship between economic growth and government expenditure for the growth functions estimated at both the aggregate level and the disaggregated level

H_1: There is no long run stable relationship between economic growth and government expenditure for the growth functions estimated at both the aggregate level and the disaggregated level.

2) Hypotheses about Short Run relationship between economic growth and government expenditure

H_0: There is a short run stable relationship between economic growth and government expenditure at both the aggregate and the disaggregated level

H_1: There is no short run stable relationship between economic growth and government expenditure at both the aggregate level and the disaggregated level in Ghana.

3) Hypotheses about Wagner's hypothesis or Granger causality between government expenditure and economic growth

H_0: There is no causality between government expenditure at all levels and economic growth.

H_1: There is at least a uni-directional causality between government expenditure at all levels and economic growth.

4) Hypothesis about the catalytic effect of government expenditure in relation to private the sector

H_0: There is no causality between government expenditure at all levels and private sector investment.

H_1: There is at least a uni-directional causality between government expenditure at all levels and private sector investment.

1.7 General expectation of the study

It is obvious that the relationship between economic growth and some of the variables have been made available by economic theory. The study therefore bases its expectation on the dictates of economic theory and the works of other authors. It is the expectation of the study to establish a level relationship between economic growth and all the independent variables in the growth function. The study expects government expenditure to have a positive impact on economic growth in the long run but expects a negative relationship in the short run. This is because it takes a long time for the series of expenditures made by government to translate into a positive change in the GDP level. The study expects economic growth to demonstrate a positive relationship with capital, labour, openness, the political system and the general life expectancy of Ghanaians. However, it is expected that, inflation exhibits a negative impact on economic growth.

At the disaggregated level, the study expects capital expenditure to validate economic theory by impacting positively on economic growth whiles recurrent expenditure is also expected to impact economic growth negatively.

On the direction of causality between economic growth and government expenditure, the study expects to validate the findings of Ghartey (2006) with the direction running from economic growth to government expenditure. Thus the study expects the potential

existence of Wagner's hypothesis in Ghana. Lastly, government expenditure is expected to Granger-cause private investment at all levels.

1.8 Organization of the study

The study is organized into five main chapters. The first chapter introduces the reader to the research and gives brief background issues of the study. It addresses the research problem, the objectives of the study, the hypotheses statements, as well as the justification and expectation of the study. The second chapter provides the literature review and focuses on both theoretical and empirical reviews on the subject matter of the study. Chapter three presents the conceptual framework and the methodology of the study. The fourth chapter of the study is dedicated to empirical data results and analysis. Finally chapter five concludes the text of the study by summarizing the main findings and providing policy implications and recommendation arising from the results.

CHAPTER TWO

LITERATURE REVIEW

This chapter is in three main sections; the first section discusses the definitions and concepts about the pertinent variables in the study. It also reviews the theories that examine the impact of government expenditure on economic growth. The second section looks at empirical works on the impact of these policy variables on economic growth and the third section gives some analytical insight on the Ghanaian economy.

2.1 Theoretical Reviews

2.1.1 The Economic Growth Variable

According to Gillis et al (1987) "Economic growth refers to a rise in national or per-capita income and product. If the production of goods and services in a nation rises, by whatever means, one can speak of that rise as economic growth"

Kuznets (1974) does not like the confinement of economic growth to changes in the level of output, income and per capita income but to him the definition must as a matter of urgency include major structural changes and large modifications in social and institutional conditions to the increase in output or income in the economy. He defined economic growth as a "long-term rise in capacity to supply increasingly diverse economic goods to its population, this growing capacity based on advancing technology and the institutional and ideological adjustments that it demands". To Todaro (1985),

economic development is "a multidimensional process involving major changes in social structures, popular attitudes, and national institutions, as well as the acceleration of economic growth, the reduction of inequality, and the eradication of absolute poverty". He highlighted the importance of economic growth to economic development. The study views the most important ingredient in the definition of economic growth as the changes in the output level. A definition that proposes the addition of the structural changes is not in itself flawed but is a little overly ambitious.

2.1.2 Government (Expenditure) Size Variable

Most economists argue that, government size when it is above a certain level is detrimental to growth possibly because of the inefficiencies inherent in the business of government. Government has as its core business, the making of laws within which the citizenry and property right could be protected. This mandate is the foundation for the efficient operation of a market economy. The mandate of the government is extended to include the provision of goods and services that private individuals will not be motivated through the market to provide. These goods are called public goods. Gwartney et al (1998) agrees with the preceding analysis but warns that, if governments does more in the economy than the core functions described, economic growth will be hurt. This is because the government will need to raise higher taxes to support its expenditure and this will hamper private investment growth and crowding out effect will be invoked with government size overshadowing private borrowing. Also, the diminishing returns of government activities will be higher compared to private individuals because government will be ill suited for those activities. Lastly, the interference of government in the

economy will slow down the wealth creation process, as governments are not as good as markets in adjusting to changing circumstances and finding innovative ways of increasing the value of resources.

The foregoing activities prescribed for government, describe the size of government but according to the UN (2001), developing an accurate measure for qualitative variables such as regulation of activities and making of laws could be misleading and inaccurate. A meaningful measure of government size is central government expenditure on final consumption. This is the part in the aggregate expenditure model indicating government.

To Chobanov and Mladenova (2009), government consumption is the sum of all goods and services provided without charge to individual households and collectively to the community. The United Nations System of National Accounts (SNA 1993) asserts that the total government sector "consists mainly of central, state and local government units together with social security funds imposed and controlled by those units. In addition, it includes non-profit institutions (NPIs) engaged in non-market production that are controlled and mainly financed by government units or social security funds". According to the System, Final general government consumption expenditure comprises of expenditure, including imputed expenditure incurred by general government on both individual consumption goods and services and collective consumption services.

2.1.3 Optimal Government Expenditure Size

Chobanov and Mladenova (2009) and Davies (2008) have emphasized an optimal level of government expenditure size in an economy. This purported optimal level of government size was first discovered by Barro (1989), Armey et al. (1995), Rahn et al. (1996) and Scully (1998, 2003) hence it is referred as the BARS curve named after the inventers who theorized it. Figure 2.1 (a curve reproduced from Chobanov & Mladenova, 2009) gives a pictorial description of the relationship between economic growth and government expenditure levels. According to the researchers initially government expenditure raises economic growth to its peak then it gets to a level any additional government expenditure reduces economic growth as the expenditure level has exhausted all it positive impact on economic growth. The curve is an inverted 'U' shaped curve. The curve is depicted in figure 2.1below.

Figure 2. 1: The BARS curve depicting government expenditure size and economic growth

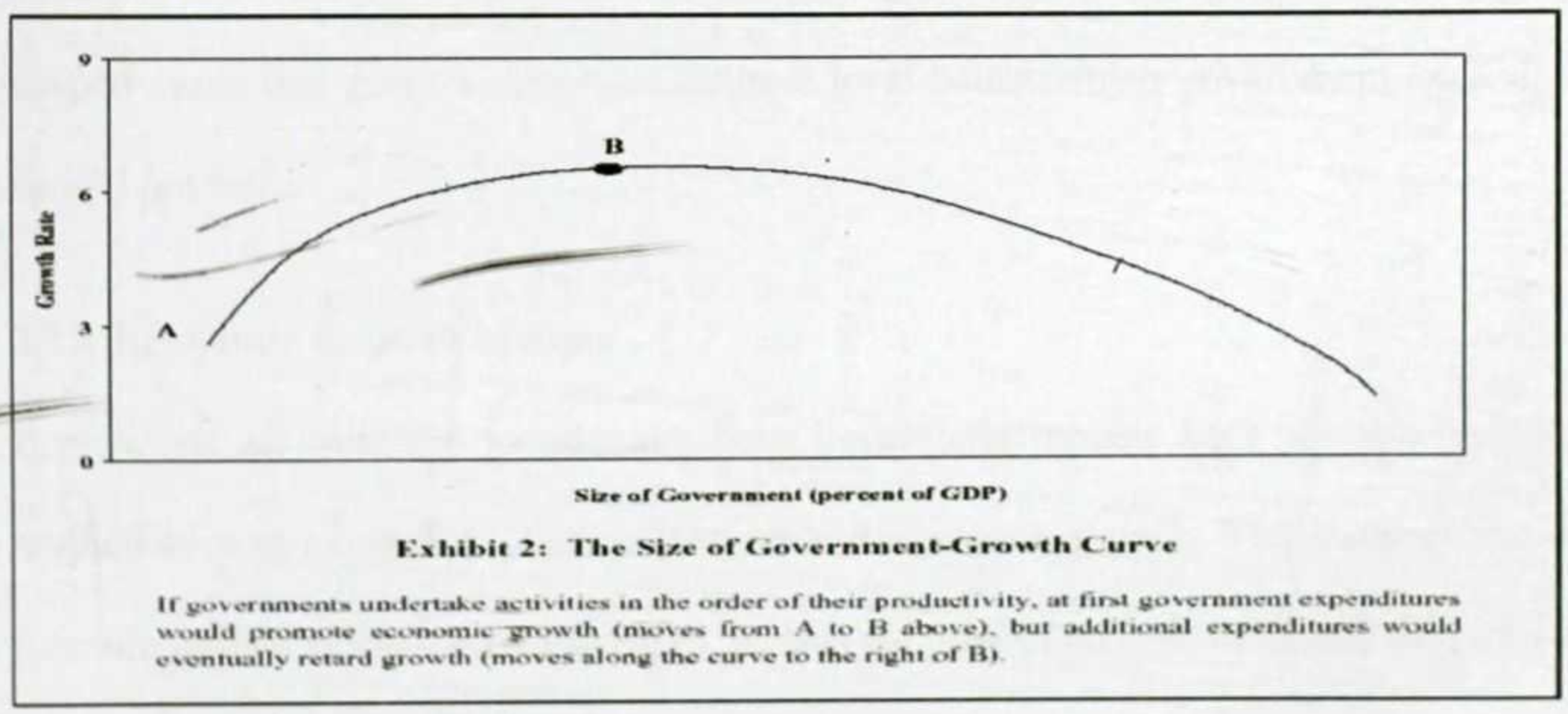


Exhibit 2: The Size of Government-Growth Curve

If governments undertake activities in the order of their productivity, at first government expenditures would promote economic growth (moves from A to B above), but additional expenditures would eventually retard growth (moves along the curve to the right of B).

Source: Chobanov and Mladenova (2009)

From figure 2.1 point 'A' on the curve represents the highest level of economic growth that is attainable given a set of government expenditures.

Thus, if government decides to use its expenditure to facilitate economic growth, at first economic growth rises then it gets to its peak. From there any attempt to raise government expenditure reduces economic growth. That refers to the right side of point 'A'.

To find point 'A', a growth equation is first estimated for the respective economy with government expenditure and its squared featuring in it. A partial differential of the growth equation estimated for the economy is taken with respect to government expenditure and a second differential is again taken to ascertain whether the underlining BARS curve will indicate a minimum or a maximum optimal government expenditure level. If the second differential indicates a negative number then the BARS curve is a indeed an inverted 'U' shaped curve but if it is a positive number then it is the normal 'U' shaped curve that gives a minimum optimal level below which government expenditure should not fall.

2.1.4 Economic Growth Models

Economists all over the world have been developing models both through logic and mathematics to explain the factors that explain economic growth. The study will at this juncture review models which strive to explain the growth process in market economies.

2.1.4.1 Harrod - Domar Model

The Harrod-Domar model is one of the Keynesian growth models developed by two famous economists: Sir Roy Harrod (1939) of England and Professor Evsey Domar (1946) of the US. The two simultaneously and independently worked out a model of growth in the 1950s that relies on savings as the main determinant of growth in developing economies.

The model assumes a closed economy with no government intervention. There is also no depreciation of existing capital such that all investment is assumed to be net investment. Also all investments come from savings and there is also a relationship between the total capital stock, and total GDP. The key equation of the H-D model is given by;

$$s/k = \Delta Y/Y$$

Where, $\Delta Y/Y$ is equal to the rate of growth of GDP. The Harrod-Domar Equation of economic development therefore states that: The rate of growth of GDP ($\Delta Y/Y$) is determined jointly by the national saving (s) and the capital-output ratio (k).

The tenets of the model are; growth is positively related to savings and inversely related to the capital output ratio. The model offers policy makers a direct mechanism to raise economic growth through savings. To Ogoe (2008), the Harrod-Domar model is very simple to work with. Given a target growth rate, "$\Delta Y/Y^*$" and the incremental capital-output ratio, "k", it is easy to find out the level of savings that must be realized to attain "$\Delta Y/Y^*$". If sufficient level of domestic savings are not forthcoming to match a certain level of investment "I" to attain $\Delta Y/Y^*$ then the model states that, the required amount of

capital flows should be borrowed from abroad. The model also predicts that the higher the savings rate, the higher the rate of economic growth, other things being equal.

The HD model is criticized mainly on the fact that, the savings gap experienced in many developing countries have been bridged with a lot of aid and soft loans from developed countries yet their development is not appreciable. The policy direction that the H-D model proposes is to make the increment of the national savings rate a priority since it has a positive relationship with the level of economic growth. However, this policy direction is not likely to be passionately enforced by Keynesian economists who believe in the existence of the Paradox of thrift.

2.1.4.2 Arthur Lewis's Two Sector Model

Lewis (1955) developed a two sector growth model which inculcated some of the classical ideas. He realized that the neoclassical economists did not describe accurately the prevailing conditions in developing countries apparently because of their assumption that labour is scarce in these countries. He assumed two sectors in these economies: The modern and the traditional sectors. To him the modern sector is smaller and uses considerable amounts of capital compared to the traditional sector, the traditional sector also is large and not capital-intensive but labour intensive.

Stolyarov (2007) asserts that in the two sector model, "capital accumulation in the modern sector is the method for growing a less developed economy without doing any real damage to the traditional sector". The major tenets of the model is that capital accumulation in the modern sector will lead to rising incomes for the labour employed

there which will subsequently lead to income inequality. Though income inequality is not in itself desirable, it is a sign of economic development. Accordingly in the process of time, the marginal productivity of the two sectors will equalize and economic integration of the two sectors will occur and wages will be determined by the marginal product of labour. Going by the dictates of the two sector model, all developing economies will need to increase investment in order to develop their economy. Thus industrialization is the key to development. But Ghana after setting up so many industries has still not been invited to the adult tables in terms of development. One will ask what was wrong with the implementation of the model.

Easterly (2001) in Stolyarov (2007), asserts that, the Lewis two-sector model was wrong on the ground that the model failed to bring about desired growth targets after many countries received aids and grant to finance the financial gap needed for industralisation. The model only worked in Tunisia but Easterly (2001) believes it "bears no statistical association between the amount of foreign aid given to the country and actual investment that occurred in that country, also there is no association between investment in Tunisia and economic growth in that country".

Another weakness in the model comes from the fact that, Lewis adopted Soviet development economics to formalize his two sector model but the breakdown of the Soviet Union is an empirical example of the failure of this approach.

2.1.4.3 The Solow Growth Model

Solow (1956) criticized the Harrod-Domar model to analyse long-run problems with the usual short-run classical analysis. The Solow model improved upon the HD model by stabilizing the steady state growth path. Most development economists coined the popular phrase "knife edge" for growth models with unstable steady state such as the HD model. The reason being that, any slight deviation from the growth path will result in a further move away from that path. This problem is fixed in Solow's model by making the capital-output ratio (k) in the model endogenous. Solow adopted all the assumptions in the Harrod-Domar model except the assumption of fixed proportions of input where he adopted the neo-classical approach. His production function has a curved, rather than an L shaped isoquant. This allows flexibility in the combination of capital and labour to yield output. The model is simplified in a variety of ways. It assumes, there is only a single good, (Y_t), in the economy. The good is produced, consumed and saved. Hence production is also the real income for individuals. Some part of income is consumed, (C_t), and the rest is saved, (S_t). Since the economy is a closed one, saving is assumed to be equal to investment (I_t). The key equation of the Solow model is given by,

$$\dot{k}_{(t)} = sf(k_{(t)}) - (n + g + \delta)k_{(t)}$$

where $sf(k)$, is the actual investment per unit of effective labour; $(n + g + \delta)k$ is break-even investment, or the amount of investment required to keep k constant.

In this model, the capital-output ratio is the adjusting variable that would guide the economy back to its steady-state growth path. Changes in the capital output ratio (k) is

spearheaded by changes in technology The need to keep the capital output ratio constant in order to maintain the steady state stems from the fact that much interest is vested in the "steady-state" growth since changes in the steady state will reflect changes in relative prices. Cassel (1918) defines the steady state growth as a "proportional" growth in a way in which there are no induced changes in relative prices over time. If k changes then also the marginal productivity of both capital and labour also changes since these factors are paid based on their marginal productivity, prices will not be stable but will fluctuate as (k) changes if Cassel (1918)'s definition is of relevance' then it is important to keep k constant at the steady state.

2.1.5 Public Expenditure Models

2.1.5.1 Wagner's Law of Increasing State Activity

Wagner's law states that "as the economy develops over time, the activities and functions of the government increase" (Akrani, 2011). Thus the German economist realized after a complete comparison of countries in different times that among progressive societies, central government and local governments increase their activities. Bird (1971) states the law as, 'as per capita income rises in industrializing nations, their public sectors will grow in relative importance.' Wagner himself gave a couple of reasons to hold his hypothesis. Peters (1997) explained that during the development process of many countries, they experience, complexities in communications and legal relationship, primarily due to division of labour that complements industrialization. For this reason,

Wagner envisaged a larger role for the state in the form of regulatory and protective activities.

Also, to Peters (1997), Wagner cited increased urbanization and population density as one factor that explains his law. As population increases there is an increasing pressure to provide security to the citizenry. Public security cannot be provided by the private sector hence it is incumbent on the government to provide. All this intervention will be made possible by the expansion of the public purse. Public security is just one of the products that the market fails to provide. Practically there are other areas where the market fails which also require government to dig deep into its purse to solve. If the foregoing argument is anything to go by, then it is laudable to quote Peter's (1997) assertion that "as nations become more advanced the number and/or magnitude of market failures would force the state to become more regulatory in nature, thereby expanding its role and this would inevitably involve higher public expenditures". Thus, if common sense is to be applied, then it is without any conceivable doubt that, as societies grow, old functions as well as new functions are performed concurrently which inevitably expands the public budget.

According to Akrani (2011) the statement indicates that, the activities of the central and local government increases on a regular basis in progressive societies. Also the increase in government activities is extensive and intensive and new functions are performed only in the interest of the society. Worthy of note is the fact that old and the new functions are performed more efficiently and completely than before.

Wagner's law has been criticized on a number of grounds. First of all, the conditions underlying the German economy in the nineteenth century such as the technological change, the increase in per capita income, rising technology and democracy limit the likelihood of testing the law empirically. Thus the applicability of the theory is only possible under conditions that prevailed in Germany in the 19th century (Gemmell, 1993).

To add more to the above, Bird (1971) asserts that though the law is recognized as a positive theory it has some normative implications especially in its assumptions. Thus the personal opinion of the German economist is expressed in the law on what ought to occur in an industrialized economy. The employment of the normative approach weakens the theoretical foundations of the law.

Lastly to Bird (1971), Wagner did not include the effect of wars in his law a mistake that Peacock and Wiseman (1961) will correct.

2.1.5.2 The Displacement Effect Hypothesis

Peacock and Wiseman (1961) utilized an inductive approach to explain the overall behaviour of government expenditure in the United Kingdom. Though they claimed not to be in search of general laws on public expenditure but to find out year to year changes in public expenditure, they came out with some thought provoking hypothesis in response to Wagner's law. The hypothesis is classified among theories of government expenditure that utilizes time series data to study the pattern of government expenditure over time. Though in their studies they validate Wagner's law, they went further to inculcate a supply side of public expenditure in their analysis. Peacock and Wiseman found out that

expenditures overtime followed a series of plateaus that were separated by peaks. Further analysis revealed that, these peaks corresponds to years where there were wars or preparation for war. This formed the basis for the displacement effect hypothesis.

Peacock and Wiseman (1961) hypothesized that, "The rise in public expenditure greatly depends on revenue collection". To them in the cause of time "economic development results in substantial revenue to the governments, this enable them to increase public expenditure".

Thus in times of war, the government increases the tax rates in order to have more funds to finance the war. Though one will expect the rates to fall back to the previous level, the tax structure remains the same, since people get used to them. Hence, the boost in revenue results in a rise in government expenditure. The strong version of the hypothesis according to Henerekson in Gemmel (1993) is that, "real absolute government expenditure per capita evolves in a step like pattern, where the movement from one step to another coincides with social disturbances such as wars.

The social upheavals or disturbances here, refers to temporal factors, permanent factors such as unemployment, price levels and population increase were analysed but were found to be of little or no impact on the behaviour of government expenditure.

2.1.5.3 Musgrave's Hypotheses

Musgrave (1969) added his voice to the debate by theorizing the behaviour of public expenditure based on the structure of the subject economy. To the professor, developing economies face a lot of infrastructure deficit and hence the intervention of government to

provide these infrastructure. In the process of time as the private sector becomes developed and able to provide a lot of goods, the size of the public sector reduces and hence government expenditure also decreases (Musgrave 1969). Authors though credit Musgrave for the theory; they criticize it by making a point that future prediction of public expenditure is not clearly plausible. Thus the possibility of further demand for public goods cannot be disqualified because; population is also bound to increase in future.

2.2 Empirical Literature Review

A number of authors have dealt with the relationship between government expenditure and economic growth. Some of the literature on the subject, deals with the relationship within the framework of determinants of economic growth on various topics while others have tested the relationship through the normal bi-variate causality analysis.

2.2.1Bi-Variate Causal Studies

Considering the Bi-variate causal relationships, Oteng- Abeyie and Frimpong (2009) tested for the Wagner's hypothesis and its reverse in three of the five countries in the West African Monetary Zone (WAMZ) comprising The Gambia, Ghana and Nigeria. Using the cointegration test and the Granger Causality test, the study found no causality in both directions, thus, both Wagner's Law and Keynes hypothesis are not valid for any of these countries. The study recommended that uncontrolled deficit financing policy "does not only fail to serve its intended purpose, it also executes the capital market". The

study also emphasised the need to "de-emphasize Keynesian economics a bit and tilt more in favour of monetarism for these economies".

Oteng-Abeyie (2011) utilised a log linear model and tested for panel cointegration between economic growth and real per capita income in Ghaña, guinea, Gambia, Nigeria and Sierra Leone. The study found out that a non-stationary panel data analysis is an inappropriate method in these countries and as such the study could not indicate whether government expenditure does not play any active role in economic growth. The study also found out that cuts in expenditure in these countries may not have the necessary direct impact on economic growth in these countries.

Loizides and Vamvoukas (2005) in their study titled government expenditure and economic growth: evidence from trivariate causality testing examined whether the relative size of government (as measured by the share of total expenditure in GNP) can Granger cause the rate of economic growth, or if the rate of economic growth can Granger cause the relative size of government. They first used a bivariate error correction model within a Granger causality framework, and then added unemployment and inflation separately as explanatory variables, creating a simple 'trivariate analysis for each of these two variables. They used data from Greece, UK and Ireland. The study found out that, in all countries public expenditure Granger cause growth in national income either in the short run or the long run. They went ahead to reject the hypothesis that public expansion hampers economic growth in the countries of focus. The public sector was found to have positive effect on economic development. Greece supported the

hypothesis of Wagner that increased output causes growth in public expenditure. It was manifest in all the tests i.e. the bivariate and the trivariate test. Data from the U.K indicated a similar pattern only in a trivariate model when inflation is added as an additional variable. By disparity, the result for Ireland doesn't indicate any Wagnerian-type causality effect.

