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AN EMPIRICAL INVESTIGATION INTO THE EXPORT-LED GROWH HYPOTHESIS IN GHANA.

BY

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Philosophy in Economics 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 acknowledgment has been made in the thesis.

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DEDICATION

To my entire family:

Paul Appiah-Kubi (Nana Amanyina), my Dad

Mad. Mary Abena Antwiwaa Boasiako, my Mum

Thomas Appiah (Obi NteAsee), my big brother

Nana Owusu-Agyeman Darkoh, my lovely son

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ABSTRACT

The export-led growth hypothesis (ELGH) postulates that export growth is one of the key determinants of economic growth. This study goes beyond the traditional neoclassical theory of production by estimating an augmented Cobb□Douglas production function in a multivariate format. The inclusion of exports and other variables as inputs provide an alternative procedure to capture total factor productivity (TFP) growth. The study tests the hypothesis by analysing the case of Ghana, using annual data for the period 1960-2007. Using Johansen's procedure to test for cointegration, it goes beyond the traditional time series studies by examining empirically the short-term as well as the long-run relationship.

The study finds that the ELGH does not hold for Ghana due to the nature of export products; however, the empirical results show that capital formation (investment), labour force and political stability mainly drove Ghana's overall economic performance from 1960 onwards. From the review of the literature it was found that the empirical evidence regarding the relationship between exports and growth is not robust for almost all developing countries particularly for Ghana as confirmed by the results of this study, and that exports do not have positive effect on the overall rate of economic growth and could not be considered an "engine of growth" as the ELGH advocates, their impact was quantitatively negative, in both the short and the long-run regressions.

The granger-causality test rather revealed a unidirectional causality running from GDP to exports but not vice versa. The evidence presented clearly supports the neoclassical theory of production but, to a larger extent, not the so-called new-

fashioned economic wisdom (ELGH). Moreover, it challenges the empirical literature regarding the ELGH and expresses serious doubts with regard to promoting exports as a comprehensive development strategy for Ghana. The ELGH is probably beneficial only for a limited number of developing countries, and only to a certain extent but not for Ghana.

However, among other things the following recommendations have been made for Ghana.

More resources should be committed into the empirical studies of growth determinants particularly issues of export expansion and development to ascertain the findings of the present study. There has not been much research in the areas of export expansion and real GDP growth based on time series analysis (The export-led growth hypothesis). More importantly, effort should be on the diversification strategy to swiftly shift from the primary exports to manufactured and service sectors of Ghana's export base. This will help enhance Ghana's export performance against the major trading partners whose exports are more valuable and weightier than Ghana whose exports are mainly primary with downward trend fluctuating prices.

The negative contribution of export variable in the short run and the long run growth equations indicate a possible gloomy future for Ghana's liberalization polices (''open border'' policies). Thus, liberalization or exports for that matter will only be growth enhancing when the primary products (raw goods) which form the bulk of Ghana's exports base is refined and develop the manufacturing and services sector so well to make them more competitive with stable international prices like our trading partners.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

AGI	Association of Ghanaian Industries
APFM	Aggregate Production Function Model
BOG	Bank of Ghana
DCRPS	Domestic Credit to private Sector as ratio to
GDP	Gross Domestic Product
DC_S	Developing Countries
ECT	Error Correction Term
ELGH	Export-Led Growth Hypothesis
EPS	Export Promotion Strategy
ERP	Economic Recovery Programme
GFCF	Gross Fixed Capital Formation
GEPC	Ghana Export Promotion Council
GSB	Ghana Standard Board
IMF	International Monetary Fund
INF	Inflation
PSI	Presidential Special Initiatives
SAP	Structural Adjustment Programme
TFPG	Total Factor Productivity Growth
UNCTAD	United Nations Conference on Trade and Development
VALCO	Volta Aluminums Company
VECM	Vector Error Correction Model

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study:

Economic growth is the increase in the amount of the goods and services produced by an economy over time. In economics, "economic growth" typically refers to growth of potential output, i.e., production at "full employment." Growth and development is as old as economics itself. There are so many theories of economic growth proposed as a means to understand the process of economic growth such as the classical growth theory, the Harrod-Domar growth model, Neoclassical growth theory, down to the New' (endogenous) theory of growth. Throughout economic literature these traditional theories apart from the endogenous theory of growth have stressed the importance of labour and capital accumulation as the only means to achieve an increase in GDP in any economy.

Economic growth is a necessary collaborator towards infrastructural and institutional development in any country. Economists and policy makers of all shades and persuasions recognize the pivotal role that growth plays in economic development. Robert Lucas Jr. (1988) expressed such concern about economic growth for India in the following lamentations *'Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, what exactly? If not what is it about the nature of India that makes it so? The consequences of human welfare involved in questions like these are staggering; once one starts to think about economic growth, it is hard to think about anything else''.* Such questions raised about the Indian economy concerning growth are directly applicable to Ghana and other developing economies especially those of the Sub-Saharan Africa.