The applicability of Wagner's law to countries at different stages of development and different characteristics was tested Peters (1997). Peters examined the United States, Thailand, Barbados, and Haiti for the periods 1948-1995, 1952-1995, 1966-1995 and 1965-1995 respectively. The Engle Granger cointegration test and the Johansen and Juselius maximum likelihood estimation technique of co integrating vectors were employed to establish the nature of the relationship between government spending and income. The result of their econometric methodology proved that, while the Engle Granger test supported Wagner's assertion for only United States and Barbados, the Johansen procedure with an enhanced model supports the reality of Wagner's law for all the countries under study.

Ansari et al (1997) in his work "Keynes versus Wagner: Public Expenditure and National Income for Three African Countries", made significant effort to determine the direction of causality between government expenditure and national income for three African countries Ghana, Kenya, and South Africa, using the traditional Granger causality test and the Holmes- Hutton (1990) causality test, (a modified version of the Granger test). His study used per capita government expenditure as a proxy for the government

expenditure and national income figures spanning from 1957 to 1990. According to the study, the two variables were deflated by using the GDP deflator for each country. The study concluded that a long run relationship does not exist between the variables of interest in all the countries. Neither was there any evidence to support Wagner's hypothesis or the reverse being supported in the short run, except for Ghana where Wagner's law is supported.

All the above were conducted by considering many countries but Chimobi (2009), examined the causal relation between government expenditures and national income by testing for the Wagner's law and its reverse in Nigeria. Johansen-Juselius cointegration method was employed. The result of the bivariate cointegration analysis exposed the fact that, there is no long run relationship among the variables that were stationary. Worthy of note is the use of national income to proxy growth instead of the traditional GDP per capita. The results did not support the dictates of Wagner's law. Thus the study revealed a causal relation running from Government expenditure to National income. The findings were justified due to the fact that, the Nigerian government has played vital roles in the development process of the West African country. Though the study tested for the applicability of the Wagner's hypothesis, the study fulfils this objective not on a Bi-variate level but within the framework of general determinants of economic growth.

2.2.2 Studies on Economic Growth Determinants

A number of studies have been conducted to assess the nature of relationship that exists between certain determinants of economic growth with government expenditure featuring prominently among them.

Tridico (2007) used his research "The Determinants of Economic Growth in Emerging Economies: a Comparative Analysis", to conduct a cross-country analysis to find the determinants of economic growth among emerging economies using OLS and correlation matrix. To him human capital and export capacity are very fundamental to economic growth. He noticed that these socio-economic variables "increase their explanatory power when associated with two non-income dimensions of development which are also policy indicators (i.e., infant mortality and life expectancy) and with good governance, expressed by two World Bank indicators such as Government effectiveness and Political Stability". The study found out that, interaction between these variables gave a better explanation of economic growth. Therefore to the researcher, socio-economic variables can cause growth when extra economic institutional variables provide motivation and security for "economic agents to accumulate knowledge and capital". On the importance of government expenditure, the study indicated that, pluralism and state intervention in non-income sectors such as health public expenditure and education generates more opportunities for people. Lastly, the study found out that the type of socio-economic model being competitive capitalism, corporative capitalism, dirigiste capitalism and socialist markets indeed does not have any effect on economic growth. .

Barro (1989) through his work "A Cross - Country Study of Growth, Saving and Government", conducted a cross country analysis to examine the determinants of growth. His framework utilized the neoclassical growth approach and a panel data from around 100 countries. Variables such as government policies, government consumption, inflation, democracy, life expectancy and education were assessed on growth rate of real per capita GDP. With respect to government policies, Barro (1996) indicated that the growth rate of real per capita GDP is enhanced by the maintenance of the rule of law. Also his study indicated that smaller government consumption raises the level of growth compared to a higher expenditure. He found out the effect of inflation on growth is significantly negative when some plausible instruments are used in the statistical procedures. The direction of causation starts from higher long–term inflation and ends up in reduced growth. According to the study, on average an increase in the average inflation rate by 10 percentage points per year will lower the growth rate of real per capita GDP on impact by 0.3 to 0.4 percentage points per year. Swelling political rights was seen to have a positive effect on growth but tend to retard growth once a moderate level of democracy has been attained. This presupposes that higher level of democracy retards economic growth. A higher starting level of life expectancy was seen to stimulate growth. Also male secondary education and higher schooling has a positive relationship with growth. For given values of these variables, growth is higher if a country begins with a lower starting level of real per capita GDP; that is, the data reveal a pattern of condition convergence.

Landau (1983) also in his study; "Government expenditure and economic growth: A Cross-Country Study", utilized regression analysis to find out the general determinants of growth in 96 countries. His independent variables included government consumption expenditure, expenditure on education, nation building and colonialism, agricultural land per capita and population growth. The result of his study proposes a negative relationship between the share of government consumption expenditure in GDP and the rate of growth of per capital GDP. The result according to Landau is consistent with a pro free market view that, within the market economies a growth of government hurts economic growth (crowding out effect). However, his result is not a solid foundation for strong conclusions due to the fact that, the government share variable is only government consumption expenditure, but not total government expenditure or total government economic impact. Since the coefficient of government expenditure was negative, "proximate explanations" for the slow growth emanated from two variables (share of government expenditure in education, population growth and agricultural land per capita). The relationship between total investment in education and the growth rate is positive and highly significant in the regressions for all time periods for both the full set of countries. This result provides a strong support for the human capital school led by Schultz (1974). The coefficient for population was negative and not significant at the 25% level. Though the rate of increase in population-when had a positive sign, it was insignificant. While when agricultural land per capita was added, the regression coefficient had the expected positive sign, but it was insignificant. The years since independence (neo-colonialism and nation building variable) according to the study had a negative sign, and was insignificant for the full sample.

Nurudeen and Usman (2008) also utilized disaggregated data to find the relationship between government expenditure and economic growth in Nigeria. They expressed economic growth (GRY) as a function of many constituents of government expenditure that include total capital expenditure (TCAP), total recurrent expenditure (TREC), expenditures on defence (DEF), agriculture (AGR), transport and communication (TRACO), education (EDU) and health (HEA). Inflation (IFN) and government fiscal balance (FISBA) were also added. They specified their growth model as:

GRY=f (TREC, DEF, AGR, TRACO, EDU, HEA, IFN, FISBA)

In the results, all the explanatory variables accounted for about 58.96% of the changes in economic growth. It was further revealed that, total capital expenditure, total recurrent expenditure, expenditures on transport and communication, education, and health, including inflation and overall fiscal balance were all statistically significant in explaining changes in economic growth. Shockingly, expenditures on defence and agriculture were not significant in explaining economic growth according to the study. This is particularly a surprise given that; many West African economies are seen to be agrarian. Their study also revealed a negative relationship between both capital and recurrent expenditure and economic growth possibly due to rise in corruption in the West African country and that any increase in inflation and overall fiscal balance results to a decrease in economic growth.

Patrick (2009) adopted the Johanssen's approach to cointegration to estimate the macroeconomic determinants of economic growth. Following the approach adopted by Lucas (1988), the researcher specified the economic growth function for Ghana as follows:

RPCGDP = f (K, L, FDI, Aid, INF, GE)

Thus, the real per capita GDP is a function of the physical capital, labour force, foreign direct investment, foreign aid, inflation and government expenditure in Ghana. The study revealed that, there existed a long-run economic growth in Ghana which is largely explained by physical capital, foreign direct investment, foreign aid, inflation and government expenditure. It became evident in the study that, short-terms changes in labour force does not affect economic growth. The estimated coefficient of the ECM indicated a mild speed of adjustment to equilibrium. The sign of the error correction term was negative and significant, which confirmed that, there existed a long-run equilibrium relationship among the variables. The study recognized that, Government expenditure yielded a negative relationship with real GDP per capita over the study years for Ghana. This, according to Patrick (2009) implies that government expenditure was not directed into pro-growth and pro-poor ~~activities~~ in the economy.

Twumasi (2010) also did a similar study on the determinants of economic growth by focusing on fiscal variables. His study though included some non-fiscal variables for specification purposes; the focus was on the fiscal variables. From the overall results, it was concluded that taxes and government spending had significant long-run impacts on

economic growth in Ghana The study suggested that, "the level of government spending and taxes in an economy can be effective in managing economic growth both in the short run and the long run". It is also evident that the set of non-fiscal variables in the study also had significant impact on economic growth in Ghana.

Sakyi and Adams (2012) analysed the effect of democracy, openness and government spending on economic growth in Ghana for the period 1960–2008 with the help of an ARDL model. They found out that democracy and government spending do not have positive long run and short-run impact on economic growth but theory was fulfilled when democracy and government expenditure were interacted. The interaction suggested that there exist a positive long and short-run effect between the interaction and economic growth. Capital and labour variables were significant in the model but trade openness was not in both the long and short run. Their study is similar to the path taken by this study but they did not use disaggregated data for their study in terms of the government expenditure neither does this study include openness and any financial development indicator in the model employed.

Anaman (2006) employed the neoclassical economic growth model which incorporated political stability, temporary shocks such as very high energy prices and government size on growth. He expressed economic growth as a function of government size, government size squared, the annual growth rate of the real value of total exports, the annual growth rate of total labour force, the annual growth rate of total human-made capital and political stability. He established that, the political stability of the country affect positively the

level of economic growth in Ghana. Also he noticed in the study that, world oil price shocks of the mid-1970s and early 1980s led to a decline in the level of economic growth. The study pointed out that, Government size impacted on economic growth in quadratic manner "with increasing government size resulting in increasing growth until a point is reached beyond which growth would actually fall with increasing government size". Though the growth of exports really influenced growth, total investment to GDP ratio did not significantly influence long-run economic growth but had the expected positive sign. Also, the Growth of labour had no influence on economic growth. The study concluded that, "Short-run economic growth was mainly influenced by political stability"

The literature above though serves the purposes for which they were conducted, but does not give us a clear cut relationship between economic growth and the various component of government expenditure. In this regard the study will decompose government expenditure into current and capital expenditure and also include the effect of colonialism or neo-colonialism into the model employed.

2.3 Government (Expenditure) Size and Economic Growth Trends in Ghana.

According to Meng (2004), government expenditure in Ghana has always been difficult to control. Before Ghana attained independence from her colonial masters, a ceiling was put on government expenditure at 10% of the GDP. This cap was removed by Dr. Nkrumah when he assumed office in 1957.This was bound to happen considering the infrastructure gap the nation was facing and ambitious industrialization objective that he

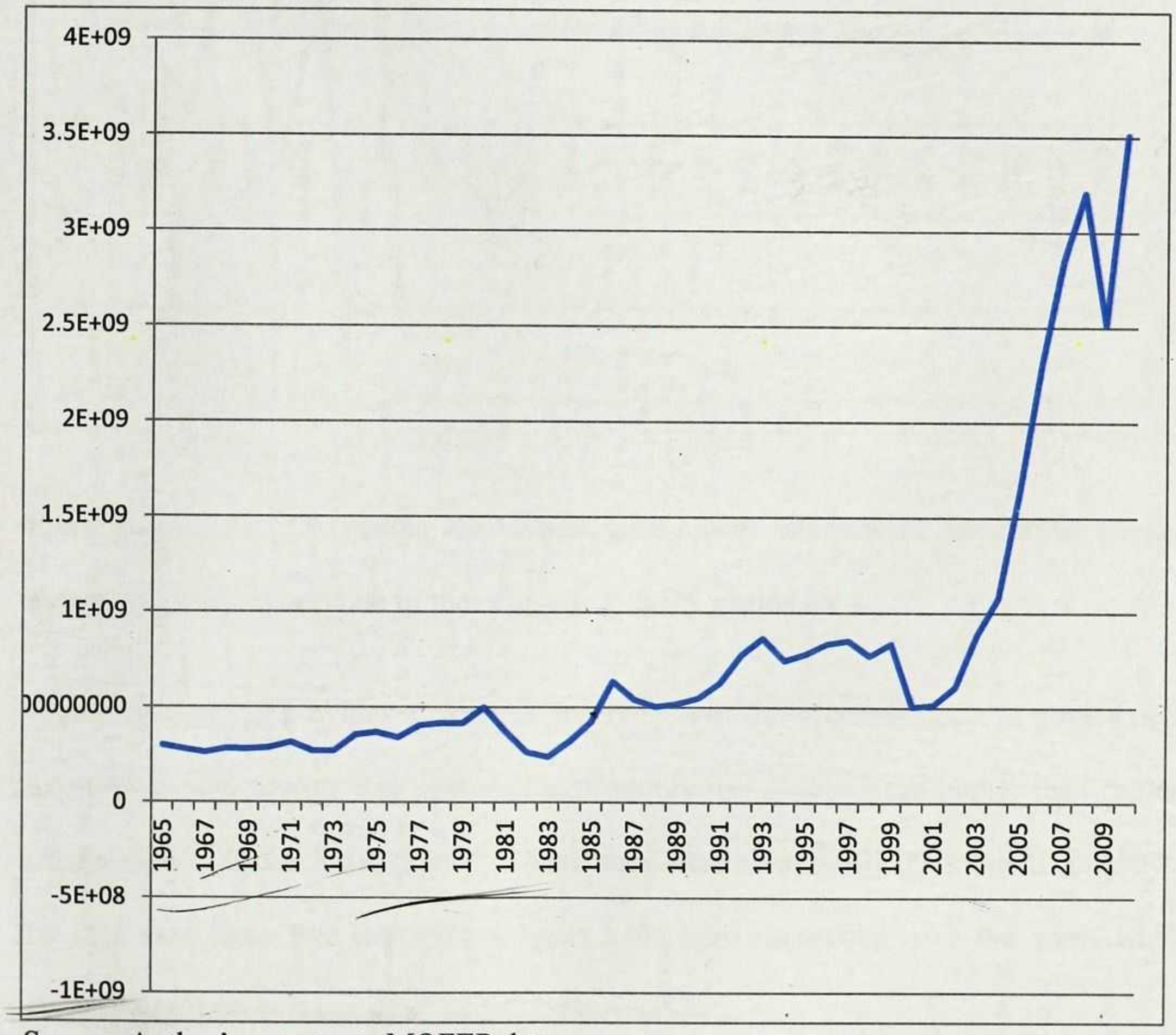
had. The high expenditure was supported by the issuing of treasury bills. By 1965 domestic bank credit to government was 12.5% of GDP and total bank lending rose from 14.5 million pounds sterling on monthly average to 153 million pounds sterling with commercial debt reaching 110 million pounds. (Meng, 2004) The increase in expenditure spearheaded a rise in inflation which eventually caused some supply rigidities in 1981.

Through the introduction of the Economic Recovery Programme (ERP) by the PNDC government, it was decided that government expenditure should be reduced to relieve the banks of unnecessary pressures. Initially the programme made some progress in the economy but foreign debts kept rising for instance the debt to GDP ratio increased from less than 5% in 1982 to more than 80% by 1992. In 1988, the government initiated the externally-funded $85 million Program of Action to Mitigate the Social Costs of Adjustment (PAMSCAD) that created 40,000 jobs over a two year period this did not lower the dependence of the west African nation on foreign aid and external borrowing By 2000, foreign debt totalled at 160% of the GDP according to Leith (2003).

In view of the foregoing, in 2002 the NPP government decided to opt for the international Monetary Fund's (IMF) Highly Indebted Poor Country (HIPC) initiative. The initiative led to significant debt relief service to Ghana but after the programme run to an end, external borrowing continue to be the source of government expenditure which in itself have assumed an upward trend in recent times. All these have led to stunted economic growth in Ghana. For the past 20 years economic growth has stabilized at around 4.5 until 2011 where the oil sector brought significant increase in growth. A

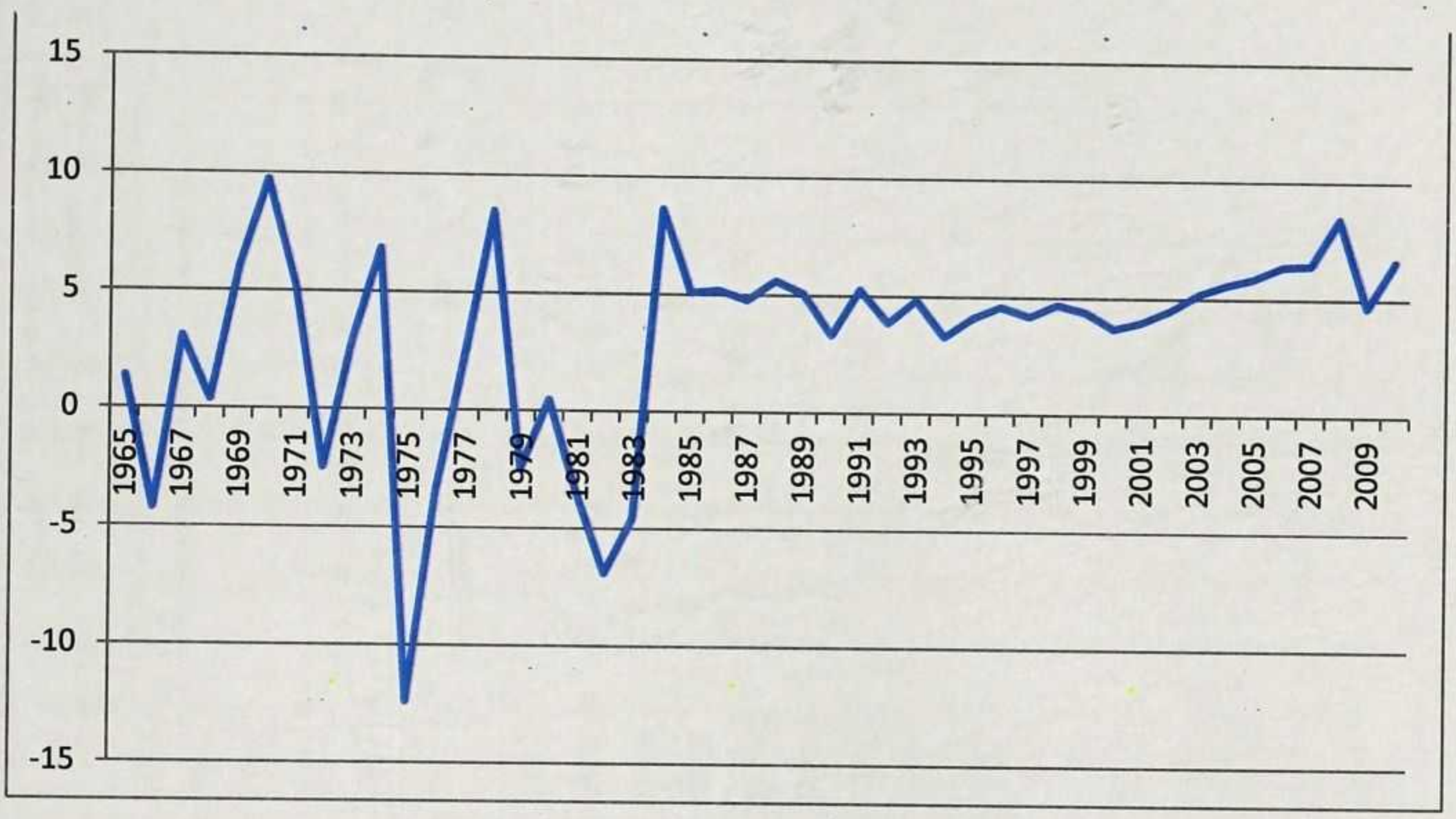
pictorial view of the relationship between government expenditure and economic growth is given below.

Figure 2. 2: Government Expenditure Trends



Source: Author's construct: MOFEP data

Figure 2. 3: GDP Growth Trends



From the graph it is visible that while government expenditure has being on the ascendency, the growth rate of the economy is fairly stationary.

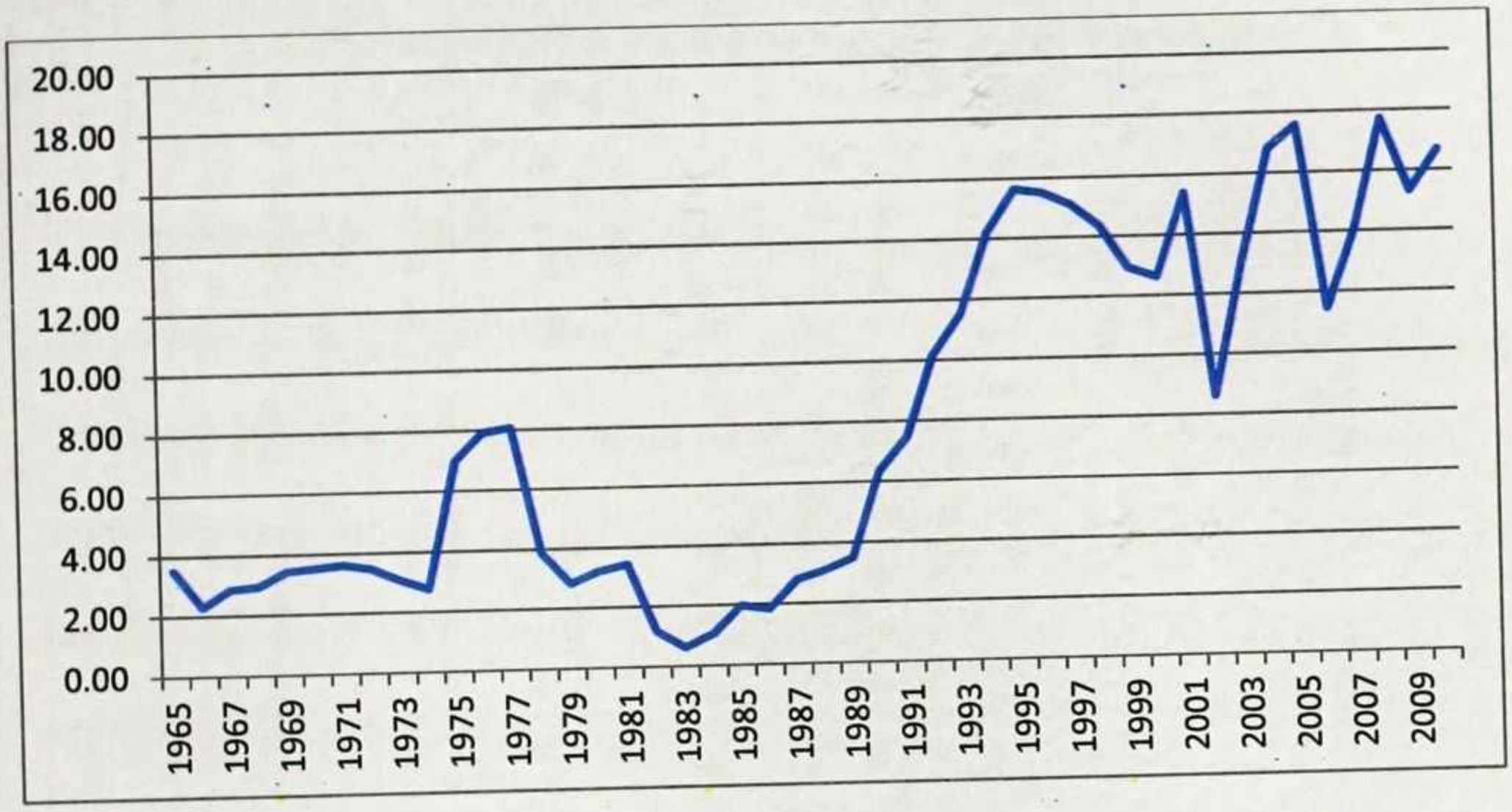
Figure 2.4 and 2.5 provides a pictorial observation of the decomposition of government expenditure and reveals that recurrent expenditure has always been higher than capital expenditure in Ghana except for 1977 when they were numerically the same. It could also be seen that these two expenditure types have been increasing over the years while economic growth has stagnated between 4% and 8%.

Figure 2. 4: Recurrent Expenditure Trends in Ghana

Source: Author's construct: MOFEP data

The graph evidently demonstrates the continuous upsurge of the recurrent component of the government of Ghana expenditure since 1983. The bulk of this expenditure stream is attributed to the large public sector wages and salaries (emoluments). The introduction of the single spine salary structure even gives the curve a higher slope as could be seen from the curve from the year 2009. It is difficult for this expenditure component to assume a downward trend since as the economy grows the activities of government increases and more people will be hired to perform these tasks which automatically raises its expenditure level.

Figure 2.5 : Capital Expenditure Trends in Ghana



Source: Author's construct: MOFEP data

This expenditure component of government expenditure started realizing a sluggish upward trend in the latter part of the 1960's and begun an upsurge in the early part of the 1970's but wasn't sustainable. The lowest ever government expenditure towards capital goods was experienced in 1983. This was the period where Ghana was experiencing economic problems as such general government expenditure was low. The periods after 1983 have recorded great increases in government expenditure but not without short periodic declines as could be seen from figure 2.5. The year 2008 recorded the highest government of Ghana capital expenditure. This was made possible by the benefits the economy was gaining from the HIPC funds it received. Considering the contribution of capital expenditure to development and that of recurrent expenditure, it would have been promising for development if the former was larger than the latter.

CHAPTER THREE

CONCEPTUAL FRAMEWORK AND METHODOLOGY

This chapter deals with the modelling techniques used to achieve the major objectives of this study. It shows how to solve the problem of the study as well as outlining the necessary techniques that is employed to achieve all the secondary objectives of the study. The theoretical model upon which the empirical work is based is also specified in the first section of this chapter, whereas unit root testing and cointegration method are explored in the last section of this chapter.

3.1 The Conceptual Framework

The theoretical model upon which the empirical model is based, is rooted in the neoclassical production function stated below,

$$Y = f(K, L) \qquad (3.1)$$

where, K is capital and L is labour and Y is the output level

Following Feder (1982), Ram (1986), and Grossman (1988) as stated in Alexiou (2009), Nketia-Amponsah (2009), Sakyi(2011) and Sakyi and Adams (2012), government expenditure (GEXP) can be incorporated into the production function (3.1) as,

$$Y = f(K, L. GEXP) \qquad (3.2)$$

The theoretical basis for including government expenditure is founded in the Keynesian multiplier process. Whereby, a rise in government expenditure transmits into series of processes that create jobs and subsequently increases the income levels in the economy.

Thus; if $Y = C + I + G + (X - M)$ ..... (3.2.1)

where G is GEXP

Given that $C = a + bY$

where 'a' is autonomous consumption expenditure and b is the induced consumption expenditure. If C is substituted with its components, then,

$Y = a + bY + I + G + (X - M)$ ..... (3.2.2)

By totally differentiating all the variables and assuming a zero (0%) income tax rate,

$dY = da + bdY + dI + dG + d(X - M)$ .....(3.2.3)

$dY - bdY = da + dI + dG + d(X - M)$ .....(3.2.4)

$dY(1 - b) = da + dI + dG + d(X - M)$ .....(3.2.5)

Dividing equation 3.2.5 by $(1 - b)$ yields,

$dY = \frac{1}{(1-b)}[da + dI + dG + d(X - M)]$ 3.2.6

Now assuming that all the variables are constant with the exception of Y and G,

$$\frac{dY}{dG} = \frac{1}{1-b} = m \quad \text{.....(3.2.7)}$$

where, m is the simple Keynesian government expenditure multiplier. It translates changes in government expenditure to output levels. Thus one way of raising the economic growth level of an economy will be to raise the government expenditure. Alternatively tax could be reduced but government expenditure is favoured particularly when there is massive unemployment in the economy.

The classical economists argue that, it is only when an economy specializes in the production of the commodity in which it has comparative advantage, that it realizes sufficient economic growth as compared to producing everything on its own. They therefore suggest the need for openness in an economy for maximum economic growth. This statement has been supported by the popular Heckscher- Ohlin theorem and most modern trade theories. Ghana's economy is an economy that has been integrated in the global economy; as such it allows trade with the outside world. The study therefore includes "OPENNESS" as one of the independent variables in the growth function. The growth function with openness therefore is stated in equation 3.3.

$$Y = f(K, L, GEXP, OPENNESS) \quad \text{..... (3.3)}$$

Traditional Keynesians also suggests a positive relation between economic growth and inflation in the short run but a negative relation in the long run. The short run Keynesian aggregate supply curve (AS) is upward sloping hence; any positive aggregate demand shock leads to both increased output and increment in the price level (Dornbusch, et al,

(1996), Gokal, & Hanif 2004). This change in output and price level is motivated by factors such as producer expectations, prices of other factors of production such as labour, capital, fiscal and or monetary policy. In the long run however, the aggregate supply curve assumes a vertical shape as such any positive aggregate demand shock is transmitted into higher inflationary figures with no impact on output growth. The model, then suggests a short-run trade-off between output and changes in inflation, but the trade-off cannot be negotiated on a permanent basis. For inflation to be held steady at any level, actual output must equal the potential output (Y). And for inflation to fall, actual output must be below the potential output. The relationship between inflation and output is expressed below:

$$INF_t = INF^e_t - \theta (Y_t - Y^*_t) \qquad (3.4)$$

where; INF_t is the actual inflation, INF^e is the expected inflation, Y* is actual output, Y is the potential output and θ relates the output gap to the actual inflation. From the above, it is important that actual output be equal to potential output or at least be at par with it either than that, it will exerts inflationary pressures on the economy.

It could be inferred that, government expenditure translates into an increase and a shift in aggregate demand and subsequently a rise in economic growth anytime the economy is operating at less than full employment. Economic growth according to the Keynesians has inflationary pressures. If the principle of transitivity is to be employed then government expenditure also causes inflation (Ahortor, Adenekan, & Ohemeng, 2013). Indeed the classical economists argued against Keynesians interventionist policies on the

main premise that it is inflationary. Inflation is therefore added to the production function in equation 3.4.

$$Y = f(K, L, GEXP, OPENESS, INF) \quad \ldots\ldots (3.5)$$

The study will therefore add a variable that is a measure of the political system in the history of Ghana. the inclusion of the political system variable (POL) as a repressor is based on the premise that, some political economists argue that democracy does not have any significant impact on growth, but Gerring et al (2005) assert that, democracy could either have a negative effect on growth or there is no effect at all. They argue that Countries with authoritarian political systems grows as democracies or even grow faster than their democratic counterpart. In view of this, Sakyi and Adams (2012) employed the political system as one of the independent variables in their growth studies. If the foregoing view is to go by then the political regime has an effect on economic growth. It is therefore justified to include the political system in the model.

Following Bloom and Canning (2000 and 2001), health, in the form of life expectancy is seen in a cross-country analysis as having a significant positive effect on economic growth. The more healthy workers are the more they will be able to work and the more income they get. To Bloom et al (nd), Healthier workers are perceived to be physically and mentally more energetic as such their productivity is seen to be higher. They are more productive and earn higher wages. They are also less likely to be absent from work because they don't suffer from chronic illness. They see this effect to be strong in developing countries, because a higher proportion of the work force is engaged in manual

labour than in industrial countries. Hence, the study includes life expectancy (LE) as a proxy for human capital in the model. The study expects the life expectancy of Ghanaians to be positively related to economic growth in Ghana and the production function is extended to take the form in equation (3.6). where all the variables are in real terms except POL and LE.

$$Y = f(K, L, GEXP, OPENESS, INF, POL, LE) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

On a priori expectation, all the independent variables are expected to have positive relationship with respect to economic growth with the exception of inflation. By taking the total differential of equation 3.6, and normalizing the variables with respect to output (Y_t), we obtain equation 3.7.

$$dY/Y = (\partial Y/\partial K)dK/Y + (\partial Y/\partial L)dL/L + (\partial Y/\partial GEXP)\ dGEXP/Y + (\partial Y/\partial OPENESS)\ dOPENESS/Y + (\partial Y/\partial INF)dINF/Y + (\partial Y/\partial POL)dPOL/Y + (\partial Y/\partial LE)dLE/Y \ldots\ldots (3.7)$$

Thus equation3.7 becomes the general operational model. where, $\partial Y/\partial K$ is the marginal product of capital and $\partial Y/\partial L$ is the marginal product labour. Similarly, $\partial Y/\partial GEXP$, $\partial Y/\partial OPENESS$, $\partial Y/\partial INF$, $\partial Y/\partial POL$, and $\partial Y/\partial LE$ can be defined as the marginal products of government expenditure, openness, inflation, political system, and life expectancy in that order.

3.2 Unit Root, Cointegration and Bounds Tests

The study tests for the stationarity of all the variables using the Augmented Dickey Fuller (ADF) test, by using the test equation with trend and intercept as in equation 3.8

$$\Delta y_t = \beta_1 + \beta_2 y_{t-1} + \alpha (t) + \sum \Upsilon i \Delta yt - i + u_t \qquad (3.8)$$

Where, Δ is the first difference operator, y is the variable under consideration, β_1 is the constant term, β_2 is the coefficient being tested, α is the trend coefficient, $\sum \Upsilon i \Delta yt - i$ is the summation of all past values of the variable under consideration which is being employed to eliminate the effect of autocorrelation with Υ_i being the coefficient and 'u_t' is the error term.

Cointegration refers to the existence of a long-run equilibrium relationship between time series variables which are individually non-stationary at their level form (Gujarati 2004). According to Twumasi (2010), the preference in selecting an ARDL model rather than a static one is informed by the need to take into account all the dynamic responses in the dependent variable that results from the changes in its own lags and the lagged values of the other explanatory variables. Hence to start directly by estimating a static long-run equation may fail to take into account the short run and the long-run responses in the system thus generating imprecise coefficient estimates. For this reason, the study will follow Pesaran *et al.* (2001) and uses the ARDL framework.

The intuition behind the use of the ARDL model to test cointegration is informed by the fact that the ARDL cointegration procedure is efficient in small sample data. Also ARDL makes it possible to estimate cointegration through ordinary least square the most important thing is for the lag length to be identified. Other estimation procedures cannot boast of the same technical advantage in multivariate estimation. Finally the ARDL mechanism can be applied without pre-testing the variables of concern for unit roots as is

the prerequisite for Johansen's procedure (1990). It can be used irrespective of the degree of integration of all the variables.

The final ARDL model that is used to test for cointegration is given in equation 3.9. The various lags of the variables are expected to be determined by the Schwarz Information Criterion (SIC).

$$\Delta lnY_t = \beta + \theta_1 lnYt_{-1} + \theta_2 lnK_{t-1} + \theta_3 lnL_{t-1} + \theta_4 lnGEXPt_{-1} + \theta_5 OPENNESS_{t-1} + \theta_6 lnINF_{t-1} + \theta_7 POLt_{-1} + \theta_8 LE_{t-1} + \sum_{i=1}^{p} \lambda_{1i} lnY_{t-i} + \sum_{j=1}^{q1} \lambda_{2j} \Delta lnK_{t-j} + \sum_{k=1}^{q2} \lambda_{3k} \Delta lnL_{t-k} + \sum_{d=1}^{q3} \lambda_{4d} \Delta lnGEXP_{t-d} + \sum_{f=1}^{q4} \lambda_{5f} \Delta OPENNESS_{t-f} + \sum_{o=1}^{q5} \lambda_{6o} \Delta lnINF_{t-o} + \sum_{w=1}^{q6} \lambda_{7w} \Delta POL_{t-w} + \sum_{r=1}^{q7} \lambda_{8r} \Delta LE_{t-r} + U_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

The ARDL Bounds test approach according to Pesaran et al (2001), is a three steps approach. The process begins by employing OLS on equation (3.9). To be able to test for the existence of a long-run relationship among the variables of interest, the test will be based on the joint F-statistics. The F statistic will test for the joint significance of all the lagged levels variables (coefficient of the long run effect). The null hypothesis of no cointegration among the variables of interest is tested against the alternative hypothesis. The test hypothesis is stated as,

H_0: $\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = \theta_8 = 0$

H_1: Not all the θ_S are zero

Two sets of critical values for a given significance level determine the test of cointegration. When the independent variables are I(m) (where $0 \leq m \leq 1$): a lower value assuming the regressors are I(0) and an upper value assuming purely I(1) regressors. Should the computed F statistic exceed the upper critical bound the null Hypothesis will be rejected. On the other hand, if the F-statistic falls in between the two bounds, then the cointegration test will be inconclusive. If the F-statistic is lower than the lower bounds value, the null hypothesis will be accepted.

The second step is to test for the long run relationship between the variables. This section forms a conditional ARDL model of order (p, q_1, q_2, q_3, q_4, q_5, q_6, q_7) to test the long run relationship between all the variables of interest. The ARDL model will assume the form,

$$lnY_t = \beta_0 + \sum_{i=1}^{p} \theta_{1i} lnY_{t-i} + \sum_{j=1}^{q1} \theta_{2j} lnK_{t-j} + \sum_{k=1}^{q2} \theta_{3k} lnL_{t-k} + \sum_{d=1}^{q3} \theta_{4d} lnGEXP_{t-d} + \sum_{a=1}^{q4} \theta_{5a} OPENNESS_{t-a} + \sum_{e=1}^{q5} \theta_{6e} lnINF_{t-e} + \sum_{s=1}^{q6} \theta_{7s} POL_{t-s} + \sum_{w=1}^{q7} \theta_{8w} LE_{t-w} + \varepsilon t \quad \text{.....(3.10)}$$

The lag length of the variables is selected based on the Bayesian Information criterion or Schwarz (BIC). The short run dynamics is captured by the error correction model,

$$\Delta lnY_t = \beta_0 + \sum_{i=1}^{p} \lambda_{1i} \Delta lnY_{t-i} + \sum_{j=1}^{q1} \lambda_{2j} \Delta lnK_{t-j} + \sum_{k=1}^{q2} \lambda_{3k} \Delta lnL_{t-k} + \sum_{d=1}^{q3} \lambda_{4d} \Delta lnGEXP_{t-d} + \sum_{g=1}^{q4} \lambda_{5g} \Delta OPENNESS_{t-g} + \sum_{h=1}^{q5} \lambda_{6h} \Delta lnINF_{t-h} + \sum_{y=1}^{q6} \lambda_{7y} \Delta POL_{t-y} + \sum_{n=1}^{q7} \lambda_{8n} \Delta LE_{t-n} + \rho ECM_{t-1} + \varepsilon_t \quad \text{.....(3.11)}$$

where, λ_i is the short-run dynamics coefficients of the model's dynamic adjustment to equilibrium. ECM_{t-1} term is the Error Correction factor. Thus it represents the short run

disequilibrium adjustment of the estimate of the long-run equilibrium error term. ρ measures the speed of adjustment to obtain equilibrium in the event of shocks .

Granger causality test is also employed to determine the pairwise relationship between the variables. Finally stability test is performed using the CUSUM and CUSUMQ approach.

3.3 Government Expenditure Disaggregation

In line with the second objective of the study, the study sort to analyse the relationship between government expenditure at the disaggregated level and economic growth. For investigative purposes, the government expenditure is divided into capital and recurrent expenditures. The capital expenditure consists of the purchase of assets that will last for a long time. They include the construction of roads and building of hospitals etc. recurrent expenditure on the other hand consists of recurring expenditures. They are items that are consumed for a short time. They include salaries and items that last for a short term. According to the OECD, current expenditures are expenditures on goods and services consumed within the current year, which needs to be made recurrently to sustain the production of services. Minor expenditure on items of equipment, below a certain cost threshold, is categorized as recurrent expenditure.

Recurrent expenditures are final consumption expenditure on property income paid, subsidies and other current transfers (e.g., social security, social assistance, pensions and other welfare benefits). Capital expenditure measures the value of purchases of fixed

assets that is those assets that are used repeatedly in the production processes for more than a year.

Equation 3.2 therefore becomes,

$$Y = f(K, L, GCAP, GCUR) \quad \text{(3.12)}$$

where GCAP the capital expenditure and GCUR the Current expenditure have replaced the total government expenditure GEXP in equation 3.8 the ARDL model now takes the form in equation 3.13.

$$\Delta lnY_t = \beta + \theta_1 lnYt_{-1} + \theta_2 lnK_{t-1} + \theta_3 lnL_{t-1} + \theta_4 lnGCAPt_{-1} + \theta_5 lnGCURt_{-1} + \theta_6 OPENNESS_{t-1} + \theta_7 lnINF_{t-1} + \theta_8 POLt_{-1} + \theta_9 LE_{t-1} + \sum_{i=1}^{p} \lambda_{1i} lnY_{t-i} + \sum_{j=1}^{q1} \lambda_{2j} \Delta lnK_{t-j} + \sum_{k=1}^{q2} \lambda_{3k} \Delta lnL_{t-k} + \sum_{d=1}^{q3} \lambda_{4d} \Delta lnGCAP_{t-d} + \sum_{b=1}^{q4} \lambda_{5b} \Delta lnGCUR_{t-b} + \sum_{f=1}^{q5} \lambda_{6f} \Delta OPENNESS_{t-f} + \sum_{o=1}^{q6} \lambda_{7o} \Delta lnINF_{t-o} + \sum_{w=1}^{q7} \lambda_{8w} \Delta POL_{t-w} + \sum_{r=1}^{q8} \lambda_{9r} \Delta LE_{t-r} + U_t \quad \text{(3.13)}$$

The long run and the short run dynamics computation and econometric derivations follows the same procedure as described for the total government expenditure as indicated in equations 4.4 and 4.5 respectively.

3.4 Sectoral Analysis

In line with the third objective, the study the study focused on government expenditure in three sectors namely the health sector, educational sector and the transportation sector. Following Nketiah- Amponsah (2009), Belgrave and Craigwell (1995) and Nurudeen and Usman (2008) a more disaggregated form of government expenditure that

accommodates expenditures on Education and Health sectors of the economy are factored into the model in lieu of total government expenditure as defined in equation 3.14. The theoretical justification for including these sectors is rooted in the ability of these sectors to consolidate capital in the country. Expenditure on health (HEALTH) and education (EDU) play a complementary role in developing human capital, expenditure to the transport sector is seen as physical-capital augmenting. In this study, the transport sector was omitted due to unavailability of consistent and reliable data. OLS is therefore used to estimate equation 3.14. Using log transformation where approipriate.

$$Y = f(lnK, lnL, lnEDU, lnHEALTH, OPENNESS, lnINF, POL) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.14)$$

3.5 Optimal level of Government Recurrent Expenditure

Scully (1998) utilized a neoclassical model that assumes some significant features of the Cobb Douglass production function to find the optimum level of government expenditure as a percentage of Real GDP in the U.S.A. Chobanov and Mladenova (2009) employed the same technique within a ~~panel~~ data analysis for a set of OECD countries. Davies (2008) employed the same procedure but instead of using GDP growth rate he employed the U.N human development index as the dependent variable.

Following Facchini and Melki (2011) Scully(1998, 2003) and assuming a quadratic relationship between government consumption expenditure and economic growth as

specified by the literature reviewed, the equation 3.15 is specified to determine the optimal size of government expenditure.

$lnY_t = f(lnK, lnL, GCUR, GCUR^2, lnOPENNESS, lnINF, POL, LE)$ ... ...(3.15)

An observation of the variables revealed that, government recurrent expenditure is about 3 times the size of the capital expenditure. But recurrent expenditure is mainly on emoluments, administration and maintenance costs. Thus they don't support economic growth directly compared to capital expenditure. It is therefore deemed necessary to estimate the optimum level of government recurrent expenditure above which it should not be allowed to exceed in order to avoid waste in the economy.

An OLS model is run with the help of Microfit 5.0 and the function is therefore maximized with respect to government recurrent expenditure. Y_t is the real gross domestic product and GEXP is the total government expenditure size as a percentage of GDP. The other variables were informed by theory on factors that determines growth. Their definitions are as already specified. The positive sign on the linear term GCUR shows the positive effects of government consumption spending on output whiles $GCUR^2$ measures the effect of government consumption expenditure on output on a deeper scope.

3.6 Sources of data and measurement of Variables.

The study used time series data which spans from 1970 to 2010 a total of forty (40) years for all the models employed with the exception of the sectoral study which used time

series data spanning from the years 1984 to 2010 because of unavailability of data for the previous years.

Data for GDP is from the World Bank. They define GDP as the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant year 2000 U.S. dollars. The source is from the World Bank Africa development indicators (2011).

Total labour force participation rate is used as a proxy for the labour force (L) in the model. The World Bank provides this data with the help of International Labour Organization (ILO). According to the World Bank, "Total labour force comprises people ages 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labour for the production of goods and services during a specified period. It includes both the employed and the unemployed".

Private investment is used as a proxy for capital (K) in the model developed. Though most researchers prefers gross capital formation, it is not suitable for this study because it takes into account both public and private investment. Since public investment is inherent in gross capital formation the econometric problem of multicollinearity will be best avoided if private investment proxy's capital. This will not only avoid multicollinearity but will enable the unique impact of government investment expenditure to be seen. The

decomposition is supported by Barro (1990), Bucci and Del Bo (2012), Ghura (1997) and Fereira (year not available). The source of this data is from the Ministry of Finance and Economic Planning.

Government expenditure is the main variable of interest analysed at the total, and at the disaggregated level. Total government expenditure as a percentage of GDP is a proxy for total government expenditure whiles government of Ghana's recurrent expenditure as a percentage of GDP is used as the recurrent expenditure. Lastly, government of Ghana's capital expenditure as a percentage of GDP is employed in all models as the capital expenditure. At the sectoral level the source of the data from 1983 to 2004 is from Nketia-Amponsah and from 2005 to 2009 is from the World Bank development indicators (2011). The source of all the other expenditure variables is from the ministry of finance and economic planning.

Inflation data are sourced from the World Bank. To them "Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals. The Laspeyres formula is generally used".

The political system variable employs the use of the polity IV project scheme. The scheme determines the level of democracy and autocracy in a particular state by examining concomitant qualities of democratic and autocratic authority in governing institutions. Rather than employing the usual dummy variables for such an exercise with (1) representing democracy and (0) zero for autocracy, the project developed what is

called the polity score. The "Polity Score" captures the authority of regimes on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). The Polity scores can also be converted to regime categories with-10 being the extreme autocracy and 10 being a consolidated democracy. To Marshall and Jaggers (2010), "the Polity scheme consists of six component measures that record key qualities of executive recruitment, constraints on executive authority, and political competition. It also records changes in the institutionalized qualities of governing authority. The Polity data include information only on the institutions of the central government and on political groups acting, or reacting, within the scope of that authority. It does not include consideration of groups and territories that are actively removed from that authority (i.e., separatists or "fragments"; these are considered separate, though not independent, polities) or segments of the population that are not yet effectively politicized in relation to central state politics". In view of the foregoing the study employs the polity index as a measure of the political system in Ghana.

The life expectancy of Ghanaians is approximated to indicate the health status of Ghanaians. The source of the data on life expectancy is from the World Bank. Life expectancy at birth indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

All analysis will be conducted with the help of Microfit 5.0, Microfit 4.0, Gretle and E-views 7 statistical software with data spanning from the years 1970 to 2010.