Ghana was the "shining star" of Africa at independence from the early years of 1960s. The years 1960-1964 saw relatively high growth, spurred on by favorable export performance and rapid industrialization linked to import-substitution policies. This encouraging beginning gave way to macroeconomic instability, and uneven and volatile growth from 1965-1983. This uncertain foundation, hit by economic shocks, brought the economy close to collapse in the early 1980s. Recognizing the need for change, the PNDC government launched the Economic Recovery Program in the early 1980's, which succeeded in renewing growth and contributing to significant poverty reduction. The Economic Recovery Programme (ERP) instituted by the Ghanaian government in 1983 led to the adoption of an export-led growth strategy aimed at increasing export earnings through export diversification and expansion. Ghana has since made substantial gains from the exports of non-traditional exports like pineapples, yams, handicrafts, canned and smoked fish, processed foods, wood products, etc. For example, in 1988, the government, through the Ministry of Trade and Industry and the Ghana Export Promotion Council (GEPC), embarked on a three-year export development plan (1988-1990). This resulted in a growth in the non-traditional outputs sector from $1.91 million in 1984 to $62.34 million in 1990, amounting to about 9.6 percent of total exports (World Bank, 1993).

It is widely accepted among economists that economic growth is an extremely complex process, which depends on many variables such as capital accumulation (both physical and human), trade, price fluctuations, political conditions and income distribution, and even more on geographical characteristics (Medina-Smith, 2001).

The export-led growth hypothesis (ELGH) postulates that export expansion is one of the main determinants of growth. It holds that the overall growth of countries can be generated not only by increasing the amounts of labour and capital within the

economy, but also by expanding exports. According to its advocates, exports can serve as an "engine of growth".

Since independence, the primary focus of the government and policy makers in Ghana has been on ways to accelerate the growth rate of national income and poverty reduction. Policy makers in many developing countries including (Ghana) were puzzled whether they should concentrate on formulating policies that are designed to be export- promotion oriented or import- substitution oriented. A push for rapid industrialization began in the early 1960s, using a wide array of control measures and state interventions. This policy option however did not yield the desired and expected growth as envisaged by the policy makers at the time of its implementation. In the 1970s, the interventions continued but with little indications as to what the ultimate development goals were (Aryeetey, et al, 2000). The growth record of Ghana has been one of unevenness when the post-reformed period is compared to the earlier period. With reasonably high GDP growth in the 1950s and 1960s, the Ghanaian economy began to experience a slowdown in GDP growth in 1964 (Aryeetey and Fosu, 2005).

In the "Vision 2020" document, the government declared an intention to achieve an accelerated growth rate of 8-10% in the medium term. But annual GDP growth over the past few years was disappointing, averaging only 4.3%. (World Bank report, 1993). Despite the initiative towards diversification, Ghana's exports predominantly depended upon primary agricultural products (Were et. al, 2002). Wood and Mayer (1998) in their UNCTAD study contended that the best short run development strategy for African countries is to increase the level of primary exports (processed and unprocessed) followed by a long-term development goal. However, the NPP Government in 2001 decided to bring in a new strategy, Vision 2010, with new

targets. For now, an overall growth rate of more than 5% is required to achieve substantial improvement in the economy and to reduce existing poverty levels. The cardinal policy of the administration was to pursue national economic progress by promoting private sector as a wheel to attain growth. The thrust of the policy is to encourage mutually beneficial partnerships between the public and private sectors, particularly in trade and industrial development with focus on enhancing the traditional and the non-traditional export product sectors as a means of achieving the desired growth that has eluded Ghana since independence.

In the 1970s, prominent economists (Krueger 1978, Bhagwati 1978 and Little et al. 1970) advanced theoretical arguments which projected export promotion as a superior development strategy to import substitution. The reasons given in support of export promotion include the fact that it encourages specializations in production which, in turn, results in productivity gains. Export growth leads to more efficient allocation of resources by shifting factors of production to the more productive export sector. Furthermore, export growth results in increased capacity utilization and greater economies of scale (Krueger 1980; Balassa 1978). Grossman and Helpman (1991) have suggested that exports enhance diffusion of knowledge through interaction with foreign buyers and learning by doing.

However, these mechanisms are frequently invoked without any theoretical support or any empirical proof. A substantial amount of research concerning the ELGH in developing countries (DCs) has been carried out during the past 30 years. In fact, during the 1990s a new series of empirical studies has been conducted on a number of divergent lines of research, methodologies, time periods and countries.

1.2: Statement of Research Problem

The export-led growth hypothesis has been the subject of considerable research in the last two decades. Yet the link between exports and economic growth, which has been subjected to empirical scrutiny, remains a subject of debate. There is a summary of a set of 42 empirical studies conducted between 1967 and 1998, which includes time period, methodology, variables, econometric technique and conclusions reached by the researchers to prove the actual effects of an increase in exports on GDP growth.

Among earlier empirical studies includes Emery (1967, 1968), Syron and Walsh (1968), Serven (1968), Kravis (1970), Michaely (1977), Heller and Porter (1978), Bhagwati (1978) and Krueger (1978). This first group of studies explained economic growth in terms of export expansion alone, in a two-variable framework. That is, they used bivariate correlation ─ the Spearman rank correlation test in crosscountry format to illustrate the alleged superior effects of the ELGH (Lussier, 1993, p. 107).

A second group of researchers, which includes Balassa (1978, 1985), Tyler (1981), Feder (1983), Kavoussi (1984), Ram (1985, 1987) and Moschos (1989), studied the relationship between export and output performance within a neoclassical framework. In most of these studies exports were included in an ad hoc manner in the production function, together with labour and capital. They claimed that by including exports they were taking into consideration a broad measure of externalities and productivity gains generated by this sector which stimulated the domestic economy. The majority of these investigations aimed at analysing DCs by using ordinary least squares (OLS) on cross-section data and used their results to demonstrate the advantages of the export promotion strategy in comparison with the import substitution policy.

Although a substantial part of the earlier studies found evidence of a correlation between exports and growth which was used to support the ELGH, this tends to hold only for crosssection studies. In fact, the recent evidence on time series, which makes extensive use of cointegration techniques, casts doubts on the positive effects of exports on growth in the long run, and is thus not as conclusive as it was previously thought to be. Therefore, early studies could have been misleading in that they advocated export expansion in an indiscriminate way. In fact, the evidence available is far from conclusive and this situation explains to some extent why this debate still exists in the economic literature. From the voluminous literature on the relationship between export expansion and economic growth it is clear that the results obtained depend not only on the theoretical approach used but also even on the econometric methodology employed. For example, cross-section studies are more likely to corroborate a positive relationship between exports and growth, while the results of time series studies depend substantially on the countries analysed, the period chosen and the econometric method used.

In addition, since cross-section studies can obscure particularities of DCs, especially those that are low-income countries as well as major oil-exporting countries, the correct strategy to follow from an empirical point of view is to address the issue in a country case framework, using as much as possible the recent developments in time series analysis as advocated by Emilio J. Medina-Smith (2001) in his UNCTAD study conducted on Costa Rica. Therefore this study applies similar econometric technique to analyse the case of Ghana. Although Emilio J. Medina-Smith (2001) in his UNCTAD study estimated the augmented production function by including exports as a third variable to determine the impact of exports on real output but there are other

growth enhancing variables that are left out in this study which could create an econometric problem of endogeneity. Therefore to avoid the possibility of omitted variables bias, the model is augmented with additional variables such as domestic credit to private sector (indicator of financial development), inflation (indicator of macroeconomic volatility) and political stability dummy to capture total factor productivity even though the emphasis is on the exports. Despite the voluminous empirical literature on export–led growth hypothesis on both developed and developing countries, it still remains a subject of debate as ambiguous results are achieved by different researchers based on different methodology, econometric technique used, data, the number of variables included etc. This study therefore tries to bridge the gap between the early researches by adopting a multivariate approach to test this hypothesis which can create a gateway for further researches in a multivariate framework.

1.3: Objectives

The main objective of this study is to examine and test the validity of the Export–Led Growth Hypothesis (ELGH) for a single developing country (Ghana) and to examine Granger-causality between exports and economic growth over the sample period. The study has the following specific objectives.

- To estimate the long and short-run export-led growth model
- To examine the contribution of exports sector and to quantify the importance of exports in the economic performance of Ghana.
- To draw policy implications from the findings for macroeconomic management.

1.4: Hypothesis

The main hypothesis of the study is that the export-led hypothesis does not hold for Ghana.

1.5: Justification

Ghana as a country over the years has experimented both import-substitution and export-oriented policies to achieve growth and thus development. It is therefore justifiable to undertake this study to find out if this growth strategy(Export-led growth hypothesis) is more appropriate for Ghana among developing countries in the sub-Saharan Africa.

The study has three distinctive features, in contrast to the hundreds of empirical studies on growth that have been published.

- First, the study goes beyond the traditional neoclassical theory of production by estimating an augmented Cobb□Douglas functional form in a multivariate format which includes exports and other growth enhancing variables using a comprehensive annual data for the period 1960□2007. The inclusion of exports and other variables as inputs of production provide an alternative procedure to capture total factor productivity (TFP) growth.

- Secondly, the study focuses on a single developing Sub-Saharan African count (Ghana), examining empirically the relationship between export expansion and economic growth.

- Thirdly, it goes beyond the traditional short-term effects, and uses extensively modern time series to examine empirically the long-run relationship, employing several procedures such as Johansen cointegration test to test for

cointegration between exports and economic growth as well as Granger-causality procedure to find out whether there is unidirectional or bi-directional relationship between the cointegration variables over the sample period.

1.6 Scope of the Study

The study deals with Ghana's export performance and its impact on growth from 1960- 2007, during which both import substitution and export-oriented policies were subscribed to. The study investigates whether increases in exports both primary (traditional and non-traditional) and manufactured goods have had greater impact on Ghana's growth performance since independence. The empirical analysis of the study focuses on the long-run and short-run relationship between export and GDP and their causality properties. Thus, whether there is uni/bi-directional relationship between them. A review of the popular theories behind the issues is also dealt with. The issue of trade and growth and its effects on export development is examined. The study covered the period from 1960-2007 inclusive, about 47 years or series.