CHAPTER FOUR

EMPIRICAL RESULTS AND ANALYSIS

This chapter presents the results of the estimated models of the conceptual framework discussed in chapter three for the analysis. The unit root tests and the (ARDL) bounds test for cointegration results are discussed first followed by the results for the long-run and the short-run dynamic effects of the variables on economic growth. Granger causality test results are presented and analysed; lastly the optimal level of government expenditure determination is also presented.

4.1 Results and Analysis of the Unit Root Test

In accordance with the dictates of the methodology, unit root test was conducted by employing the augmented Dickey Fuller test because of the potential existence of autocorrelation in the variables. Table 4.1 shows the results of the ADF unit root test. The ADF test employed included a constant only, and a constant and a trend. To avoid spurious regression results, it is important that none of the variables under consideration be integrated of order two *I*(2) before applying the ARDL approach. During the test the null hypothesis of unit root were rejected for variables; K, GCAP, GCUR, OPENNESS, POL and LE in their levels as they achieved stationarity after first differencing at the 5% significant level since their tau value was higher than the critical values of the ADF statistic. However, Y, lnL and lnINF were all stationary in their levels. The results clearly shows that none of the variables are integrated of order two *I(2)* thereby providing a reasonable justification for the application of an ARDL model.

Table 4. 1: ADF Unit Root Test

VARIABLES	LEVELS		FIRST DIFFERENCE	
	INTERCEPT	**INTERCEPT+ TREND**	**INTERCEPT**	**INTERCEPT +TREND**
LnY	7.999	2.317	-1.086	-5.292***
LnL	-6.285**	-6.656**		
lnGEXP	-1.575	-1.883	-4.623***	-4.855***
lnGCAP	-1.981	-2.002	-5.766**	-5.705**
lnGCUR	-1.932	-2.327	-6.336**	-6.043**
OPENNESS	1.708	0.954	-4.726**	-5.247**
lnINF	-4.193**	-4.206**		
POL	-1.734	-3.296	-5.798**	-5.733**
LnK	2.736	-1.163	-6.815**	-5.672**
LE	-0.396	-2.562	-3.158**	-3.035

Calculated and generated from Eviews 7.0 and ** denotes the rejection of the null hypothesis of unit root at the 5% significant level.

4.2 Results and Analysis of the Cointegration Test

In this section the test result of all the level relationship for the ARDL models described in chapter three are presented in Table 4.2 as cointegration test results.

Table 4. 2: Cointegration tests

Equation	F' Statistics	95% Lower Bound	95% Upper Bound	Cointegration Status
EQUATION 3.9	5.3745**	2.7486,	4.1285	COINTEGRATED
EQUATION 3.13	10.173 **	2.6154	4.0506	COINTEGRATED
Calculated and generated from Microfit 5.0 ** Denotes the rejection of the null hypothesis at the 5% significant level				

The Bounds test is conducted using the 'F' statistic. From the table, the 'F' Statistic lies above the upper bound in both equation 3.9 and 3.13 hence, the null hypothesis of no level effect is rejected.

According to Pesaran (2001) the critical value bounds are computed by stochastic simulations using 20000 replications. The critical ARDL bounds test values for Equation 3.9 for both the 95% and 90% confidence level is given by 2.7486, 4.1285 and 2.2989, 3.5346 for the lower and upper bounds respectively.

The critical ARDL upper and lower Bounds test values for Equation 3.13 are 2.6154 and 4.0506 for the 5% significant level and 2.2005 and 3.4820 for the 10% significant level respectively. From table 4.2, it could be seen that equation 3.9 in chapter three which feature aggregate government expenditure in the independent variables is cointegrated at the 5% significant level suggesting a level relationship between real GDP and all the other independent variables in the model.

At the disaggregated level which considers the decomposition of government expenditure into capital expenditure and recurrent expenditure, (Equation 3.13) a level relationship is also established between real GDP and all the independent variables. The evidence is seen in Table 4.2 thus Equation 3.13, also shows significant cointegration between the variables at the 5% significant level.

4.3 Results and Analysis of the Long Run Relationships

One of the reasons that spearheaded the selection of the ARDL model is due to its ability to demonstrate the immediate impact and the long run impacts of the independent

variables on the dependent variable in this case, RGDP. We first consider the long run impacts of the various independent variables in all the functions developed and then later the short run impact they have on RGDP. The highest lag in the model is lag two (2). The lags were chosen based on the Schwarz information criterion (SIC).

4.3.1 Effect of Total Government Expenditure on Real GDP.

Table 4.3 provides the ARDL results for analysing the effect of total government expenditure on real GDP in the long run inter alia on real GDP growth.

Table 4. 3: Estimated Long Run Coefficients of EQN.3.9 using the ARDL Approach.

Dependent variable is lnY 39 observations used for estimation from 1972 to 2010 ARDL (1, 0, 2, 2, 0, 2, 0, 1) selected based on Schwarz Bayesian Criterion				
Regressors	Coefficient	Standard Error	T-Ratio	Probability value
lnK	0.064***	(0.021)	3.061	0.006
lnL	0.155***	0.039	3.999	0.001
lnGEXP	0.011***	0.003	3.367	0.003
OPENNESS	-0.020	0.104	-0.189	0.851
lnINF	-0.003***	0.750	-4.131	0.000
POL	0.003	0.004	0.839	0.410
LE	2.642***	0.390	6.781	0.000
CONSTANT	8.614***	1.325	6.501	0.000

Calculated and generated by Microfit 5.0. *, **, *** denotes the rejection of the null hypothesis at the 10%, 5%, 1% significant level respectively.R^2, RSS and F statistic are displayed in the short run results.

The long run implications of the model present some thought provoking results in terms of the signs of the variables. Starting with capital, the sign indicates that capital has a

positive impact on economic growth or RGDP. Since the natural log of capital was used, its effect is in the form of elasticities likewise the impact of labour government expenditure and inflation. The coefficient of capital 0.064 means that, all things being equal, a 1% rise in capital will raise real GDP by 6.4%. This clearly is in line with theory. It is highly significant at 1% significant level.

Labour according to the results, has a positive impact on economic growth indeed a 1% rise in the labour force will raise the level of economic growth by approximately 15.5%. This result is significant at 1% significant level. This indeed is not surprising considering the labour intensive method of production that permeates in almost every industry in Ghana. Majority of the labour force in Ghana are in the Agriculture sector. This sector is dominated by labour intensive method of production instead of mechanized farming. This is a testimony to the positive impact the labour force in Ghana has on economic growth in Ghana.

From the table, a 1% rise in government expenditure in Ghana will raise real GDP growth through the multiplier process by about 1.1%. This conforms to the prior expectation and the Keynesians theory of using government expenditure to boost economic growth. However, it must be noted that, this positive impact is being felt in the long run, the short run implications are discussed later.

Inflation was in agreement with theory since the sign between inflation and economic growth was negative, A 1% rise in the inflation rate will reduce real GDP growth by 0.3% this was significant at 1%. The sign of this variable is due to the fact that any

increment in the price level is transmitted to increment in the level of interest rate which subsequently impacts negatively on the level of investment and hence the level of output in the economy.

The other variables (POL, OPENNESS, and LE) in Table 4.3 are not elasticities but measure their marginal impacts on growth. The variable of interest government expenditure is highly significant and positive.

Openness of the economy to the outside world according to the table does not help to boost economic growth in the long run. From the results, a unit increase in the level of openness decreases real GDP growth by 2%. This is not significant at any level. The possible reason why this has a negative relationship with growth is due to the fact that exports in Ghana are lesser than imports. The balance of trade account for most years in Ghana has been in a deficit which goes to reiterate the point that most of the goods consumed in Ghana are imported but not produced in Ghana thus lesser productive activities takes place in Ghana. Also, poor terms of trade which emanates from the consistent supply of primary product into the global market may have caused the negative relation. These products experience inconsistent and rapid change of price that does not favour the country.

Life expectancy is positively related to economic growth at 1% significant level. An increases in life expectancy by one year raises the level of economic growth by over 264%. This makes human health the most important variable in the growth function. It must be noted that all these elasticities are growth elasticities.

Looking at the impact of democracy in Ghana, it shared a positive relation with economic growth though it is not significant at all, it reemphasize the point made by political economist on the need to have a democratic change of government to provide that peaceful environment needed for business activities. Thus it boosts business confidence in the economy.

4.3.2 Effect of Capital and Recurrent Expenditure on Real GDP growth

Table 4.4 shows the ARDL results for the effect of disaggregated government expenditure inter alia on real GDP in the long run.

Table 4. 4: Estimated Long Run Coefficients of EQN.3.13 using the ARDL Approach

Dependent variable is *lnY*. ARDL((1,1,2,0,2,1,1,0,0) selected based on Schwarz Bayesian Criterion 39 observations used for estimation from 1972 to 2010				
Regressors	Coefficient	Standard Error	T-Ratio	Prob.
LnK	-0.033	0.056	-0.591	0.561
LnL	0.207***	0.044	4.702	0.000
lnGCAP	-0.003	0.004	-0.764	0.453
lnGCUR	0.034***	0.006	5.711	0.000
OPENNESS	-0.016	0.110	-0.143	0.887
lnINF	-0.004***	0.001	-6.605	0.000
POL	0.006**	0.002	2.364	0.027
LE	2.693***	0.344	7.823	0.000
CONSTANT	9.280***	1.402	6.970	0.000

Calculated and generated from Microfit 5.0 *, **, *** denotes the rejection of the null hypothesis at the 10%, 5%, 1% significant level respectively.R^2, RSS and F statistic are presented together with the short run results.

Most of the variables maintained their signs while some variables assumed new signs though insignificant when government expenditure was decomposed into capital and recurrent expenditure. Focusing on the elasticity variables in the model, capital was

negatively related to economic growth in the long run with an explanatory power of -0.033 which suggests that a 1% increase in the capital stock reduces economic growth by 3.3% in the long run. But this clearly can be taken on a light note since it was highly insignificant. The sign was mainly informed by the decomposition.

Labour on the other hand had its explanatory power rising from 0.155 to 0.207. It is still positively related to economic growth and significant at 1% thus a 1% increase in the labour force will raise economic growth in Ghana by 20.7%.

An interesting observation in the growth function is the sign of both the capital and recurrent expenditure in Ghana. The relationship shows that in the long run government capital expenditure is negatively related to economic growth. This indeed is not in line with theory and the prior expectation. The results show that a 1% increase in government capital expenditure will in the long run reduce economic growth by 2.3%. Though it is not significant at all, it is possible because of the potential existence of corruption in the country. Thus not all the funds devoted to capital expenditure actually end up being used for that activity.

Corruption by public servants and the purported 10% stake given to corrupt politicians siphons chunk of the money away from their productive uses. Also there exists potential misallocation of capital expenditure from economically efficient but politically inefficient areas to economically inefficient but politically efficient areas.

This assertion is indeed proved by Gyimah- Brempong (2001); using panel data on a number of African countries with Ghana inclusive asserted that, corruption indeed decreases economic growth directly and indirectly by decreasing investment in physical capital. A unit increase in corruption reduces economic growth and per capita income by between 0.75 and 0.9 percentage points and between 0.39 and 0.41 percentage points per year respectively. The corruption problem again is highlighted by Fox et al (2011). The researchers hammered on the lack of political and administrative accountability in the Ghanaian situation. They stressed on the fact that politics in Ghana is a zero sum game where the winner takes all in the form of awarding contracts to its loyal supporters at the expense of promoting efficiency in the system. This is probably part of the reason why capital expenditure fails to contribute positively to real GDP growth in Ghana in the present study. Shoddy works by government contractors does not allow most projects to exhaust the expected life span it has been designated for but instead lasts for far fewer years thereby impeding any long run benefit it should have conferred on the economy. Modebe et al (2012) also using the same Nigerian economy found capital expenditure to be negatively related to economic growth in Nigeria.

Switching to recurrent expenditure, the result showed that recurrent expenditure in Ghana's case is positively related to the level of economic growth and significant at the 1% significant level. According to the result a 1% rise in recurrent expenditure has the propensity of increasing economic growth by 3.4%. The study expected the long run relationship between recurrent expenditure and economic growth to be negative since this expenditure type does not go into active investment. This finding is not completely out of

touch in the world of economic research for instance Ilegbinosa et al (2012) found out that recurrent expenditure in Nigeria confers significant benefit to three sectors of the Nigerian economy.

Openness again is insignificant and negatively related to economic growth for the same reasons as explained earlier this time around a unit increase in the level of openness will harm economic growth by reducing it by 1.6% this is lower than the previous case where the reduction in economic growth was 0.02.

Inflation was in line with the prior expectation. According to standard economic theory a rise in the level of inflation raises the cost of borrowing which in turn affects private investment thereby negatively impacting on real GDP growth. The inflation situation could be seen to have affected the private investment which as discussed was negatively related to economic growth. From the regression result, a 1% rise in the level of inflation will impede real GDP growth by 0.4% this is a little higher than the effect of inflation in the previous model.

The political system maintained it positive impact on real GDP growth. It was statistically significant at 5% level and exerts a positive marginal impact of about 6% on growth for a a unit increase in the level of democracy. This is higher than the previous case.

The human health status variable life expectancy which also doubles as the last of the elasticity variables maintained its high positive and statistically significant impact on real GDP growth. Its coefficient is displayed in the table above. From the table it could be seen that a 1 year increase in life expectancy in Ghana will raise GDP growth by 269.3% this is quite high and fairly reasonable given that the productivity of labour is enhanced when they are healthy.

4.4 Results and Analysis of Short Run Relationships

4.4.1 Error Correction Analysis of the ARDL Model Using Total Government Expenditure

Generally, the Error Correction Model (ECM) provides the means of reconciling the short run behaviour of an economic variable with its long-run behaviour. The existence of cointegration relationships among the variables implies the estimation of Error Correction Model to determine the dynamic behaviour of the growth equation. The Error Correction Model captures the short run dynamics of the system and its coefficient measures the speed of adjustment to obtain equilibrium in the event of shocks to the system. Table 4.5 reports the results of the short-run dynamic growth equation. If cointegration relationship is established among the variables, then it automatically implies the estimation of an Error Correction Model that assesses the dynamic behaviour of the growth function. The error correction model for the estimated ARDL equation involving total government expenditure is given in table 4.5.

Table 4. 5: Short Run Error Correction Representation for Eqn.3.13

Dependent variable is *ΔlnY* 39 observations used for estimation from 1972 to 2010 ARDL (1, 0, 2, 2, 0, 2, 0, 1) selected based on Schwarz Bayesian Criterion				
Regressors	Coefficient	Standard Error	T-Ratio	Prob.
ΔlnK	0.036**	0.013	2.712	0.011
ΔlnL	0.034***	0.009	3.551	0.001
ΔlnGEXP	-0.003	0.002	-1.566	0.129
ΔOPENNESS	-0.011	0.057	-0.191	0.850
ΔlnINF	-0.716***	0.240	-2.986	0.006
ΔPOL	0.002	0.002	0.811	0.425
ΔLE	7.219**	2.627	2.748	0.011
ecm(-1)	-0.555***	0.109	-5.099	0.000

R-Squared	0.748	R-Bar-Squared	0.5829
S.E. of Regression	0.029	F-Stat. F(11,27)	6.1917 [0.000]
Mean of Dependent Variable	0 .030	S.D. of Dependent Variable	0 .045
Residual Sum of Squares	0 .020	Equation Log-likelihood	92.728
DW-statistic	2.326	Schwarz Bayesian Criterion	63.419

Calculated and generated from Microfit 5.0 and *, **, *** denotes rejection of the null hypothesis at the10%, 5% and 1% significant level

The short run dynamics of equation 4.3 was estimated with an R-squared value of 0.748 meaning about 74.8% of the variation in the growth of real GDP is explained by the independent variables in the model. The R-bar-square is about 58.3%. The F-statistic confirmed the joint significance of all the independent variables at 1% significant level. The DW statistic was 2.326 which is high enough to debunk the presence of autocorrelation in the model. The error correction term was highly significant at 1% and negative which is the appropriate sign for it. A coefficient of -0.555 is indicative of the fact that approximately 55.5% of all disequilibria from the preceding year's shock converges back to the long-run equilibrium in the existing year.

With respect to the coefficients of the variables in the model, most of them assumed the same sign as it had in the long run with the exception of one (government expenditure). As usual the first elasticity variable, Capital was positively related to economic growth as was in the long run. It was significant at 5% and indicated that a 1% increase in it will increase economic growth by 3.6%. The short run labour elasticity of growth according to the growth function estimated is 0.034 and highly significant at one per cent. This reemphasizes the importance of labour in the growth process of Ghana. This sign is right in the sense that, Ghana like most African countries utilizes labour intensive methods in the production of most of her output.

Also majority of the goods traded are raw materials that do not go through any mechanized processing. The last of the elasticities human capital which is proxied by life expectancy from the table is highly elastic and significant at the 5% level. This variable is also consistent with the apriori expectation in both the short and the long run but assumed a higher coefficient in the short run (7.219) compared to the long run.

Government expenditure is the only variable that took a different sign in the short run. This variable was positive and highly significant in the long run but in the short run it took on a negative coefficient and it was insignificant. This indeed is not strange as a number of studies have found negative relationship between government expenditure and economic growth. Amponsah-Nketiah (2009) did find a similar result using OLS, Sakyi (2011), Sakyi and Adams (2012) all found a negative coefficient for government expenditure in relation to in the Ghanaian economy. Their study proved that government expenditure in Ghana is detrimental to economic growth. According to Nketiah-

Amponsah (2009), the reason for such a relationship stems from the need to raise taxes to finance Government spending which hurt economic growth. Economic growth suffers because, taxes bring a lot of distortions into the economy since a higher government spending also means a higher rate of taxation, which may suffocate economic growth.

Trade liberalization or the degree of openness maintained its negative relationship with real GDP growth. A similar result was found by Asiedu (2010).

Inflation and the level of democracy continued to affirm the dictates of economic theory this time with a coefficient of -0.716 and 0.002 respectively. Whiles inflation was significant at 10% significant level. The political variable was not significant at all in the short run. The probable reason for such a phenomenon could be that, it takes a lot of time to realize the gains from democratic change of government.

4.4.2 Error Correction Analysis for the ARDL Model Using Disaggregated Government Expenditure

The result for the short-run equation which centred on disaggregation of total government expenditures into recurrent and capital expenditures are provided in table 4.6. The model was correctly specified with an R- square of about 86.5% and an R-bar- square of about 76.7%. This means that more than 86% of the variation in the dependent variable is explained by all the independent variables combined. The joint significance of all the independent variables was tested by the F statistic and it was significant at 1%.

Table 4. 6: Short Run Error Correction Representation for Eqn.3.13

Dependent variable is *ΔlnY* 39 observations used for estimation from 1972 to 2010 ARDL (1,1,2,0,2,1,1,0,0) selected based on Schwarz Bayesian Criterion				
Regressors	Coefficient	Standard Error	T-Ratio	Prob.
ΔlnK	0.048**	0.020	2.403	0.023
ΔlnL	0.042***	0.008	5.362	0.000
ΔlnGCAP	-0.001	0.002	-0.740	0.466
ΔlnGCUR	0.003	0.003	1.057	0.300
ΔOPENNESS	-0.134**	0.052	-2.575	0.016
ΔlnINF	-0.001***	0.001	-5.760	0.000
ΔPOL	0.003**	0.001	2.265	0.032
ΔLE	1.455***	0.319	4.563	0.000
ecm(-1)	-0.540***	0.088	-6.129	0.000

R-Squared	0.865	R-Bar-Squared	0.767
S.E. of Regression	0.022	F-Stat. F(11,27)	12.811 [0.000]
Mean of Dependent Variable	0 .030	S.D. of Dependent Variable	0 .045
Residual Sum of Squares	0 .010	Equation Log-likelihood	104.928
Akaike Info. Criterion	87.928	Schwarz Bayesian Criterion	73.787
DW-statistic	2.401		

Calculated and generated from Microfit 5.0 where *, **, *** represents the rejection of the null hypothesis at the 10% 5% and 1% significance level.

The short run implications of equation 3.89 is not different from the long run results displayed in table 4.6 with the exception of some few variables that changed signs. Beginning with the elasticity variables, the coefficient of capital in the short run changed from the negative and insignificant sign it assumed in the long run to a positive and a significant relationship with real GDP growth. Capital was this time around significant at the 5% level. This is in line with the neoclassical economist theory on the marginal productivity of capital. The sudden contrast in signs between the long run and the short

run if respected could be traced back to the maintenance culture in the manufacturing sector in Ghana. The massive industrialization that took off in Ghana suffered from depreciation which subjected a lot of the factories in Ghana to halt production. A testimony to this fact was the dominance of the timber industry in Ghana. Today, Most of the factories have winded up because of broken down equipment. In this situation, it is reasonable to assume that in the short run the marginal benefit from such investment could be substantial but will have absolutely no benefit in the long run. Private investment was significant at the 5% level.

The labour elasticity to growth continues to obey the dictates of the neoclassical economist's theory. It was positively related to economic growth and highly significant at 1%. Also each percentage change in the labour force translates into more than 4.2% increase in real GDP growth rate. The human capital variable '*LE*' is still consistent with theory and highly significant at the 1% level. It was highly elastic with a marginal change of 1.455% change in real GDP growth for a an increase in the life expectancy of one year.

Focusing on the choice variables, government capital expenditure and government recurrent expenditure, they maintained their respective signs in the short run just like in the long run. Capital expenditure was negatively related to real GDP growth with a coefficient of -0.001 though not statistically significant at any acceptable level. The sign of the variable is in line with theory since most capital expenditures are expected to contribute to growth in the long run and not in the short run. Recurrent expenditure from the result of the estimation technique applied, has a positive coefficient of 0.003. Thus it

postulates a 0.3% increase in real GDP for any 1% increase in the level of recurrent expenditure. It was not significant though at any acceptable level of significance.

The rest of the independent variables preserved their signs as in the short run. Trade liberalization maintained its consistency in the model by negatively impacting real GDP growth again. It was statistically significant at 5% with a coefficient of -0.134. Inflation fulfilled economic theory and apriori expectation by relating negatively with the independent variable. It was highly significant at 1% with the prospect of reducing real GDP growth by 0.1% for each 1% increase in the inflation rate. Lastly democracy was statistically significant at 5% and has a prospective positive marginal impact of 0.003 on growth for a unit increase in the level of democracy in Ghana.

The error correction term was negative and highly significant at 1% and had a high explanatory power of 0.54. This suggests that, about 54% of all disequilibria from the foregoing year's shock congregate back to the long-run equilibrium in the existing year.

4.5 Results of Sectoral Analysis of Government Expenditure Allocation

To have a comprehensive idea on the particular sectors that promote economic growth as a result of government spending without constructing a sink model, two sectors of the economy were brought into the neoclassical growth function constructed. These are the health sector and the education sector. Both comes into the model as human capital and replaces life expectancy in the previous equations. An OLS regression was run with the two sectors featuring prominently in the model. The choice of OLS is made because of data availability. The results are demonstrated below.