1.7 Organization of the Study

The rest of the study is structured as follows: Chapter two summarizes the literature review on export-growth relationships. This chapter reviews both theoretical and empirical literature on the study. It also discusses the historical review of Ghana's export sector policies and performance over the years. Chapter three presents the conceptual framework of the empirical model. Chapter four is devoted to the analysis, and discussions of the empirical model. This is followed by chapter five which deals with summary of major findings, conclusion and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Review

2.1 Trade and Growth Nexus

Although the theoretical links between trade and economic growth have been discussed for over two centuries, controversy still persists regarding their real effects. The initial wave of favourable arguments with respect to trade can be traced to the classical school of economic thought that started with Adam Smith and which was subsequently enriched by the work of Ricardo, Torrens, James Mill and John Stuart Mill in the first part of the nineteenth century. Since then, the justification for free trade and the various indisputable benefits that international specialization brings to the productivity of nations have been widely discussed and are well documented in the economic literature (Bhagwati, 1978; Krueger, 1978).

However, in the last decade there has been a surprising and impressive resumption of activity in the economic growth literature triggered by the endogenous growth theory, which has led to an extensive inventory of models that stress the importance of trade in achieving a sustainable rate of economic growth. These models have focused on different variables, such as degree of openness, real exchange rate, tariffs, terms of trade and export performance, to verify the hypothesis that open economies grow more rapidly than those that are closed (Edwards, 1998). Although most models emphasized the nexus between trade and growth, they stressed that trade is only one of the variables that enter the growth equation. However, the advocates of the Export-Led Growth Hypothesis (ELGH) have stated that trade was in fact the main engine of growth in South-East Asia. They argue that, for instance, Hong Kong (China), Taiwan Province of China, Singapore and the Republic of Korea, the so-called Four Tigers,

have been successful in achieving high and sustained rates of economic growth since the early 1960s because of their free-market, outward-oriented economies (World Bank,1993).

The extensive literature concerning the relationship between trade and growth is also the consequence of the many changes that have taken place in the fields of development economics and international trade policy in the last two decades. An example of these changes is the tremendous modification from inward oriented policies to export promotion (EP) strategy. By the early 1980s export-led orientation and export promotion had already secured a wide consensus among researchers and policy makers, to such an extent that they had become "conventional wisdom" among most economists in the developing world (Tyler, 1981; Balassa, 1985). This is still the case in some international organizations, the international bank community and multilateral lenders such as the World Bank and the International Monetary Fund (IMF), and among the mainstream policy makers.

The advocates of the export-led strategy and free trade point out that most developing countries that followed inward oriented policies under the import substitution strategy (ISS), mostly in Sub-Saharan Africa and Latin America, had poor economic achievements (Balassa, 1980). Some of them including Ghana showed on average a complete lack of growth, while real income declined between 1960 and 1990 (Barro and Sala-i-Martin, 1995). These facts were partly responsible for the substantial change that occurred in the trade literature in the 1980s. For example, Bruton (1989) states that as the first stage of import substitution came to an end, those countries that continued with this strategy, particularly in developing countries, or that were unable

to shift to a more outward approach became increasingly vulnerable to external events. Most of them became increasingly dependent on short-run capital inflows, in particular from private banks, in order to maintain their levels of imports and thus of consumption. This was particularly the case of most Sub-Saharan African countries (including Ghana) that were greatly affected by the crisis of the early 1980s. Thereafter, many DCs were forced to stimulate their export-led orientation even more because most of them had to rely on multilateral organizations such as IMF and World Bank to implement adjustment and stabilization programmes to correct imbalances in their basic macroeconomic indicators. This is the very period where Ghana implemented ERP I and II and SAP as a recovery measure and also to stabilize the economy. The strategy was to encourage a free market through policies that relied heavily on the export promotion approach as one of the most suitable and trustworthy mechanisms. Promoting exports would enable developing countries (DCs) to correct imbalances in the external sector and at the same time assist them in ensuring that their domestic economies made a full recovery.

As part of an outward strategy, a new set of policies rapidly became a key component for policy makers in DCs involved in adjustment and stabilization programmes. In this atmosphere, numerous Governments started at this time to stimulate exports using diverse mechanisms and instruments, such as subsidies and tax exemptions. Consequently, by the mid-1980s, the economic literature concerning development economics, economic growth, adjustment and stabilization programmes had quickly rejected the *inward-oriented approach* and was suddenly placing great emphasis on *export-led strategy*. Most macroeconomic theorists and policy makers in DCs rapidly embraced the new wisdom, in the belief that by following this scheme their countries

would achieve or regain the high rates of growth of the past. Each strategy has been subject of an extensive theoretical survey and that the literature examining the relationship between trade and growth has increased substantially in the last decade with the impetus provided by the endogenous growth theory. However, it is not the intention of the present study to participate in or contribute to the discussion concerning the advantages and disadvantages of both economic strategies, which recently gained a new impetus (Bruton, 1998; Edwards, 1998; Frankel and Romer, 1999; Rodrik, 1999).[3]

In addition, although the theoretical literature has frequently focused on the relationship between trade and economic growth (Adams, 1973; Crafts, 1973; Edwards, 1992; Scott, 1992), the interesting phenomenon is that "empirical examinations have typically examined the relationship between exports and growth" (Levine and Renelt, 1992, p. 953).Therefore, the next section briefly reviews the empirical literature related to the export-led strategy, considering in particular the role that exports played in output growth and paying close attention to the issue of causal links between exports and economic growth.

2.1.2 Exports and Growth Nexus

Since the late 1960s studies have been conducted to examine the role of export performance in the economic growth process. Although the empirical literature can be considered to be vast, its results are clearly contradictory for both DCs and industrialized economies, a feature that could explain why this topic is still at the top of the agenda for many economists. To explore the correlation between export and economic growth, this study re-examines the export-led growth hypothesis for Ghana using cointegration approach. Further, to analyze whether the causality is from export

to economic growth or vice versa, this study uses Granger causality to compare the unidirectional/ bi-directional or no causality link between exports and economic growth.

According to the so-called new orthodoxy Export-Led growth hypothesis (ELGH), most authors as well as multilateral institutions would agree that promoting exports and achieving export expansion are beneficial for both developed and DCs for many reasons, including the following (i) they generate a greater capacity utilization; (ii) they take advantage of economies of scale; (iii) they bring about technological progress; (iv) they create employment and increase labour productivity; (v) they improve allocation of scarce resources throughout the economy; (vi) they relax the current account pressures for foreign capital goods by increasing the country's external earnings and attracting foreign investment; and (vii) they increase the Total Factor Productivity (TFP) and consequently the well-being of the country. Thus export expansion leads to an increase in the quantity and quality of production of goods and services to sell abroad (World Bank, 1993).

2.1.3 Review of Theories of Economic Growth

Economic growth is the increase of per capita gross domestic product (GDP) or other measure of aggregate income, typically reported as the annual rate of change in real GDP. Economic growth is primarily driven by improvements in productivity, which involves producing more goods and services with the same inputs of labour, capital, energy and materials. Economists draw a distinction between short-term economic stabilization and long-term economic growth. The topic of economic growth is primarily concerned with the long run. The short-run variation of economic growth is termed the business cycle. There are many models (theories) of economic growth

advanced by many economists beginning from the Classicals, the Neoclassical, and the Keynesians etc. Among them are reviewed below.

A. The Solow-Swan Model:

The Neoclassical growth theory perceives growth as an increase in stocks of capital goods (means of production) as has been codified in the Solow-Swan Growth Model, which involved a series of equations to show the relationship between labour-time, capital goods, output, and investment. According to this view, the role of technological change becomes crucial, even more important than the accumulation of capital. This model, developed by Robert Solow and Trevor Swan in the 1950s, was the first attempt to model long-run growth analytically. This model assumes that countries use their resources efficiently and that there are diminishing returns to capital and labour increases. From these two premises, the neoclassical model makes three important predictions. First, increasing capital relative to labour creates economic growth, since people can be more productive given more capital. Second, poor countries with less capital per person will grow faster because each investment in capital will produce a higher return than rich countries with ample capital. Third, because of diminishing returns to capital, economies will eventually reach a point where any increase in capital will no longer create economic growth. This point is called a "steady state".

The model also notes that countries can overcome this steady state and continue growing by inventing new technology. In the long run, output per capita depends on the rate of saving, but the rate of output growth should be equal for any saving rate. In this model, the process by which countries continue growing despite the diminishing returns is "exogenous" and represents the creation of new technology that allows

production with fewer resources. Technology improves, the steady state level of capital increases, and the country invests and grows. The data does not support some of this model's predictions; in particular that all countries grow at the same rate in the long run or that poorer countries should grow faster until they reach their steady state. Also, the data suggests the world has slowly increased its rate of growth.

However modern economic research shows that the baseline version of the neoclassical model of economic growth is not supported by the evidence, hence several criticisms have been levelled against this model. Limitations of the model include its failure to take account of entrepreneurship (which may be a catalyst behind economic growth) and strength of institutions (which facilitate economic growth). In addition, it does not explain how or why technological progress occurs. This failing led to the development of endogenous growth theory, which endogenizes technological progress and/or knowledge accumulation. Empirical evidence offers mixed support for the model. If productivity were associated with high technology then the introduction of information technology should have led to noticeable productivity acceleration over the past few decades; but it has not. Econometric analysis on Singapore and the other "East Asian Tigers" has produced the surprising result that although output per worker has been rising, almost none of their rapid growth had been due to rising per-capita productivity.

B: Harrod-Domar Growth Model

The Harrod–Domar model is used in development economics to explain an economy's growth rate in terms of the level of saving and productivity of capital. It suggests that there is no natural reason for an economy to have balanced growth. The model was developed independently by Sir Roy F. Harrod in 1939 and Evsey Domar in 1946.

The Harrod–Domar model was the precursor to the exogenous growth model. According to the model there are three concepts of growth:

- Warranted growth
- Natural growth
- Actual growth

The Harrod–Domar model makes the following a priori assumptions:

1: Output is a function of capital stock

2. The marginal product of capital is constant; the production function exhibits constant returns to scale. This implies capital's marginal and average products are equal.

3. Capital is necessary for output.

4. The product of the savings rate and output equals saving, which equals investment

5. The change in the capital stock equals investment less the depreciation of the capital stock

In summation, the savings rate times the marginal product of capital minus the depreciation rate equals the output growth rate. Increasing the savings rate, increasing the marginal product of capital, or decreasing the depreciation rate will increase the growth rate of output; these are the means to achieve growth in the Harrod–Domar model.

Although the Harrod–Domar model was initially created to help analyse the business cycle, it was later adapted to explain economic growth. Its implications were that growth depends on the quantity of labour and capital; more investment leads to capital

accumulation, which generates economic growth. The model also had implications for less economically developed countries; labour is in plentiful supply in these countries but physical capital is not, slowing economic progress. LEDCs do not have sufficient average incomes to enable high rates of saving, and therefore accumulation of the capital stock through investment is low.