Table 4. 7: Ordinary Least Squares Estimation of EQN. 3.14

Dependent variable is lnY 27 observations used for estimation from 1984 to 2010 ARDL				
Regressors	Coefficient	Standard Error	T-Ratio	Prob.
lnK	0.059*	0.034	1.755	0.096
lnL	0.008	0.015	0.522	0.608
lnEDU	-0.052*	0.027	-1.939	0.068
lnHEALTH	0.053***	0.014	3.922	0.001
OPENNESS	0.345***	0.093	3.718	0.002
lnINF	0.001	0.001	0.440	0.665
POL	0.036***	0.006	6.105	0.000
CONSTANT	20.788***	0.674	30.838	0.000

R-Squared	0.976	R-Bar-Squared	0.966
S.E. of Regression	0.064	F-Stat. F(7,8) 103.703	[0.000]
Mean of Dependent Variable	22.196	S.D. of Dependent Variable	0 .350
Residual Sum of Squares	0 .074	Equation Log-likelihood	39.231
Akaike Info. Criterion	31.264	Schwarz Bayesian Criterion	26.231
DW-statistic	1.719		

Calculated and generated from Microfit 4.0 where; *, **, *** denotes the level of significance at the 10%, 5% and 1% level.

Though least squares was used to estimate equation 3.9, the signs of the existing parameters of the model continue to exhibit considerable level of consistency with the exception of one that changed signs. The estimation procedure showed excellent result as the R-Square is 97.6% and the R-Bar- Squared is also 96.6%. The R- Square means that over 97.6% of all changes in the dependent variable are explained by all the independent variables. The F statistic also proved that all the independent variables are significant at 1%. The DW statistic of 1.719 is evidence enough to dismiss the notion of autocorrelation in the function. All statistical tests for the presence of any econometric problem is reported in Table 5.0

Capital and labour as could be seen from table 4.8 exhibited positive signs suggesting that they are positively related to real GDP growth. However labour is not significant at any level but capital was significant at 10% with the capacity to raise real GDP growth by 5.9% for each 1% increase in capital. This is proof enough of the positive catalytic role played by private investment. Creating the enabling environment for private investment according to this result is one of the surest ways of raising economic growth.

With respect to the variables of interest in equation 3.9, government expenditure on education and health, the study revealed mixed results as theory did not hold for expenditure on education but theory was confirmed with respect to health. The study reveals that expenditure on education has a negative relationship with real GDP growth. It was significant though at the 10% significant level. Indeed expenditure on education has a coefficient of -0.052 which proposes a reduction in real GDP growth of about 5.2% for a 1% increase in government expenditure towards education.

It was expected that government expenditure on education will raise real GDP growth because it develops the needed human resource that the country needs for productivity to go on. This was emphasized by Benhabib and Spiegal (1994) they argued that a more educated labour force would innovate quicker compared to their uneducated counterpart thereby raising productivity. Though the result defies theory, it does not stand alone in this part of the world. Nurudeen and Usman (2010) found a similar result in Nigeria. In Ghana, Nketiah- Amponsah (2009) found out that government expenditure on education had a negative relationship with economic growth. His estimation result indicated a strong impact of about 30% reduction in economic growth for a 1% increase in

government expenditure towards education. Cooray (2009) explains the reason for such behaviour is because; government expenditure towards education has an indirect rather than a direct way of improving economic growth through increasing the quality of education. This is the reason why it is negatively related to real GDP growth. Also Nketiah- Amponsah proposed that the behaviour of the variable is as a result of the fact that, the benefits of education is obtained in the long run rather than on the interim since the model estimation did not rely on the use of ARDL, the model estimated could not give a vivid picture of how of how the variables behaves in the long run.

Turning all attention on the effect of government spending on health, the result showed a highly significant positive relationship between expenditure towards health and real GDP growth. The result demonstrated a 5.3% increase in real GDP growth for any 1% increase in expenditure towards health. This is not far from economic theory. Indeed, Gerdtham and Jonsson, (2000) echoed that the relation between health expenditure and economic growth has bi-variate causation. At one hand increased income translates into great health as individuals with high income can access it. On the other hand, high expenditure on health leads to economic growth. This is because Health is also a capital good and as such, venturing in health care is an important foundation of economic growth.

The World Health Organization (WHO) dignifies the forgoing statement in the report by it's commission on Macroeconomics and Health in (2001) in Mehrara and Musai (2011) that, "extending the coverage of crucial health service to the world's poor could save millions of lives each year, reduce poverty, promote global security and spur economic growth." It could be seen from the results that government of Ghana expenditure towards

health has the potential to command economic growth in Ghana. Similar positive relation is confirmed by Kulindwa and Nerima (2012) for the Ugandan economy.

The level of openness in this model showed considerable level of significance at the 1% level and it was positive concurring with the classical argument on comparative advantage trade. This theory admonishes nations to produce the goods of which they are relatively well endowed to produce. For in so doing they will receive significant benefits.

Inflation is the only variable that changed signs in this model. It's coefficient of 0.001 means a 1% rise in the level of inflation can confer economic growth of about 0.1%. However it was not significant at all as such the sign can be downplayed. It must be noted that, the possibility of inflation positively relating economic growth is viable as some economists believe growth comes with some level of inflation. This is possible from Keynesian's perspective.. Keynes (1936) recognizes that in the intermediary stage of the long run aggregate supply any attempt to raise aggregate demand comes with an additional small inflationary pressures. Indeed if the forgoing is respected then the result from Table 4.7 is plausible. But the study softens it stand on the sign on the premise that it was insignificant. Democracy maintained its importance in the model. It was significant at 1% and positively related to real GDP growth. And has a relatively high marginal impact of 3.6% on real GDP growth for each unit increase in the level of democracy.

4.6 Diagnostic and Stability test Results

The diagnostic checks of the model presented no problem with the exception of equation 4.3 that had a small hetereoscedasticity in the model as indicated in table 4.8. All the models were stable and the functional forms were all rightly specified. Multicollinearity problem was tested with Gretle statistical package and the results are displayed at the appendix. The study employed the variance inflation factor to test for Multicollinearity for all the models the result of the test did not revealed any collinearity problems in any of the previously stated models as far as the study is concerned. Moreover the Microfit software did not also find any collinearity problems with the models.

The Lagrange multiplier test of residual serial correlation was utilized to test for autocorrelation in all the models employed. The result of the test as displayed in table 4.9 shows no serial correlation in any of the models. Ramsey's RESET test using the square of the fitted values was also employed to test whether the appropriate functional forms were specified in each of the models employed. The tests revealed that indeed all the model have no functional specification problem hence the study is justified in using them. The normality test was based on a test of skewness and kurtosis of the residuals. The test found out that all the variables were normally distributed and as such, no normality problems were found. Lastly, hetereoscedasticity was tested ,Based on the regression of squared residuals on squared fitted values. The results revealed that, all the models were homoscedastic with exception of equation 3.13 that showed small evidence of hetereoscedasticity. But the evidence is not big enough as such, it should be rejected.

Table 4 . 8: Model Diagnostics and stability Test

Test Statistics	EQN.3.9	EQN 3.13	EQN.3.14
Serial correlation	1.328	2.251	0.083
	(0.249)	(0.134)	(0.774)
Functional Form	0.948	1.498	1.302
	(0.330)	(0.22)	(0.254)
Normality Test	0.395	0.712	0.074
	(0.821)	(0.700)	(0.964)
Hetereoscedasticity	5.532	0.332	0.002
	(0.019)	(0.564)	(0.967)
CUSUM	STABLE	STABLE	STABLE
CUSUMQ.	STABLE	STABLE	STABLE

Calculated and generated from Microfit 5.0 Probability values are in parenthesis and relevant graphs for testing stability are provided in the appendix.

4.7 Further Results and Analysis of Hypothesis Tests

Previous analyses and results have focused on the first and second hypotheses that deal with the relationship between government expenditure and economic growth in the short run and in the long run at the aggregate and the disaggregated level. This section investigates the Wagnerian hypothesis at the aggregate and the disaggregated level of government expenditure through the application of Granger causality test. Also higher government expenditure has been justified on the grounds that, in an economy where the private sector is not well developed, government expenditure is needed to give the necessary impetus to the private sector to grow. Thus it is the expectation of most underdeveloped economies that government expenditure will play a catalytic role to empower the private sector to assume its position as the engine of growth of any economy. In view of this, Granger causality test is invoked to test this catalytic effect. This assesses the relationship between government expenditure at various levels and private sector investment K.

The optimal lag was selected based on the Schwarz Bayesian information criterion selected for running the ARDL models used in the previous section. The lag structure is thus two (2).

4.7.1 Wagnerian Hypothesis

Starting with the causal relationship between economic growth and government expenditure at the aggregate level, the Wagnerian hypothesis was validated at the 10% significant level. The Keynesian claim of government expenditure fuelling real GDP growth was not valid as far as the study is concerned. The result revealed a uni-directional causal relationship running from real GDP growth to government expenditure. This means that, economic growth in Ghana places pressure on government expenditure to grow. The finding is in line with the results of Nketiah-Amponsah (2009) but it is not consistent with that of Liu et al (2008) for the U.S economy and Sevitenyi (2012) for the Nigerian economy.

At the disaggregated level the Keynesians view on government expenditure providing the necessary impetus for economic growth was once again not supported by the causality between any of the components of government expenditure and economic growth. But evidence of Wagner's hypothesis was revealed with the direction running from economic growth to recurrent expenditure. However, there was no causality between economic growth and capital expenditure. This is no surprise as the initial long run and short run analysis did not find significant relationship between economic growth and capital

expenditure. The result of the pairwise Granger causality test between all the expenditure variables and economic growth is given in Table 4.9.

Table 4. 9: Wagner's Hypothesis

Null Hypothesis:	No. of Obs	F-Statistic	Prob.
GEXP does not Granger Cause ΔLNRGDP	39	0.47020	0.6289
ΔlnRGDP does not Granger Cause GEXP		2.89028	0.0693
GCUR does not Granger Cause ΔLNRGDP	39	0.43801	0.6489
ΔlnRGDP does not Granger Cause GCUR		2.55627	0.0924
GCAP does not Granger Cause ΔLNRGDP	39	0.30782	0.7371
ΔlnRGDP does not Granger Cause GCAP		2.25822	0.1200

Calculations and computations from E-views 7

4.7.2 Catalytic Effect

The causality test employed to test for the existence of any ripple effect to the private sector indicated that, there is no causality between private investment and any of the expenditure levels. It was expected that government expenditure whether at the aggregate or disaggregated level, could Granger-cause private investment to legitimize the catalytic effect that it has been touted to produce. The analysis at the disaggregated level supports the result at the total level. There is no direction of causality between any of the components of government expenditure and private investment. Hence the catalytic effect that government expenditure has been hyped to provide is non-existent in Ghana's case. This means that the Keynesian multiplier does not have any significant impact on private investment. Table 4.10 shows the result of the pairwise Granger causality test.

Table 4. 10:Catalytic Effects

Null Hypothesis:	No. of obs.	F-Statistic	Prob.
K does not Granger Cause GEXP	39	0.44074	0.6472
GEXP does not Granger Cause K		0.07113	0.9315
K does not Granger Cause GCUR	39	1.28015	0.2911
GCUR does not Granger Cause K		0.68451	0.5112
K does not Granger Cause GCAP	39	0.12498	0.8829
GCAP does not Granger Cause K		0.49722	0.6126

Calculations and computations from E-views 7.0

With respect to the causal relationship between economic growth and private investment (K), the test also revealed a uni-directional causality running from real GDP growth to private investment. This relationship is justified on the grounds that, when private individuals have more income, they motivated to invest as they are able to meet their daily expenses and still accommodate savings. As such, all other things being equal, a higher income is an indication of a higher prospect in savings and hence an increase in investment. Ghura (2007) got an opposite result in his study of the Cameroonian economy. Table 4.12 gives the details of the results.

Table 4. 11:Granger causality test results for ΔlnRGDP and K

Null Hypothesis:	No. Obs.	'F' Statistic	Probability
K does not Granger Cause ΔlnRGDP	39	3.49122	0.0418
ΔlnRGDP does not Granger Cause K		1.30016	0.2857

Calculations and computation from E-views 7.0

4.8 The Optimal Value of Government Recurrent Expenditure

The relationship between government expenditure and growth has been determined both at the aggregate, disaggregated and sectoral level. The relationship has also been determined in the long run and the short run but the question that still remains unanswered is the optimal recurrent expenditure size. Following the accounts of scully (1998) and Davies (2008), an OLS was run that took the positive and negative effects of government of Ghana recurrent expenditure into account and arrived at the results depicted in Table 5.2. Differential calculus was brought into play to let the optimal level of government expenditure evolve.

Lagrange multiplier test of residual serial correlation, Ramsey's RESET test using the square of the fitted values, a test of skewness and kurtosis of residuals and a test based on the regression of squared residuals on squared fitted values were employed to check autocorrelation, functional form, normality and hetereoscedasticity respectively. The econometric prowess of the model is displayed below table 4.12 there is no evidence of autocorrelation, functional form, normality and hetereoscedasticity problems. The Microfit software did not find any collinearity problem however, when Multicollinearity was tested with Gretle using the variance inflation factor the results showed some minimum level of Multicollinearity but were not serious. The results are depicted in appendix two. To quote the words of Blanchard in Gudjarati (2004) "Multicollinearity is God's will, not a problem with OLS or statistical technique in general".

Moreover, the Microfit software used for the OLS estimation deemed it not severe that is why it went ahead to estimate it.

Table 4. 12: OLS Regression Result for Estimating Optimal Recurrent Government Expenditure

Dependent variable lnY 40 observations used for estimation from 1970 to 2010				
Regressors	Coefficient	Standard Error	T-Ratio	Prob.
ΔlnK	0.061481***	0.022	2.818	0.008
ΔlnL	0.011379	0.013	0.887	0.382
GCUR	0.0091403	0.029	-0.315	0.755
$GCUR^2$	-0.0003545	0.001	-349	0.729
lnOPENNESS	0.28130***	0.048	5.919	0.000
lnINF	-0.025572	0.015	-1.686	0.102
POL	0.0063976**	0.002	2.645	0.013
LE	0.066981***	0.005	14.608	0.000
CONSTANT	17.1587***	0.437	39.303	0.000
R-Squared	0.984	R-Bar-Squared		0.981
S.E. of Regression	0.055	F-Stat. F(8,31)	252.6878	[0.000]
Mean of Dependent Variable	22.031	S.D. of Dependent Variable		0 .40114
Residual Sum of Squares	0 .100	Equation Log-likelihood		65.0935
Akaike Info. Criterion	56.0935	Schwarz Bayesian Criterion		48.3824
DW-statistic	1.5354			

Source: Microfit 5.0 *, **, *** denotes the level of significance at the 10% 5% and 1%

A: Serial Correlation	CHSQ (1) = 1.8988[.168]*	F (1, 31) = 1.5054[.229]
B: Functional Form	CHSQ (1) = 3.2281[.072]*	F (1, 31) = 2.6493[.114]
C: Normality	CHSQ (2) = .41076[.814]*	Not applicable
D: Hetereoscedasticity	CHSQ (1) = .020232[.887]*	F (1, 39) = .019255[.890]

Table 4.12 does not provide any new challenge that has not been dealt with. As the model is OLS it presents results that are similar to the baseline model in equation 3.13. In the

model, the choice variable, government recurrent expenditure is positively related to real GDP but its square is negatively related to real GDP growth confirming the results in the baseline models presented in table 4.4 and 4.7 with respect to the short run and the long run. The negative sign on the squared recurrent expenditure suggests that government recurrent expenditure will be detrimental to the economy if its level is doubled. Thus government expenditure has got an optimum level if recurrent expenditure levels are above this optimum level, it will be harmful to real GDP growth. Table 4.12 therefore gives enough justification for inferences and deductions from this model as no econometric problem is detected.

Since the essence of this section is to calculate the optimum level of government consumption or recurrent expenditure, the result from the OLS regression is depicted in an equation form for the necessary mathematical operations. Though the expenditure variables are not significant the overall equation is significant at the 1% significant level the "F" statistic shows this. Also the R^2 has a relatively higher explanatory power of about 98%. Thus the independent variables explain about 98% of the overall variation in the dependent variable hence the model could be relied on for analysis. The results are depicted below;

$$\ln Y = 17.1587 + 0.061481\ln K + 0.011379\ln L + 0.0091403GCUR - 0.0003545GCUR^2 + 0.28130\ln OPENNESS - 0.025572\ln INF + 0.0063976POL + 0.066981LE \quad \ldots\ldots\ldots\ldots 5.1$$

From the equation above, we maximize lnY with respect to government recurrent expenditure (GCUR) by taking the partial derivative of lnY with respect to GCUR.

$$\frac{\partial lnY}{\partial GCUR} = 0.0091403 - 0.000709GCUR \quad \text{.....5.2}$$

$$\frac{\partial^2 lnY}{\partial GCUR^2} = -0.000709$$

This suggests that the optimum level is a maximum.

Setting $\frac{\partial lnY}{\partial GCUR} = 0$

$$0.0091403 = 0.000709GCUR \quad \text{.....5.3}$$

Dividing through by 0.000709

$GCUR = 12.89\%$ of GDP

Hence Real GDP is maximized when government of Ghana keeps its recurrent spending approximately at 13% of GDP. This is the recurrent expenditure level that maximizes economic growth. Indeed, this percentage clearly is reasonable because the private sector is not that developed to assume a primary role in the development agenda of Ghana. This optimum level falls in between the highest expenditure level of 7.3% and 20.8%. But Chabanov and Mladnova (2009) estimated the optimal recurrent expenditure for the OECD countries to be about 10.8% of GDP. Facchini and Melki (2011) also found the optimal total government expenditure for France to be around 34% of GDP.

A look at some government of Ghana budgets indicates that, this optimum level has been surpassed many times. For instance MOFEP data indicates that in 1994 government

recurrent expenditure was 17.9% of GDP in 2004, it rose to 20.4% of GDP and in 2010 it was around 17.5% of GDP.

Public expenditure has been on the ascendency in recent times indeed according to Tanzi and Schuknecht (1996); the industrial countries had public expenditure levels on average at 44.8% of GDP in 1990, and 47.2% in 1994.

Other measures of the optimum expenditure size have considered other variables that take into account the welfare of the populace. Variables such as real GDP per capita and the Human development index are considered a better measure than the real GDP growth rate. This is because this measure recognizes the highest economic growth and ascribes it to its associated government expenditure but, economic growth is not due to only one variable in fact it is plausible that a year might have recorded higher growth rate and the measure might ascribe it to the government expenditure within the year when in actual fact it wasn't.

CHAPTER FIVE

FINDINGS, RECOMMENDATION AND CONCLUSION

This final chapter provides the major findings of the study and draws policy implications of these findings for the Ghanaian economy.

5.1 Major Findings of the Study

After embarking on series of analysis to suit the objectives of the study, the study revealed that:

Government expenditure has a positive relationship with economic growth in the long run. However this relationship is not the same in the short run, it is rather negative. This is because, in order for government to spend, taxes will have to be raised to support the expenditures. These taxes affect productivity in the short run as there are distortions in taxes that impede economic growth. However these distortions are trounced by the positives government expenditure provide to the economy in the long run thereby making government expenditure growth enhancing in the long run and growth challenging in the short run. The forgoing analysis indicates that it takes a longer time for government expenditure to translate into positive benefits for the whole economy. Hence if government decides to use its expenditure to raise economic growth the result will not be achieved overnight but might take some time to yield the returns.

On the disaggregated level, government expenditure was decomposed into capital and recurrent expenditure and together with the other independent variables regressed on real GDP growth. The study found out that, government capital expenditure was not growth oriented but rather countered economic growth in both the long run and the short run though the result was not significant at all. The study blames the situation on the massive corruption that takes place in awarding of contracts and the shoddy works on government physical investments such as roads by contractors. The study also cites the poor location of government physical investments as one of the reasons for the negative relationship thus they are pro political but not pro economic growth oriented. Sharma (2012) also found out the same relationship for Nepal. This finding provides evidence about the existence of the crowding out effect that is often associated with government spending.

Recurrent expenditure on the other hand was growth augmenting both in the long run and the short run. It is therefore not entirely bad for the economy if government spends on recurrent items. The notion behind this is that a chunk of recurrent expenditures is in the form of wages and salaries which constitute private consumption expenditure and private savings. All these are positively related to economic growth in Ghana. It is therefore not surprising that recurrent expenditure was positively related to real GDP growth.

At the sectoral level the study found government expenditure on education to be negatively related to economic growth in Ghana but the study expected a positive relationship between the two variables. The behaviour of the two variables emanates from the fact that, the positive feedbacks from education is not a short term phenomenon

but a long term one and the study did not analyse this relationship with the ARDL model but OLS which fails to capture the long term phenomenon and the short term relationship. Also expenditure on education does not have a direct benefit but an indirect one through effective labour force and increment in technological innovation.

Government expenditure on health was positively related to economic growth and it was in harmony with the prior expectation. The impact of expenditure on health is not experienced only in the long run but also in the short run. Thus the mechanism by which government expenditure on health enters the economic growth process is very quick. The positive relationship confirms the fact that expenditure on health improves human capital which is positively related to economic growth according to theory.

With respect to the other independent variables that are not the variables of interest in the study, the study found a consistent relationship between economic growth and some of the variables while some of the variables exhibited slight inconsistencies when OLS was used to model the sectoral analysis. The labour force exhibited a consistent positive relationship with real GDP growth in all the models that were run. This re-emphasizes the active role of labour in the Ghanaian economy. The fact that agriculture continues to absorb majority of the Ghanaian labour force is testimony enough to accept the preceding findings. This is because the agricultural sector is dominated by labour intensive method of production. This automatically makes labour a major player in the production process.

The political system or democracy exhibited a constant positive relationship with economic growth. Thus in all the models the level of democracy was positively related to economic growth re-echoing the need for political stability in Ghana. This heightens confidence in the economy and subsequently leads to higher investments.

Life expectancy which was used to proxy the health status of Ghanaians in equations 3.9 and 3.13 also exhibited a strong, consistent and a positive relationship with economic growth. It was in agreement with economic theory and the prior expectation of the study and confirms the assertion that, human capital is also a type of capital therefore any investment in it in an economy such as Ghana ought to have positive economic growth implications in the economy.

The study tested for the existence of both the Wagnerian hypothesis and the Keynesians concept on government expenditure through the application of granger causality test at both the aggregate and the disaggregated level. The study discovered that, at the aggregate level, the hypothesis is in force as far as Ghana is concerned but the Keynesians perception does not hold in the Ghanaian context. At the disaggregated level, the study did not find any evidence supporting the Keynesians impression but the Wagnerian hypothesis was once again in effect with respect to government recurrent expenditure.

The study also found from the Causality test that, government expenditure does not play any catalytic role for private investment at both the aggregate and the disaggregated level. The study expected a bi- directional causality between the two variables but this

expectation was thwarted by this finding. The uni- direction is justified on the grounds that many of the big government contracts are given to foreign companies instead of local companies hence the catalytic role that those expenditures are supposed to play is not realized. This causality test also confirms the potential existence of crowding out effect in the economy.

The study also discovered that the optimal government expenditure level that produces the highest economic growth is 12.89% of GDP. The reality is that this figure was calculated based on only government recurrent expenditure but other macro-economic variables such as inflation were not taken into account. This means that all recurrent expenditures in excess of 312.89% of GDP will worsen the economic growth prospect of the country.

5.2 Recommendations of the study

Based on the general findings indicated in the previous section, the study recommends the following for policy makers to act upon them:

1. Because total government expenditure has a direct positive relationship with real GDP growth, the study advocates it utilization to trigger economic growth but warns that the recurrent component should not be allowed to exceed its optimum of size of 12.89% of GDP. However, the study recommends an alternative to using government spending to trigger economic growth if the aim of that policy is

to trigger economic growth within a short period of time as its impact is felt in the long run.

2. There is also the need for policy makers to take into consideration the welfare of the private sector by controlling the expenditure component that competes with the private sector to prevent the crowding out effect from coming into force. In order to engender the growth of the local private sector with government spending, the study advocates the need for government to make sure that it inculcates in its policies the need for local private enterprises to receive the chunk of these expenditures.

3. With respect to government capital expenditure, though the study found insignificant negative relationship between it and economic growth the Granger test implies that it has the potential to predict economic growth as such the study recommends that policy makers review its content to suit only economic growth oriented investments. The study also advocates the need to eliminate corruption from the system and adhere strictly to the dictate of a scientific project appraisal before embarking on any government project.

4. Though recurrent expenditure has some growth augmenting implications it is important that, this component is pegged at an optimal level. This is because massive expenditure without a corresponding increase in productivity can spearhead an upsurge in inflation.

5. With respect to the human capital component of the sectoral analysis the study recommends that, government needs to guarantee maximum efficiency from funds committed to education by ensuring that the quality of education is unquestionable and also make sure that more funds are committed to bridge the infrastructure gap in the educational sector. Moreover, there is the need for policy makers to increase yearly budgetary allocation to the health sector as it has proven to be very productive and also has a positive ripple effect on life expectancy. It is obvious that a mere budgetary allocation will not on its own raise productivity as such, a system needs to be developed that will match specific expenditure and revenue decisions and ensure that the handling of allocated funds are as transparent as possible. There were other recommendations which are not about the variables of interest

6. The evidence from the result shows that continuous growth in the labour force will be good for the economy. This is because, following the classical economists argument, a continuous growth in the labour force will sustain if not beat down the price of labour. This is good for employers and it also eliminates to an extent the level of unemployment. The study advocates for policies that increases the labour force but favours policies that are tilted towards enhancing their quality.

7. To add more to the above, since more investments are needed in order to enjoy sustainable long-run economic growth, the study proposes a national policy that will ensure that sufficient savings are mobilized for investment in the country. To

Asiedu (2010), this could be done if deposit insurance is given to all savers to safe guard them from any loses they might sustain from saving.

8. It is also recommended to the Bank of Ghana to stabilize the inflation rate at a level supportive of sustainable economic growth. A single digit and stable inflation is needed to minimize instabilities and uncertainties in the domestic financial market, this will automatically lend enormous support to capital formation needed for investment in Ghana.

9. Ghana is not an Island hence trade with its neighbours and the global world is inevitable. The study proposes that a national culture is be instilled in the citizens to patronize in domestically manufactured products whiles a national policy is put in place to encourage the export of processed products. This will guarantee the country a favourable terms of trade which is needed to repair the country's trading position.

10. Lastly, there is the need sustain the current democratic dispensation to foster higher economic growth in the future. Thus although manipulating all the macro economic variables in the model could guarantee the country economic growth, the country can consolidate her gains by improving upon the current democratic system of government to maximize economic growth.

5.3 Conclusion

Existing literature and data has in recent times provided a lot of information that, whiles government expenditure is on ascendency in Ghana, economic growth in Ghana has stagnated for a long time. The study set out to investigate the impact of government expenditure on economic growth at three levels and to see whether the Wagnerian hypothesis or the Keynesians impression of government expenditure holds in Ghana. The study therefore concludes that there is reason to accept that total government expenditure has a positive long run effect on growth and a negative impact in the short run.

Also at the disaggregated level the study reveals sufficient evidence of a positive impact of recurrent expenditure on economic growth whiles capital expenditure revealed a negative insignificant effect on economic growth in both the long run and the short run. The sectoral analysis disclosed that government expenditure on health is economic growth augmenting whiles expenditure on education was growth impeding. The study therefore found evidence of the Wagnerian hypothesis but disapproves the existence of the Keynesians impression of the effect of government expenditure in Ghana. There is also a reason to believe that government expenditure does not engender growth in private investment in Ghana.

Though the study was able to bring into light some thought provoking revelations, it was not without some difficulties. Inadequate data continues to be a problem for most time series data oriented research in Africa and this study was a victim of this canker as consistent sufficient data was not available for the study. Also the study recorded some minimum level of hetereoscedasticity in the result of equation 3.9 which the researcher

considers as a limitation. The study also did not apply the ARDL model on the sectoral analysis; the study recommends that future research on this area should inculcate other sectors such as transport and infrastructure to the already examined sectors and apply the ARDL model on it to be able to distinguish the long run effect from the short run effect. Also the study recommends that, future calculations of the optimal government expenditure should consider a variable that takes into account the welfare of the citizenry such as the Human Development Index (HDI) instead of real GDP.

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APPENDIX

APPENDIX ONE

Autoregressive Distributed Lag Estimates
ARDL(1,0,2,2,0,2,0,1) selected based on Schwarz Bayesian Criterion

Dependent variable is LNRGDP
39 observations used for estimation from 1972 to 2010

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNRGDP(-1)	.44494	.10886	4.0873[.000]
LNK	.035799	.013201	2.7119[.012]
LNL	.033516	.0094382	3.5511[.002]
LNL(-1)	.023359	.0099375	2.3506[.028]
LNL(-2)	.028977	.010981	2.6389[.015]
GEXP	-.0030352	.0019383	-1.5659[.131]
GEXP(-1)	-.7433E-3	.0026540	-.28005[.782]
GEXP(-2)	.010026	.0027421	3.6563[.001]
OPENNESS	-.010933	.057195	-.19116[.850]
INF	-.7159E-3	.2398E-3	-2.9857[.007]
INF(-1)	-.4853E-3	.2529E-3	-1.9185[.068]
INF(-2)	-.5173E-3	.2594E-3	-1.9943[.058]
POL	.0017397	.0021461	.81062[.426]
LNLE	7.2194	2.6272	2.7479[.011]
LNLE(-1)	-5.7530	2.4698	-2.3294[.029]
C	4.7813	1.3499	3.5418[.002]

R-Squared	.99682	R-Bar-Squared	.99475
S.E. of Regression	.029231	F-stat. F(15, 23)	480.7961[.000]
Mean of Dependent Variable	22.0495	S.D. of Dependent Variable	.40333
Residual Sum of Squares	.019652	Equation Log-likelihood	92.7275
Akaike Info. Criterion	76.7275	Schwarz Bayesian Criterion	63.4190
DW-statistic	2.3263	Durbin's h-statistic	-1.3893[.165]

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.3276[.249]	F(1, 22)= .77528[.388]
B:Functional Form	CHSQ(1)= 1.0129[.314]	F(1, 22)= .58662[.452]
C:Normality	CHSQ(2)= .39497[.821]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 5.5317[.019]	F(1, 37)= 6.1155[.018]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Multicollinearity test for equation 3.9 using variance inflation factor

Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem
lnK 6.147
lnL 1.546
GEXP 1.763
OPENNESS 1.890
INF 1.530
POL 2.683
lnLE 3.827

VIF (j) = 1/ (1 - R (j) ^2), where R (j) is the multiple correlation coefficient between variable j and the other independent variables

Properties of matrix X'X:

1-norm = 152016.04
Determinant = 2.8600436e+013
Reciprocal condition number = 2.3178107e-008

Estimated Long Run Coefficients using the ARDL Approach
ARDL(1,0,2,2,0,2,0,1) selected based on Schwarz Bayesian Criterion

Dependent variable is LNRGDP
39 observations used for estimation from 1972 to 2010

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNK	.064495	.021068	3.0612[.006]
LNL	.15467	.038675	3.9992[.001]
GEXP	.011255	.0033428	3.3670[.003]
OPENNESS	-.019697	.10398	-.18943[.851]
INF	-.0030960	.7495E-3	-4.1310[.000]
POL	.0031342	.0037357	.83899[.410]
LNLE	2.6419	.38963	6.7806[.000]
C	8.6140	1.3250	6.5012[.000]

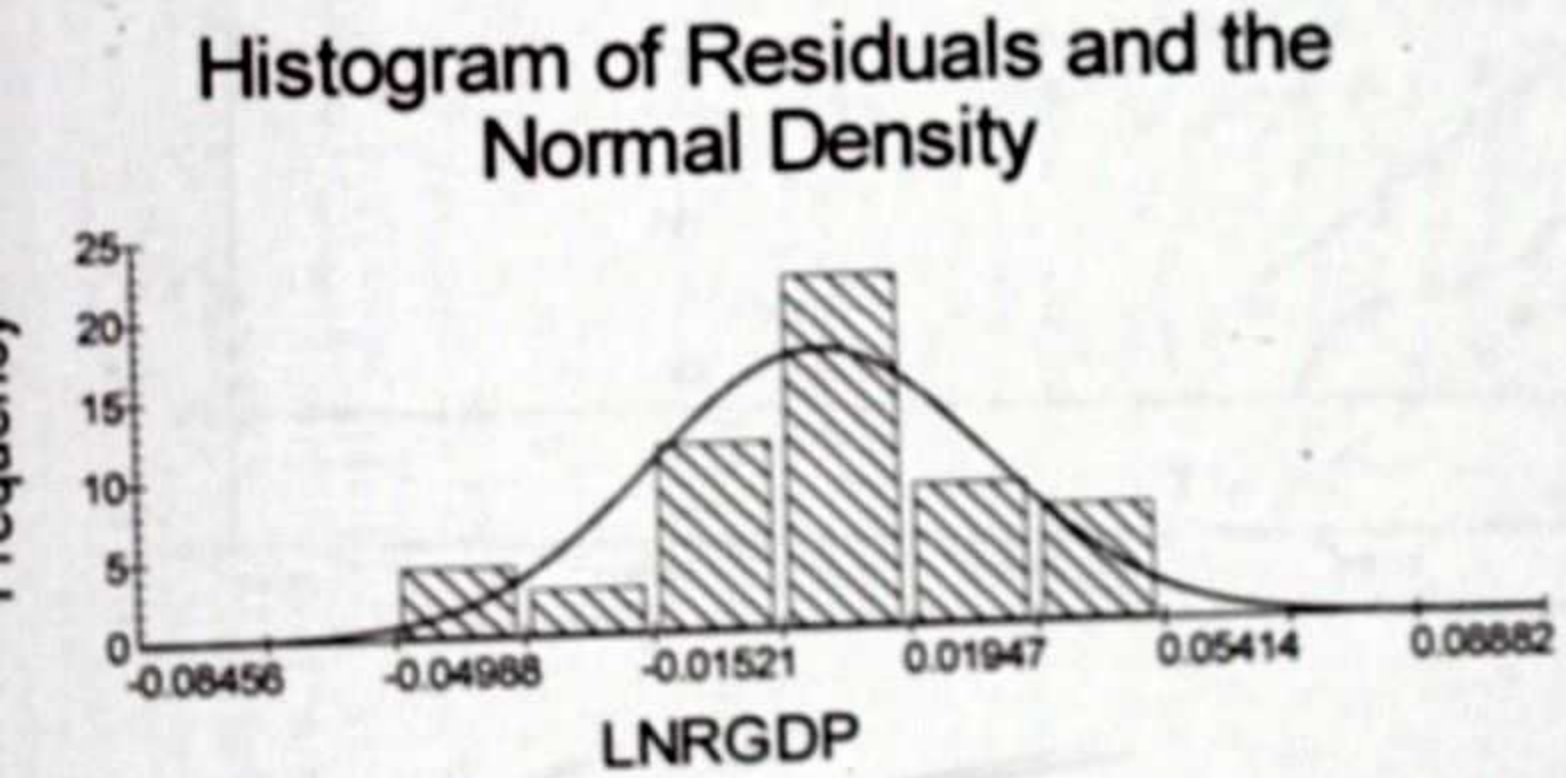
Error Correction Representation for the Selected ARDL Model
ARDL(1,0,2,2,0,2,0,1) selected based on Schwarz Bayesian Criterion

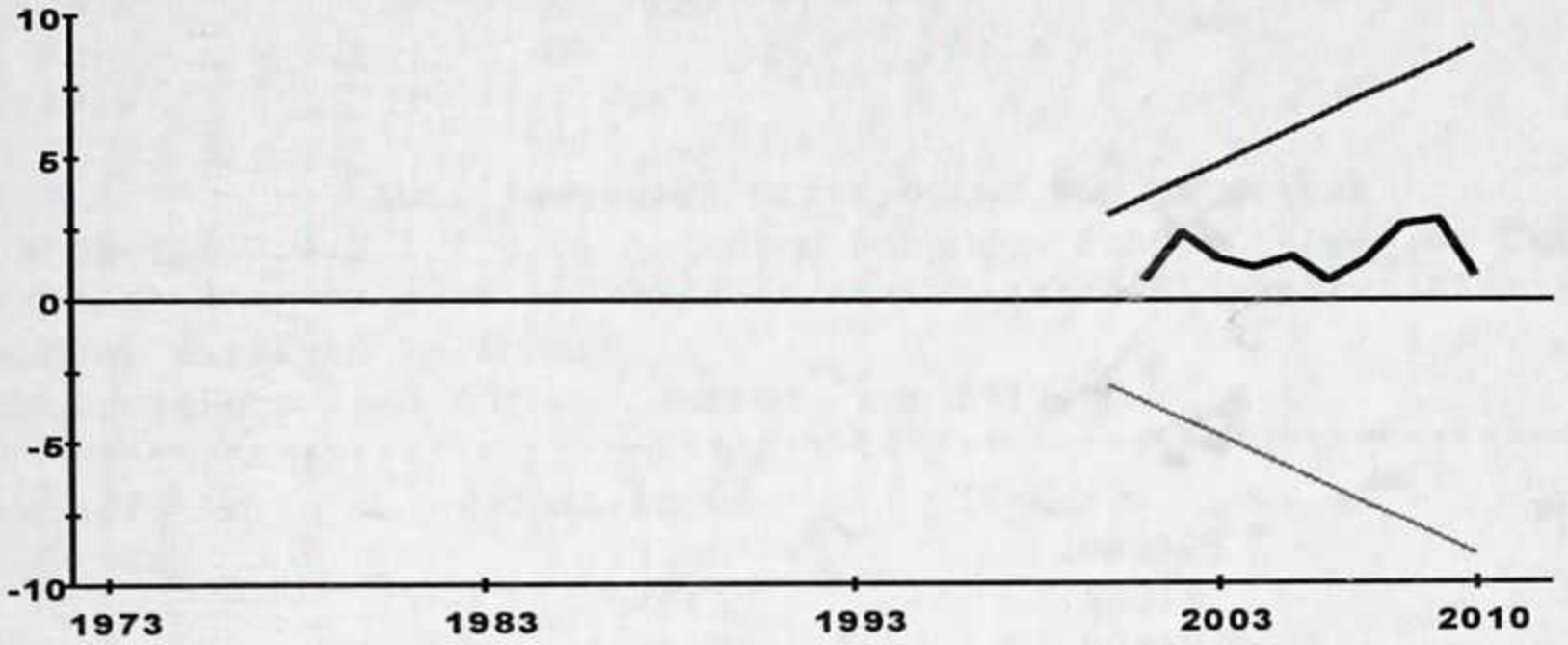
Dependent variable is dLNRGDP
39 observations used for estimation from 1972 to 2010

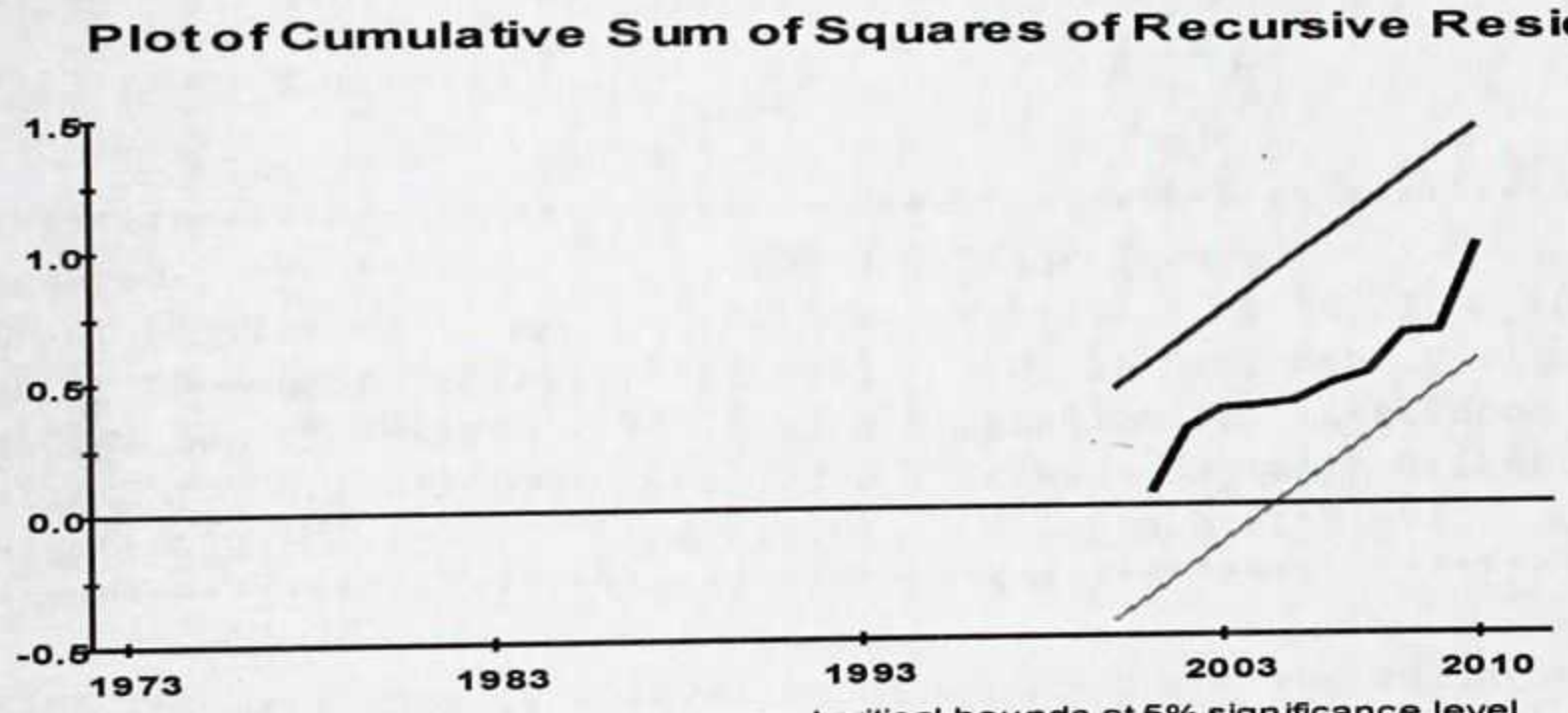
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNK	.035799	.013201	2.7119[.011]
dLNL	.033516	.0094382	3.5511[.001]
dLNL1	-.028977	.010981	-2.6389[.014]
dGEXP	-.0030352	.0019383	-1.5659[.129]
dGEXP1	-.010026	.0027421	-3.6563[.001]
dOPENNESS	-.010933	.057195	-.19116[.850]
dINF	-.7159E-3	.2398E-3	-2.9857[.006]
dINF1	.5173E-3	.2594E-3	1.9943[.056]
dPOL	.0017397	.0021461	.81062[.425]
dLNLE	7.2194	2.6272	2.7479[.011]
dC	4.7813	1.3499	3.5418[.001]
ecm(-1)	-.55506	.10886	-5.0989[.000]

List of additional temporary variables created:
dLNRGDP = LNRGDP-LNRGDP(-1)

```
dLNK = LNK-LNK(-1)
dLNL = LNLAB-LNLAB(-1)
dLNL1 = LNLAB(-1)-LNLAB(-2)
dGEXP = GEXP-GEXP(-1)
dGEXP1 = GEXP(-1)-GEXP(-2)
dOPENNESS = OPENESS-OPENESS(-1)
dINF = INF-INF(-1)
dINF1 = INF(-1)-INF(-2)
dPOL = POL-POL(-1)
dLNLE = LNLEXP-LNLEXP(-1)
dC = C-C(-1)
ecm = LNRGDP  -.064495*LNK   -.15467*LNLAB  -.011255*GEXP +  .019697*OPENESS
+ .0030960*INF -.0031342*POL   -2.6419*LNLEXP   -8.6140*C
*******************************************************************************
R-Squared                        .74755   R-Bar-Squared                    .58291
S.E. of Regression               .029231  F-stat.    F( 11,  27)    6.1917[.000]
Mean of Dependent Variable       .030400  S.D. of Dependent Variable      .045261
Residual Sum of Squares          .019652  Equation Log-likelihood         92.7275
Akaike Info. Criterion           76.7275  Schwarz Bayesian Criterion      63.4190
DW-statistic                     2.3263
*******************************************************************************
R-Squared and R-Bar-Squared measures refer to the dependent variable
dLNRGDP and in cases where the error correction model is highly
restricted, these measures could become negative.
```




Plot of Cumulative Sum of Recursive Residuals
10
5
0
-5
-10
1973
1983
1993
2003
2010
The straight lines represent critical bounds at 5% significance level


Plot of Cumulative Sum of Squares of Recursive Residuals
1.5
1.0
0.5
0.0
-0.5
1973
1983
1993
2003
2010
The straight lines represent critical bounds at 5% significance level

APPENDIX TWO
DISAGREGGATED LEVEL

27/02/2013 15:57:07

Autoregressive Distributed Lag Estimates
ARDL(1,1,2,0,2,1,1,0,0) selected based on Schwarz Bayesian Criterion

Dependent variable is LNRGDP
39 observations used for estimation from 1972 to 2010

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNRGDP(-1)	.45952	.088186	5.2108[.000]
LNK	.048425	.020157	2.4025[.025]
LNK(-1)	-.066278	.024137	-2.7458[.012]
LNL	.041958	.0078252	5.3619[.000]
LNL(-1)	.035481	.0080401	4.4130[.000]
LNL(-2)	.034512	.0087319	3.9524[.001]
GCAP	-.0014899	.0020146	-.73955[.467]
GCUR	.0030562	.0028921	1.0568[.302]
GCUR(-1)	-.012696	.0037906	-3.3493[.003]
GCUR(-2)	.027876	.0037407	7.4521[.000]
OPENNESS	-.13361	.051891	-2.5748[.017]
OPENNESS(-1)	.12509	.046621	2.6831[.014]
INF	-.0011335	.1968E-3	-5.7608[.000]
INF(-1)	-.0010299	.2257E-3	-4.5620[.000]
POL	.0031279	.0013813	2.2645[.034]
LNLE	1.4554	.31898	4.5628[.000]
C	5.2811	.98950	5.3372[.000]

R-Squared	.99830	R-Bar-Squared	.99706
S.E. of Regression	.021859	F-Stat. F(16,22)	807.2043[.000]
Mean of Dependent Variable	22.0495	S.D. of Dependent Variable	.40333
Residual Sum of Squares	.010512	Equation Log-likelihood	104.9275
Akaike Info. Criterion	87.9275	Schwarz Bayesian Criterion	73.7873
DW-statistic	2.4005	Durbin's h-statistic	-1.4984[.134]

Testing for existence of a level relationship among the variables in the ARDL model

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
8.6895	2.6154	4.0506	2.2005	3.4820

W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
78.2056	23.5390	36.4552	19.8046	31.3377