The model implies that economic growth depends on policies to increase investment, by increasing saving, and using that investment more efficiently through technological advances.

The model concludes that an economy does not find full employment and stable growth rates naturally, similar to the Keynesian beliefs.

The main criticism of the model is the level of assumption, one being that there is no reason for growth to be sufficient to maintain full employment; this is based on the belief that the relative price of labour and capital is fixed, and that they are used in equal proportions. The model explains economic boom and bust by the assumption that investors are only influenced by output (known as the accelerator principle); this is now widely believed to be false.

In terms of development, critics claim that the model sees economic growth and development as the same; in reality, economic growth is only a subset of development. Another criticism is that the model implies poor countries should borrow to finance investment in capital to trigger economic growth; however, history has shown that this often causes repayment problems later.

The endogenity of savings is also hugely criticized. Perhaps the most important parameter in the Harrod–Domar model is the rate of savings. Can it be treated as a parameter that can be manipulated easily by policy? That depends on how much

control the policy maker has over the economy. In fact, there are several reasons to believe that the rate of savings may itself be influenced by the overall level of per capita income in the society, not to mention the distribution of that income among the population.

C: Endogenous growth theory (Model)

This Growth theory was advanced with the theories of economist Paul Romer and Robert Lucas, Jr. in the late 1980s and early 1990s. Unsatisfied with Solow's explanation, these economists worked to "endogenize" technology in the 1980s. They developed the endogenous growth theory that includes a mathematical explanation of technological advancement. This model also incorporated a new concept of human capital, the skills and knowledge that make workers productive. Unlike physical capital, human capital has increasing rates of return. Therefore, overall there are constant returns to capital, and economies never reach a steady state. Growth does not slow as capital accumulates, but the rate of growth depends on the types of capital a country invests in. Research done in this area has focused on what increases human capital(e.g. education) or technological change (e.g. innovation).

One of the main failings of endogenous growth theories is the collective failure to explain conditional convergence reported in the empirical literature. Another frequent critique concerns the cornerstone assumption of diminishing returns to capital. Some contend that *new growth theory* has proven no more successful than exogenous growth theory in explaining the income divergence between the developing and developed worlds (despite usually being more complex.

The review of the above theoretical literature of economic growth has revealed that almost all the traditional exogenous theories of economic growth stressed the

importance of capital (physical and human) and labour accumulation in addition to technology to increase their GDP growth. However, literature on economic growth and development in the late 1970s, (Krueger,1978), (Bhagwati, 1978) advanced theoretical arguments which projected export promotion as a superior development strategy such that economies can generate GPD growth by expanding their exports. Therefore this study tries to endogenize exports and other growth enhancing variables for Ghana to take account of this omission.

2.2 Empirical Review

Jung and Marshall (1985) examined the causality of exports and economic growth in developing countries. Four African countries were included in the sample of the study. The results in this paper showed that among the African countries, only in Kenya did economic growth play a positive role in boosting exports. Fosu (1990) investigated the role of export growth in less developed African countries. Using a pooled time-series for the period of 1960-1970 and 1970-1980, the author found that exports have a positive and significant effect on economic growth in 28 African LDCs. However, in comparing the non-African LDCs with African LDCs, the study concluded that the impact of exports on economic growth is comparatively smaller in the African sample.

Ahmad and Kwan (1991) looked into the causal relationship of exports and economic growth in 47 countries in Africa. By utilizing pooled time series and cross sectional data from 1981-1987, the study tested Granger causality based on an error correction model. The results generally supported the notion that no causation exists between exports and economic growth (or vice versa) in the African countries. However, the authors showed that in some low-income African countries, weak causality runs from

economic growth to exports. Ukpolo (1994) studied the linkage of export and economic growth using eight low-income African countries over the period 1969-1988. Based on the time-series regression results, the author concluded that there is a positive relationship between non-fuel primary exports and economic growth. However, the regression results present some inconclusive outcome on the positive role of manufactured exports on economic growth.

Amoateng and Amoako-Adu (1996) used the trivariate causality analysis by including the external debt into the export-economic growth Granger causality regression. Using data for Low-Income Africa, Middle-Income Africa, Africa - south of Sahara, and the entire sample, (for the period of 1971-1990, 1971-82 and 1983-90), the relationships among GDP growth, export revenue growth and foreign debt service was examined in this study. The authors found bidirectional causality between external debt servicing, economic growth and exports. More recently, bigger developing countries like China and India have actively pursued the export-led growth strategy. Shan and Sun (1998) tested the export-led growth hypothesis by estimating an augmented growth equation using time series data for China. The results from their study indicate a bi-directional causality between exports and real industrial output in China over the period 1987-1996.

Giles and Williams (2000) did a comprehensive review of literature of about 150 applied papers on ELG from 1963-1998. The literature was divided into three groups: cross-country correlation coefficients, cross sectional and individual country-specific time-series. Two-third of the papers under review used time series, and about 70 of them focused on the dynamic relationship of exports and economic growth using the concept of Granger causality. The authors presented somewhat mixed results of ELG studies done so far with diverse and contradicting conclusions.