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1) = 2.2509[.134]	F(1,21) = 1.2863[.270]
B:Functional Form	CHSQ(1) = 1.4978[.221]	F(1,21) = .83873[.370]

```
* C:Normality          *CHSQ(2)  =   .71231[.700]*       Not applicable        *
*                      *                          *                             *
* D:Heteroscedasticity*CHSQ(1)  =   .33227[.564]*F(1,37)      =   .31794[.576]*
*************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regre


Multicollinearity test for equation 2.13 using Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

lnK  6.296
lnL  1.553
GCAP 3.004
GCUR 5.639
OPENNESS 1.974
INF   1.885
POL   2.865
lnLE  3.923
VIF (j) = 1/ (1 - R (j) ^2), where R (j) is the multiple correlation coefficient between
variable j and the other independent variables
Properties of matrix X'X:
 1-norm = 152016.04
 Determinant = 9.5795786e+014
 Reciprocal condition number = 2.2496824e-008
                                                                    15:57:52
27/02/2013

          Estimated Long Run Coefficients using the ARDL Approach
     ARDL(1,1,2,0,2,1,1,0,0) selected based on Schwarz Bayesian Criterion
*************************************************************************
 Dependent variable is LNRGDP
 39 observations used for estimation from 1972 to 2010
*************************************************************************
 Regressor                Coefficient       Standard Error       T-Ratio[Prob]
 LNK                       -.033031           .055922          -.59065[.561]
 LNL                        .20713            .044056           4.7016[.000]
 GCAP                      -.0027566          .0036092         -.76378[.453]
 GCUR                       .033740           .0059076          5.7114[.000]
 OPENNESS                  -.015763           .11000           -.14330[.887]
 INF                       -.0040027          .6060E-3         -6.6045[.000]
 POL                        .0057872          .0024486          2.3635[.027]
 LNLE                       2.6928            .34421            7.8233[.000]
 C                          9.7712            1.4018            6.9704[.000]
*************************************************************************

Testing for existence of a level relationship among the variables in the ARDL model
*************************************************************************
 F-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
    8.6895         2.6154           4.0506           2.2005           3.4820
*************************************************************************
 W-statistic  95% Lower Bound  95% Upper Bound  90% Lower Bound  90% Upper Bound
   78.2056        23.5390          36.4552          19.8046          31.3377
*************************************************************************
 If the statistic lies between the bounds, the test is inconclusive. If it is
 above the upper bound, the null hypothesis of no level effect is rejected. If
 it is below the lower bound, the null hypothesis of no level effect can't be
 rejected. The critical value bounds are computed by stochastic simulations
 using 20000 replications.
                                                                    15:58:52
27/02/2013
```

Error Correction Representation for the Selected ARDL Model
ARDL(1,1,2,0,2,1,1,0,0) selected based on Schwarz Bayesian Criterion

****

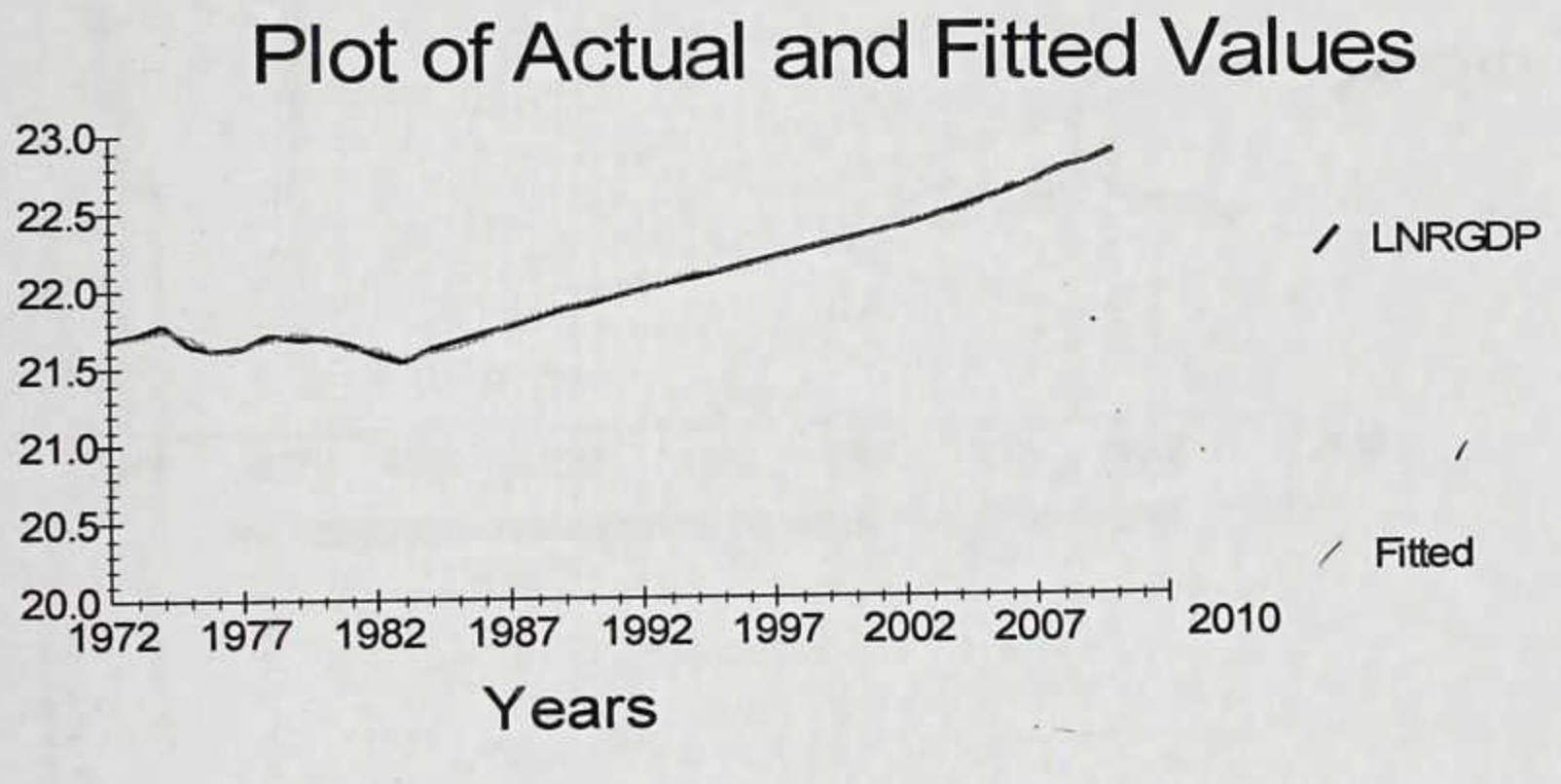
Dependent variable is dLNRGDP
39 observations used for estimation from 1972 to 2010

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNK	.048425	.020157	2.4025[.023]
Dln1	.041958	.0078252	5.3619[.000]
dLNL1	-.034512	.0087319	-3.9524[.001]
dGCAP	-.0014899	.0020146	-.73955[.466]
dGCUR	.0030562	.0028921	1.0568[.300]
dGCUR1	-.027876	.0037407	-7.4521[.000]
dOPENNESS	-.13361	.051891	-2.5748[.016]
dINF	-.0011335	.1968E-3	-5.7608[.000]
dPOL	.0031279	.0013813	2.2645[.032]
dLNLE	1.4554	.31898	4.5628[.000]
ecm(-1)	-.54048	.088186	-6.1288[.000]

****

List of additional temporary variables created:




```
dLNRGDP = LNRGDP-LNRGDP(-1)
dLNK = LNK-LNK(-1)
dLNLAB = LNLAB-LNLAB(-1)
dLNLAB1 = LNLAB(-1)-LNLAB(-2)
dGCAP = GCAP-GCAP(-1)
dGCUR = GCUR-GCUR(-1)
dGCUR1 = GCUR(-1)-GCUR(-2)
dOPENNESS = OPENNESS-OPENNESS(-1)
dINF = INF-INF(-1)
dPOL = POL-POL(-1)
dLNLE = LNLEXP-LNLEXP(-1)
ecm = LNRGDP +  .033031*LNK   -.20713*LNLAB + .0027566*GCAP  -.033740*GCUR +
.015763*OPENNESS + .0040027*INF -.0057872*POL   -2.6928*LNLEXP   -9.7712*C
```

****

R-Squared	.86496	R-Bar-Squared	.76675
S.E. of Regression	.021859	F-Stat. F(11,27)	12.8106[.000]
Mean of Dependent Variable	.030400	S.D. of Dependent Variable	.045261
Residual Sum of Squares	.010512	Equation Log-likelihood	104.9275
Akaike Info. Criterion	87.9275	Schwarz Bayesian Criterion	73.7873
DW-statistic	2.4005		

****

R-Squared and R-Bar-Squared measures refer to the dependent variable dLNRGDP and in cases where the error correction model is highly restricted, these measures could become negative.

Testing for existence of a level relationship among the variables in the ARDL model

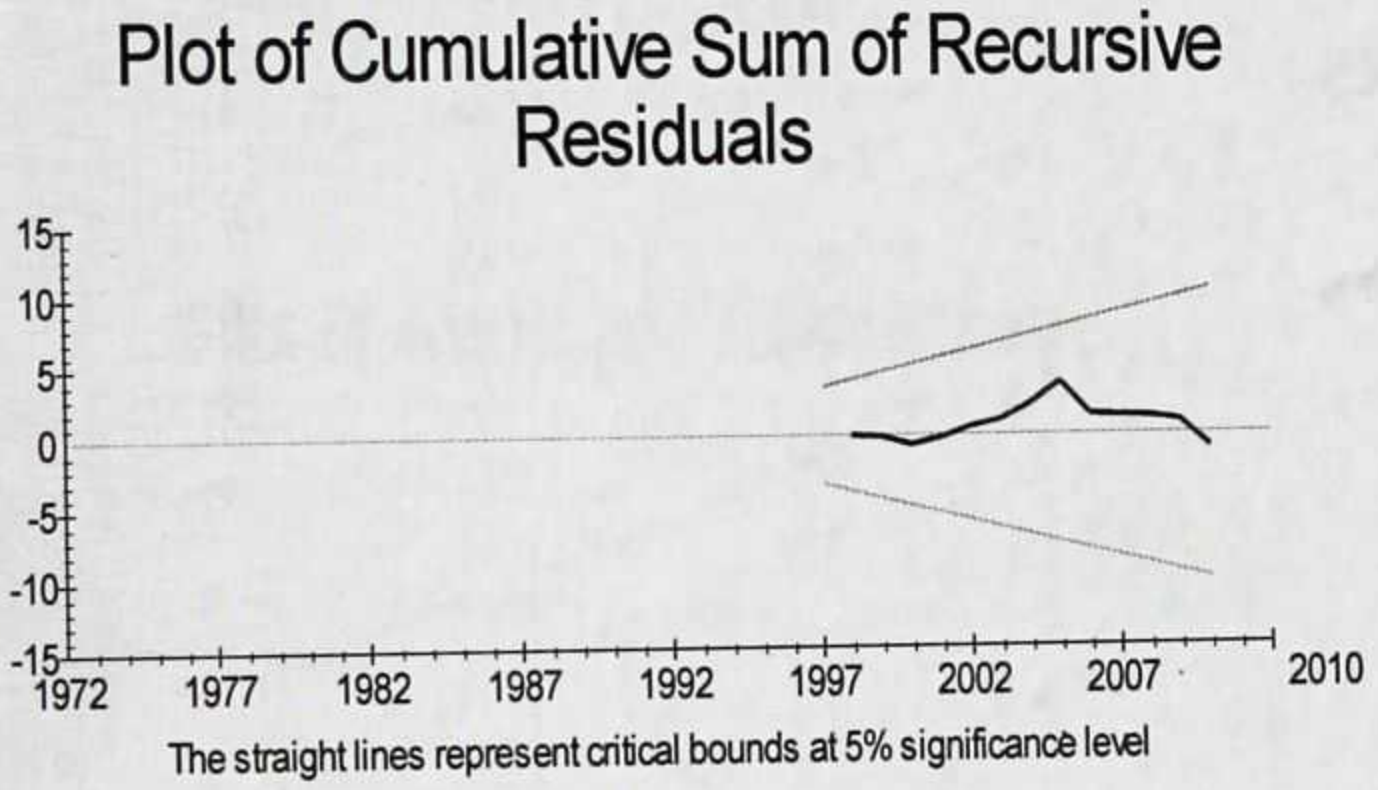
****

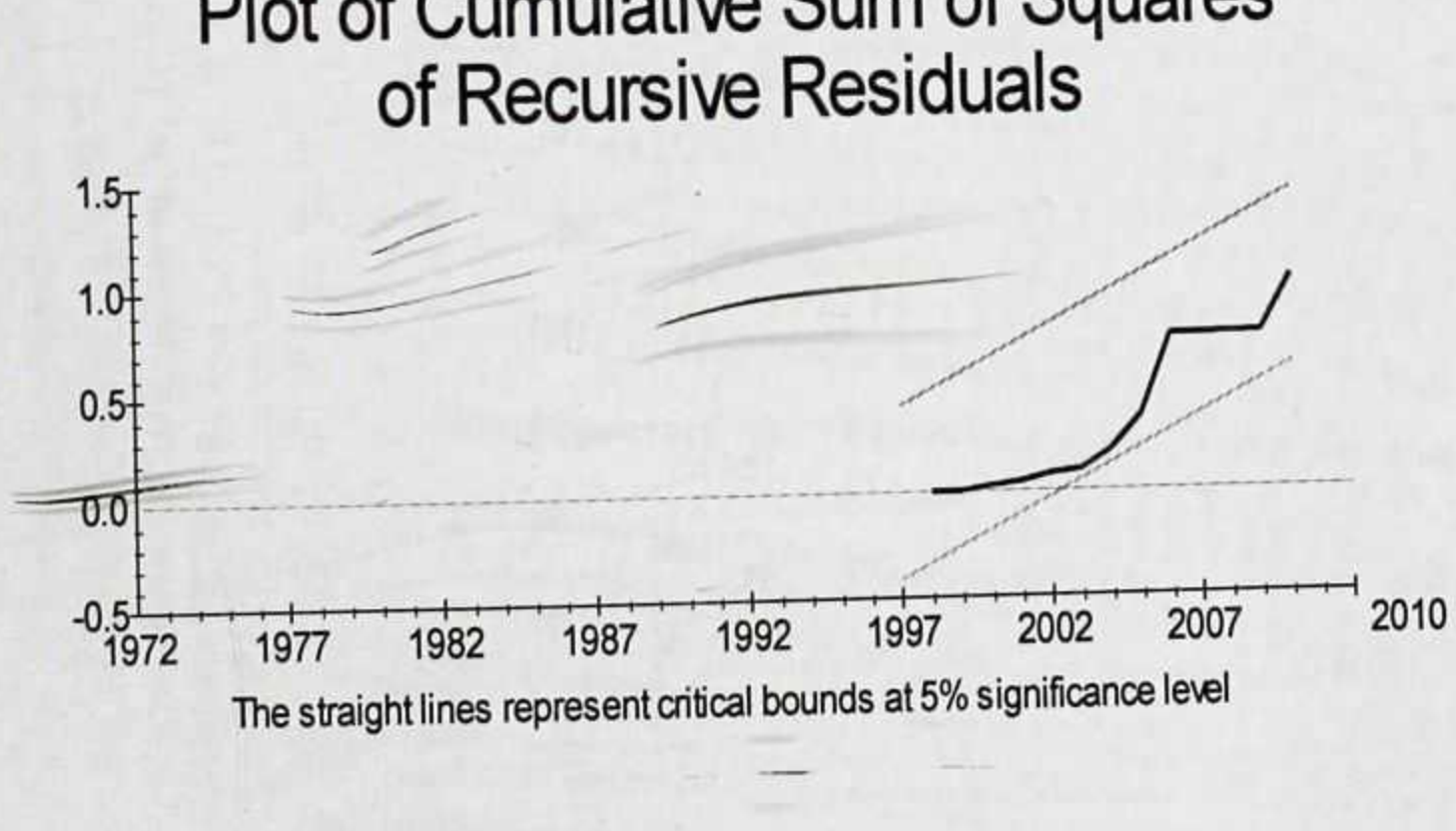
F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
8.6895	2.6154	4.0506	2.2005	3.4820

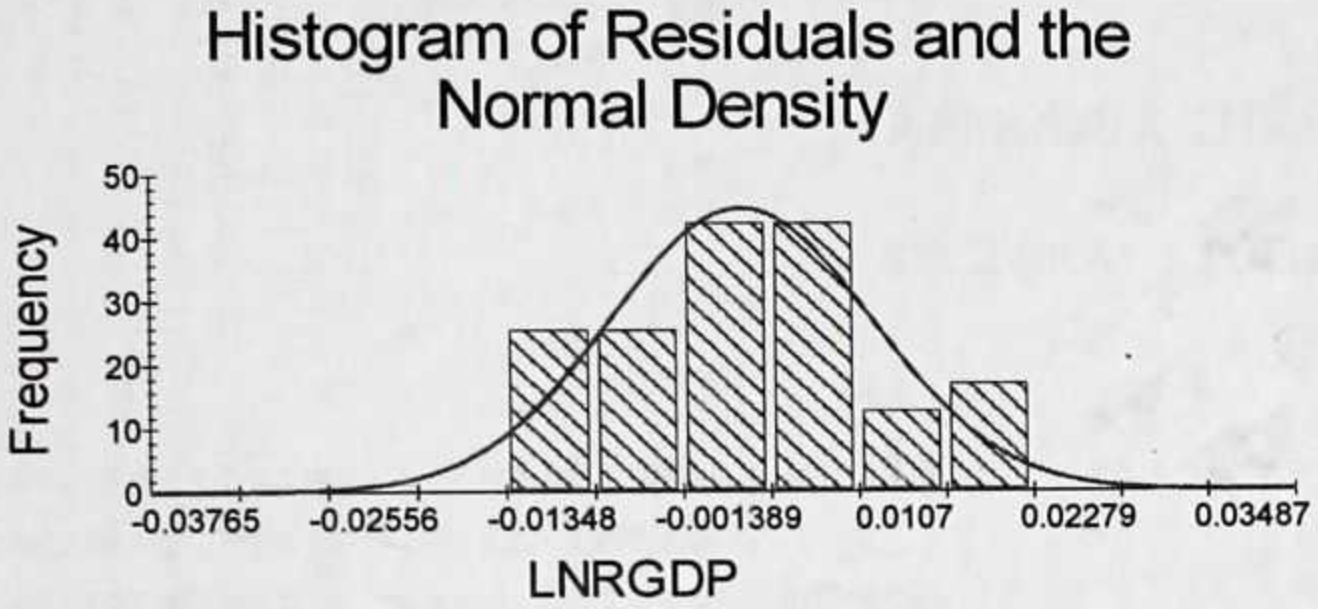
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
78.2056	23.5390	36.4552	19.8046	31.3377

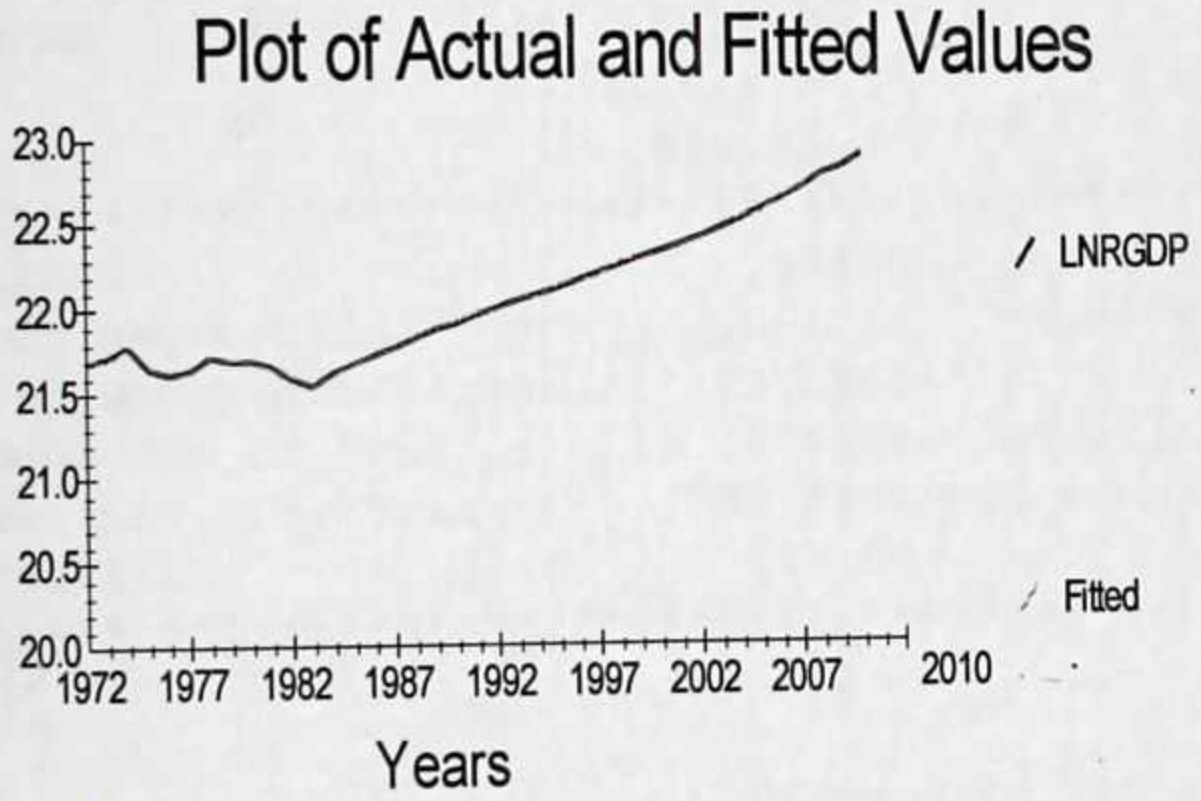
****

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations






Histogram of Residuals and the Normal Density
Frequency
50
40
30
20
10
0
-0.03765
-0.02556
-0.01348
-0.001389
0.0107
0.02279
0.03487
LNRGDP


Plot of Actual and Fitted Values
23.0
22.5
22.0
21.5
21.0
20.5
20.0
1972
1977
1982
1987
1992
1997
2002
2007
2010
Years
LNRGDP
Fitted