There is a set of 42 empirical studies conducted between 1967 and 1998, which includes time period, methodology, variables, econometric technique and conclusions reached by the researchers. Although a substantial part of the earlier studies found evidence of a correlation between exports and growth which was used to support the ELGH, this tends to hold only for cross-sections studies. In fact, the recent evidence on time series, which makes extensive use of cointegration techniques, casts doubts on the positive effects of exports on growth in the long run, and is thus not as conclusive as it was previously thought to be. Therefore, explanations regarding this extensive empirical literature are in order.

Among earlier empirical studies Emery (1967, 1968), Syron and Walsh (1968), Serven (1968), Kravis (1970), Michaely (1977), Heller and Porter (1978), Bhagwati (1978) and Krueger (1978) should be mentioned. This first group of studies explained economic growth in terms of export expansion alone, in a two-variable framework. That is, they used bivariate correlation-the Spearman rank correlation test in cross-country format to illustrate the alleged superior effects of the ELGH (Lussier, 1993, p. 107).

A second group of researchers, which includes Balassa (1978, 1985), Tyler (1981), Feder (1983), Kavoussi (1984), Ram (1985, 1987) and Moschos (1989), studied the relationship between export and output performance within a neoclassical framework. In most of these studies exports were included in an ad hoc manner in the production function, together with labour and capital. They claimed that by including exports they were taking into consideration a broad measure of externalities and productivity gains generated by this sector which stimulated the domestic economy. The majority of these investigations aimed at analyzing DCs by using ordinary least squares (OLS) on cross-section data and used their results to demonstrate the advantages of the

export promotion strategy in comparison with the import substitution policy. It was not until recently that this line of research began to focus on country-specific studies, for both industrialized countries and DCs. Surprisingly, more than half of the empirical investigations published in the 1990s found no long-run relationship between exports and economic growth; rather, the studies suggest that it arises only from a positive short-term relationship between export expansion and growth of gross domestic product (GDP). The studies of industrialized nations have analysed the cases of Canada, France, Germany, the United Kingdom, the United States and Switzerland, among others. In only a few cases have the empirical results confirmed that export expansion was a key element in the economic success of those countries (Kugler,1991; Afxentiou and Serletis, 1991; Henriques and Sadorsky,1996). Even more astonishing is the finding in relation to Japan, which is that internal forces were the handmaidens of the great Japanese economic success in the twentieth century, including the post-war period, and not trade as many have claimed in the recent past (Boltho,1996).

The review of the empirical literature on exports and growth since the late1960s, showed that the recent evidence available suggests that exports do not necessarily cause growth, as many economists believed and maintained until recently and as early studies suggested. The results reported are clearly sensitive to the variables employed, e.g. investment instead of capital, population instead of labour force, and also to the theoretical framework assumed, i.e. bivariate models and ad hoc production functions instead of an augmented neoclassical production function as advocated by Emilio J. Medina-Smith in his UNCTAD study (2001) on Costa-Rica. He tested the export-led growth hypothesis by estimating an augmented growth equation using time series data for Costa-Rica. The result from his study indicates a unidirectional causality from

exports to real output or GDP. Mohan Ramesh and Nandwa Boaz (2007) also tested the hypothesis in a multivariate format by estimating an augmented growth equation using time series data from 1970-2004 on Kenya. By adopting the Bounds testing approach the authors concluded that there is long-run relationship between exports and GDP growth and thus, gave credence to the hypothesis. Sentsho (2003), using the aggregate production function models (APFM) provides econometric evidence of the determinants of economic growth in Botswana. Moreover, Accounting for Ghana's growth, Aryeetey and Fosu (2005) used the aggregate production function model of growth accounting. They used Cobb-Douglas production function in formulating their model. Adu G. (2006) also employed the augmented growth equation using times series analysis to find out the determinants of economic growth in Ghana using other growth enhancing variables in addition to the traditional growth variables. The author thus found that there exist a long-run relationship between real GDP growth rate and most of the growth determinant variables.

Although an augmented Cobb-Douglas production function could be considered ad hoc, this issue can be tackled by constructing a simple two-sector growth model, which is based on the following assumptions. First, the economy is composed of two sectors, each of which produces a single good. One is a tradable good and the other is non-tradable merchandise; that is, the first one is produced for the foreign market, while the second is entirely for the domestic market. Second, both sectors demand inputs from the economy, essentially labour and capital. Third, there are significant productivity differences between the two sectors. Fourth, the production of the domestic sector (non-export sector) depends on the volume of exports. This type of model has been widely used since Feder (1983) first presented it. It focuses on the likelihood of non-optimum allocation of resources due to a differential of productivity

between the two sectors and where exports can capture a range of positive spillovers and externalities which are not measured by the conventional national accounts. From the voluminous literature on the relationship between export expansion and economic growth that is outlined, it is clear that the results obtained depend not only on the theoretical approach used but also even on the econometric methodology employed. For example, cross section studies are more likely to corroborate a positive relationship between exports and growth, while the results of time series studies depend substantially on the countries analyzed, the period chosen and the econometric method used. In addition, since cross-section studies can obscure particularities of DCs, especially those that are low-income countries as well as major oil-exporting countries, the correct strategy to follow from an empirical point of view is to address the issue in a country case framework, using as much as possible the recent developments in time series analysis.