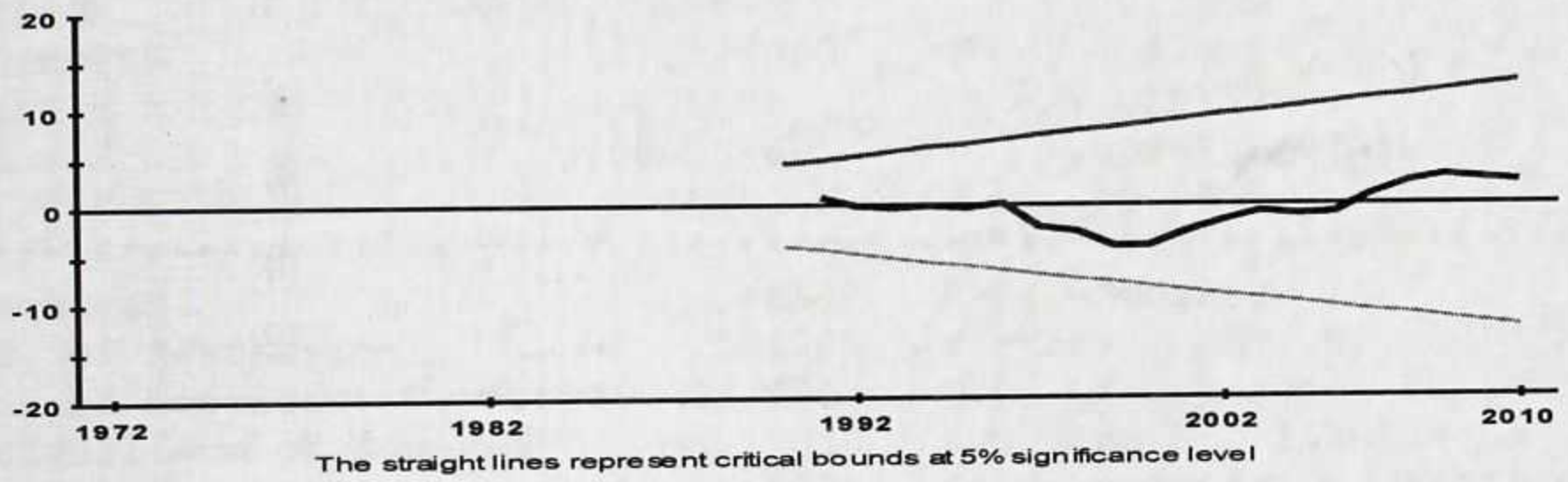
APPENDIX THREE

SECTORAL STUDY

```
**********************************************************************
 Dependent variable is LNΔRGDP
 28 observations used for estimation from 1984 to 2010
**********************************************************************
 Regressor                Coefficient       Standard Error       T-Ratio[Prob]
 C                          20.788             .6789           30.8377[.000]
 LNK                        .058620           .034175            1.7554[.096]
 LNL                       .0078772           .014547            .52231[.608]
 EDU                       -.051940           .026787           -1.9390[.068]
 HEALTH                     .053262           .013580            3.9222[.001]
 OPENNESS                    .34483           .092754            3.7177[.002]
 INF                       .5104E-3          .0011592            .44027[.665]
 POL                        .035693          .0058465            6.1050[.000]
**********************************************************************
 R-Squared                        .97580   R-Bar-Squared                .96639
 S.E. of Regression               .064234  F-stat.    F(  7,  18)  103.7029[.000]
 Mean of Dependent Variable       22.1956  S.D. of Dependent Variable    .35040
 Residual Sum of Squares          .074268  Equation Log-likelihood      39.2638
 Akaike Info. Criterion           31.2638  Schwarz Bayesian Criterion   26.2314
 DW-statistic                     1.7188
**********************************************************************

                        Diagnostic Tests
**********************************************************************
*    Test Statistics  *        LM Version        *        F Version        *
**********************************************************************
*                     *                          *                         *
* A:Serial Correlation*CHSQ(   1)=  .082755[.774]*F(   1,  17)=  .054282[.819]*
*                     *                          *                         *
* B:Functional Form   *CHSQ(   1)=   1.3017[.254]*F(   1,  17)=   .89595[.357]*
*                     *                          *                         *
* C:Normality         *CHSQ(   2)=  .073805[.964]*       Not applicable     *
*                     *                          *                         *
* D:Heteroscedasticity*CHSQ(   1)= .0017552[.967]*F(   1,  24)= .0016203[.968]*
**********************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values

Test for Multicollinearity using Variance Inflation Factors
Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem
lnK 6.041
lnL 1.388
EDU 4.859
```

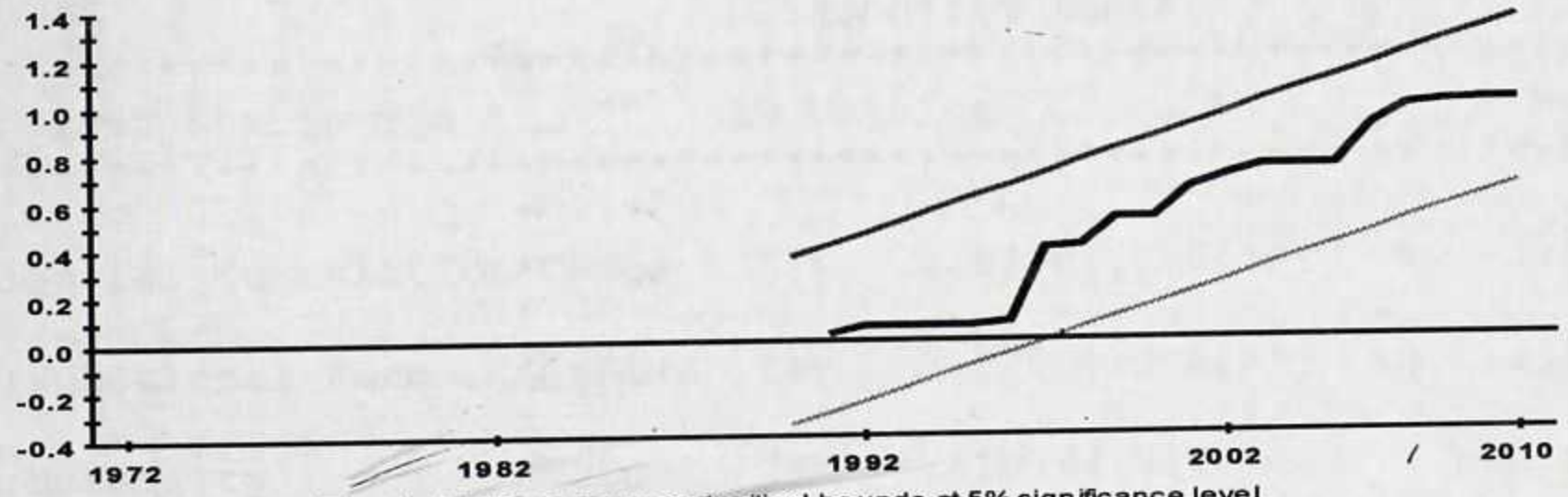
```
HEALTH 3.806
OPENNESS 2.462
INF 1.261
POL 7.005
VIF (j) = 1/ (1 - R (j) ^2), where R (j) is the multiple correlation coefficient
between variable j and the other independent variables

Properties of matrix X'X:

1-norm = 39909.399
Determinant = 7.354597e+011
Reciprocal condition number = 2.0343716e-007
```

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

APPENDIX FOUR

OPTIMAL GOVERNMENT SIZE

Ordinary Least Squares Estimation

Dependent variable is LNRGDP
41 observations used for estimation from 1970 to 2010

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
C	17.1587	.43657	39.3032[.000]
LNK	.061481	.021817	2.8180[.008]
LNL	.011379	.012827	.88712[.382]
GEXP	.0091403	.029021	.31496[.755]
GEXPSQR	-.3545E-3	.0010152	-.34923[.729]
LNOPENESS	.28130	.047525	5.9191[.000]
LNINF	-.025572	.015167	-1.6860[.102]
POL	.0063976	.0024186	2.6452[.013]
LE	.066981	.0045852	14.6080[.000]

R-Squared	.98442	R-Bar-Squared	.98052
S.E. of Regression	.055985	F-stat. F(8, 32)	252.6878[.000]
Mean of Dependent Variable	22.0317	S.D. of Dependent Variable	.40114
Residual Sum of Squares	.10030	Equation Log-likelihood	65.0935
Akaike Info. Criterion	56.0935	Schwarz Bayesian Criterion	48.3824
DW-statistic	1.5354		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.8988[.168]	F(1, 31)= 1.5054[.229]
B:Functional Form	CHSQ(1)= 3.2281[.072]	F(1, 31)= 2.6493[.114]
C:Normality	CHSQ(2)= .41076[.814]	Not applicable
D:Heteroscedasticity	CHSQ(1)= .020232[.887]	F(1, 39)= .019255[.890]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

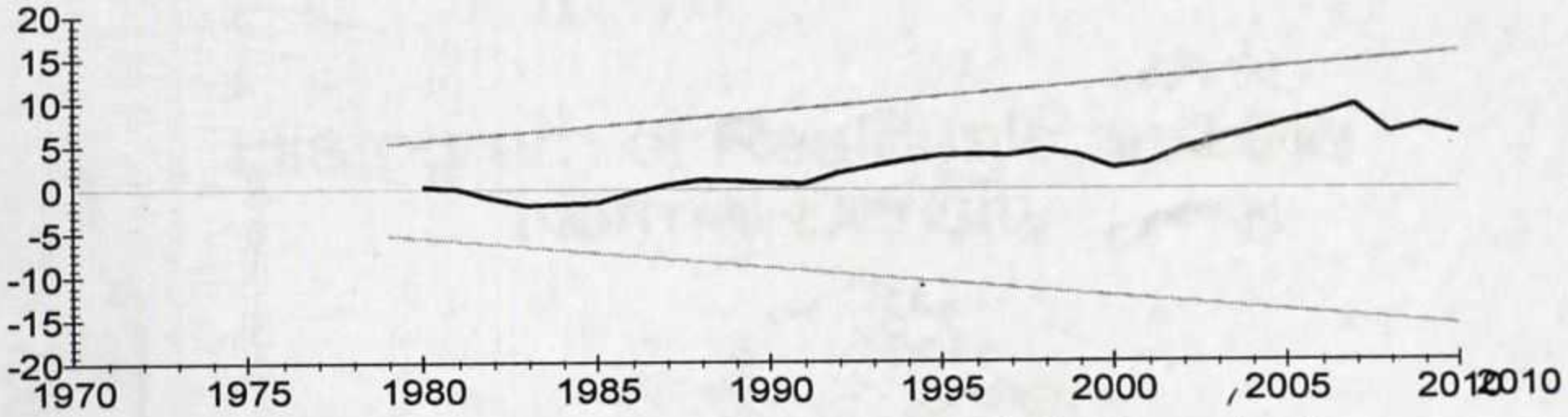
Multicollinearity test for equation 2.15 using Variance Inflation Factors

Minimum possible value = 1.0
Values > 10.0 may indicate a collinearity problem

lnK	6.866
lnL	1.590
GCUR	126.922
$GCUR^2$	122.921
lnOPENNESS	2.885
lnINF	1.785

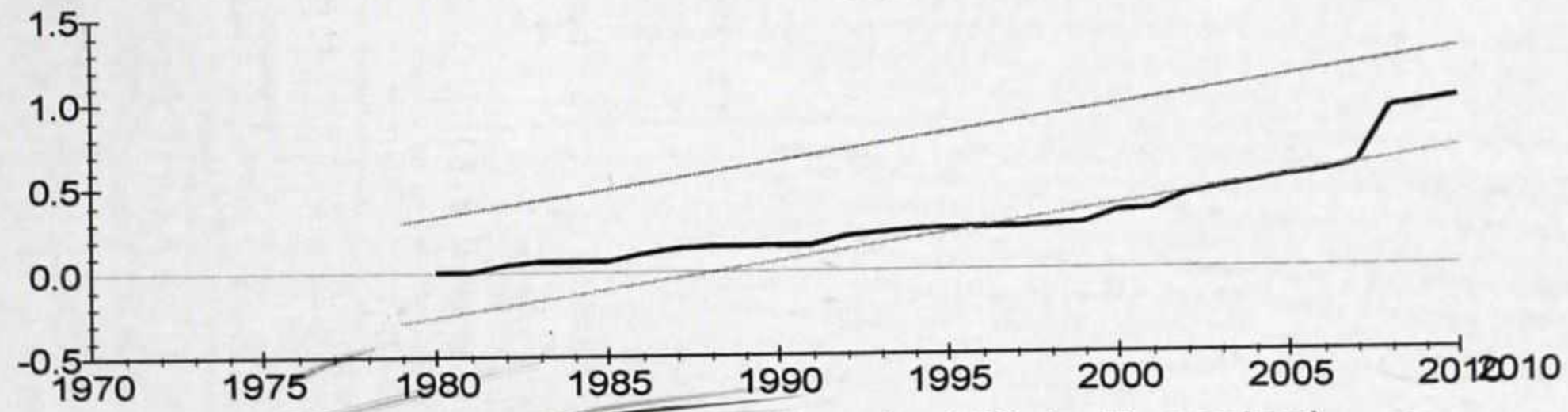
```
POL    2.729
LE     4.390
VIF (j) = 1/ (1 - R (j) ^2), where R (j) is the multiple correlation coefficient
between variable j and the other independent variables

Properties of matrix X'X:

1-norm = 3224583
Determinant = 1.0271627e+017
Reciprocal condition number = 4.4028424e-009
```

Plot of Cumulative Sum of Recursive Residuals

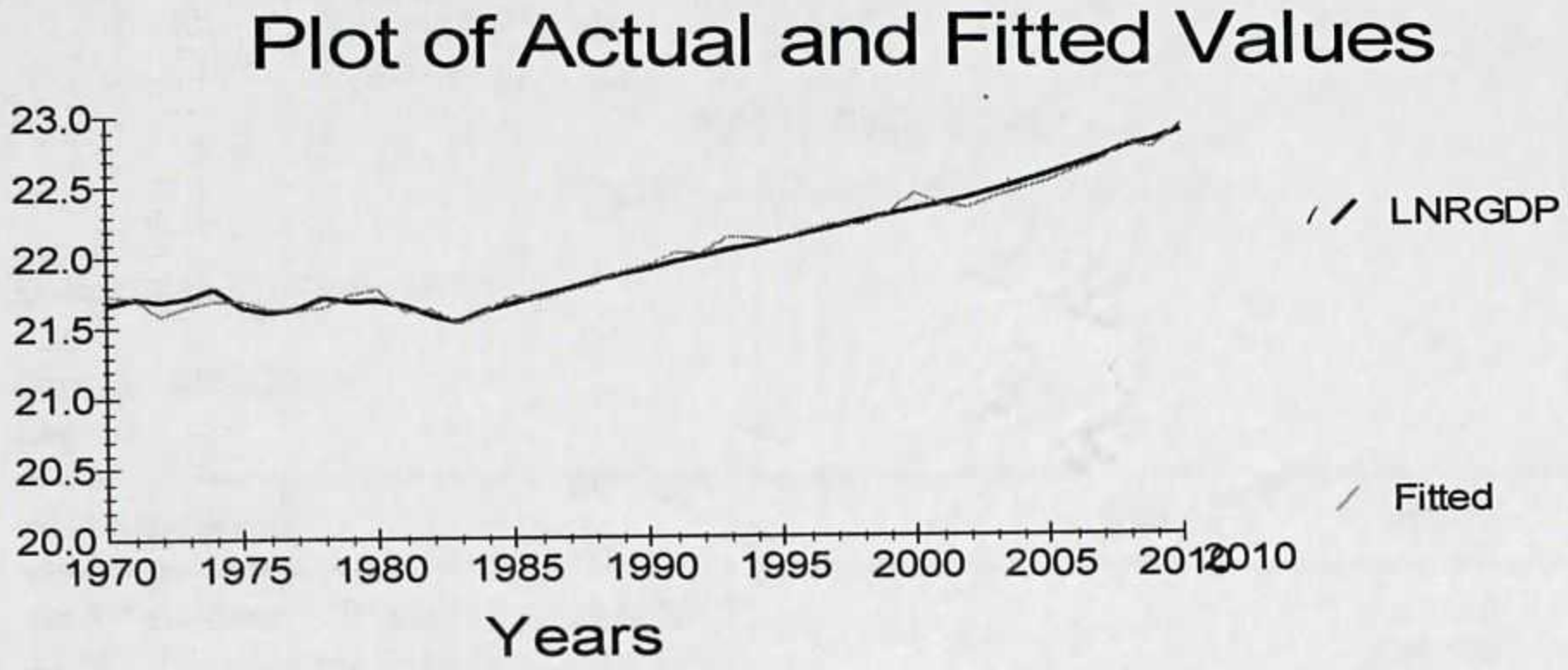


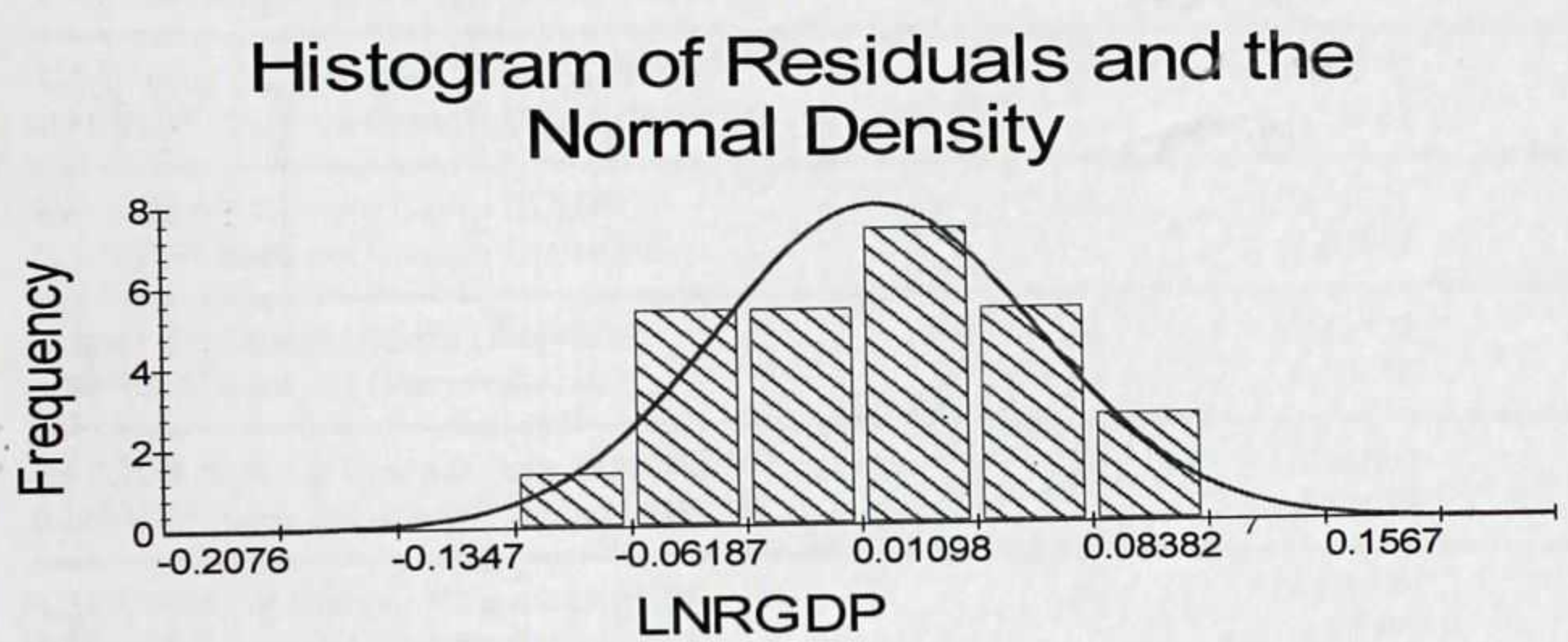
The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level


Plot of Actual and Fitted Values
23.0
22.5
22.0
21.5
21.0
20.5
20.0
1970
1975
1980
1985
1990
1995
2000
2005
2010
Years
LNRGDP
Fitted


Histogram of Residuals and the Normal Density
Frequency
8
6
4
2
0
-0.2076
-0.1347
-0.06187
0.01098
0.08382
0.1567
LNRGDP

APPENDIX FIVE
Pairwise Granger Causality Tests

Date: 03/20/13 Time: 09:16

Sample: 1970 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GEXP does not Granger Cause ΔLNRGDP	39	0.47020	0.6289
ΔLNRGDP does not Granger Cause GEXP		2.89028	0.0693
GCUR does not Granger Cause ΔLNRGDP	39	0.43801	0.6489
LNΔRGDP does not Granger Cause GCUR		2.55627	0.0924
GCAP does not Granger Cause ΔLNRGDP	39	0.30782	0.7371
ΔLNRGDP does not Granger Cause GCAP		2.25822	0.1200
INF does not Granger Cause ΔLNRGDP	39	0.11201	0.8944
ΔLNRGDP does not Granger Cause INF		6.00061	0.0059
K does not Granger Cause LNΔRGDP	39	3.49122	0.0418
LNΔRGDP does not Granger Cause K		1.30016	0.2857
LABOUR does not Granger Cause LNΔRGDP	39	65309.0	1.E-61
Δ LNRGDP does not Granger Cause LABOUR		0.78189	0.4656
LEXP does not Granger Cause ΔLNRGDP	39	1.91476	0.1629
Δ LNRGDP does not Granger Cause LEXP		0.40943	0.6673
POL does not Granger CauseΔ LNRGDP	39	1.03649	0.3656
ΔLNRGDP does not Granger Cause POL		3.00604	0.0628
GCUR does not Granger Cause GEXP	39	1.32957	0.2780
GEXP does not Granger Cause GCUR		0.14654	0.8642
GCAP does not Granger Cause GEXP	39	1.32957	0.2780
GEXP does not Granger Cause GCAP		6.05673	0.0056
INF does not Granger Cause GEXP	39	2.35779	0.1099
GEXP does not Granger Cause INF		0.15784	0.8546
K does not Granger Cause GEXP	39	0.44074	0.6472
GEXP does not Granger Cause K		0.07113	0.9315
LABOUR does not Granger Cause GEXP	39	1.17147	0.3221
GEXP does not Granger Cause LABOUR		0.40476	0.6703
LEXP does not Granger Cause GEXP	39	0.90183	0.4153
GEXP does not Granger Cause LEXP		0.47777	0.6243
POL does not Granger Cause GEXP	39	0.49543	0.6136
GEXP does not Granger Cause POL		4.55942	0.0176
GCAP does not Granger Cause GCUR	39	0.14654	0.8642
GCUR does not Granger Cause GCAP		6.05673	0.0056

INF does not Granger Cause GCUR	39	0.98933	0.3823
GCUR does not Granger Cause INF		0.07405	0.9288
K does not Granger Cause GCUR	39	1.28015	0.2911
GCUR does not Granger Cause K		0.68451	0.5112
LABOUR does not Granger Cause GCUR	39	1.22453	0.3065
GCUR does not Granger Cause LABOUR		0.66757	0.5195
LEXP does not Granger Cause GCUR	39	1.39059	0.2627
GCUR does not Granger Cause LEXP		0.77693	0.4678
POL does not Granger Cause GCUR	39	0.19954	0.8201
GCUR does not Granger Cause POL		2.85285	0.0716
INF does not Granger Cause GCAP	39	3.91091	0.0296
GCAP does not Granger Cause INF		0.33933	0.7146
K does not Granger Cause GCAP	39	0.12498	0.8829
GCAP does not Granger Cause K		0.49722	0.6126
LABOUR does not Granger Cause GCAP	39	0.21106	0.8108
GCAP does not Granger Cause LABOUR		0.07609	0.9269
LEXP does not Granger Cause GCAP	39	0.33314	0.7190
GCAP does not Granger Cause LEXP		1.23145	0.3046
POL does not Granger Cause GCAP	39	0.67680	0.5150
GCAP does not Granger Cause POL		4.74239	0.0153
K does not Granger Cause INF	39	2.08772	0.1396
INF does not Granger Cause K		0.04096	0.9599
LABOUR does not Granger Cause INF	39	0.16835	0.8458
INF does not Granger Cause LABOUR		0.50334	0.6089
LEXP does not Granger Cause INF	39	1.68998	0.1997
INF does not Granger Cause LEXP		0.49341	0.6148
POL does not Granger Cause INF	39	0.59621	0.5566
INF does not Granger Cause POL		0.63888	0.5341
LABOUR does not Granger Cause K	39	4.84753	0.0141
K does not Granger Cause LABOUR		2.07024	0.1418
LEXP does not Granger Cause K	39	2.43140	0.1031
K does not Granger Cause LEXP		1.94244	0.1589
POL does not Granger Cause K	39	0.17560	0.8397
K does not Granger Cause POL		5.05087	0.0120
LEXP does not Granger Cause LABOUR	39	3.28210	0.0497
LABOUR does not Granger Cause LEXP		0.96926	0.3896
POL does not Granger Cause LABOUR	39	1.60163	0.2164
LABOUR does not Granger Cause POL		0.21733	0.8058
POL does not Granger Cause LEXP	39	0.51006	0.6050
LEXP does not Granger Cause POL		5.47207	0.0087