From the review of literature about export-growth relations, the first group of studies explained economic growth in terms of export expansion alone, in a two-variable framework. That is, they used bivariate correlation ─ the Spearman rank correlation test in crosscountry format to illustrate the alleged superior effects of the ELGH (Lussier, 1993, p. 107).

The second group included exports in an ad hoc manner in the production function, together with labour and capital. They claimed that by including exports they were taking into consideration a broad measure of externalities and productivity gains generated by this sector which stimulated the domestic economy. The majority of these investigations aimed at analyzing DCs by using ordinary least squares (OLS) on

cross-section data and used their results to demonstrate the advantages of the export promotion strategy in comparison with the import substitution policy.

In recent studies, which make use of modern time series techniques in a country case framework; Medina-Smith (2001) estimated the augmented production function by including exports as a third variable to determine the impact of exports on real output but there are other growth enhancing variables that are left out in this study which could create an econometric problem of endogeneity. This study therefore tries to bridge the gap by including some of these variables.

2.3. Historical Review of Ghana's Export Sector Policies and Performance

Ghana was the "shining star" of Africa at independence fifty one years ago. The years 1960-1964 saw relatively high growth, spurred on by favorable export performance and rapid industrialization linked to import-substitution policies. This encouraging beginning gave way to macroeconomic instability, and uneven and volatile growth from 1965-1983. This uncertain foundation, hit by economic shocks, brought the economy close to collapse in the early 1980s. Recognizing the need for change, the government launched the Economic Recovery Program in the early 1980's, which succeeded in renewing growth and contributing to significant poverty reduction. The economy definitely responded positively to ERP/SAP soon after inception. It recovered from its negative growth rate of about 5% in 1983 to a hefty positive rate of8% in 1984. The favourable growth has continued since that time, with relatively little variance, even if there is a slight slowdown in the rate of growth since 1990.

Since independence the successive governments of Ghana have tried to promote export and for that matter trade in general across the various regimes through many

policies such as the establishment of the Ghana Export Promotion Council in 1969 as an agency of the Ministry of Trade and Industry with the mandate to develop and promote Ghanaian exports. The Council's focus has primarily been to diversify Ghana's export base from the traditional export products of Gold and other minerals, Cocoa Beans, Timber Logs and Lumber, and Electricity. There are over 383 different Non-Traditional Export products categorized into Agricultural, Processed / Semi Processed and Handicrafts. This body was to oversee Ghana's export performance and to facilitate the development and expansion of the production base, and the promotion of Non-Traditional Exports.

The promotion of Ghana's foreign trade has been central to all government plans to revive the economy since 1983.The first phase of reform, marked by the adoption of a stabilization programme, Economic Recovery Program (ERP), with major support from the International Monetary Fund (IMF) and the World Bank, was instituted in April 1983, with implementation over1983-1986. The ERP, a market-oriented programme, was intended to halt the downward economic spiral. Starting in 1986, the second phase of reform saw ERP being supplemented with the Structural Adjustment Programme (SAP), geared toward correcting a number of structural imbalances in order to engender a sustained healthy economic growth. Under the ERP, export-producing industries received the most direct support; they also received the most indirect support through the improvement of their proximate infrastructure. By promoting exports, the government sought to obtain foreign exchange essential to repay debts and to ease the country's restrictions on imports. Imports, of course, are also necessary to upgrade many of the export industries hamstrung for lack of equipment.

Prior to 1983, economic conditions conspired to erode the terms of trade to such an extent that Ghanaians had reverted to smuggling goods across the borders as well as to trading on the black market on a significant scale. Ghanaians who had anything to sell could multiply their earnings by selling their goods in French-speaking countries, especially neighboring Côte d'Ivoire, and then changing the resultant francs into Cedis at black market rates. Smuggling cut down the amount of foreign exchange available for official transactions, leading to a reduction in imports, which hit manufacturing enterprises dependent upon imported equipment and raw materials especially hard. As a result, many consumer goods were no longer available in Ghana, which further boosted smuggling across borders of those countries where such goods could be obtained. By 1982 the World Bank estimated that transactions on the parallel, or black market constituted 32.4 percent of all domestic trade (World bank, 1993).

Since the start of the ERP in 1983, the government has introduced several policies to adjust the pattern of Ghana's trade structure. These include devaluing the currency as well as raising producer prices for crucial exports such as cocoa to offset the advantages of smuggling such goods across borders. In addition, the government introduced an interbank foreign exchange market to facilitate currency exchange. By the early 1990s, government efforts had resulted in the restoration of many of Ghana's historical trade relationships. Exports were again dominated by cocoa, which earned US$280 million in 1993. Other significant export commodities in 1993 were gold (US$416 million) and timber (US$140 million), followed by electricity, diamonds, and bauxite. Ghana's nontraditional exports, such as furniture, cola nuts, and pineapples, have also increased significantly according to the World Bank (1993 report). An economic recovery programme (ERP) instituted by the Ghanaian government in 1983 led to the adoption of an export-led growth strategy aimed at

increasing export earnings through export diversification and expansion. Ghana has since made substantial gains from the exports of non-traditional exports like pineapples, yams, handicrafts, canned and smoked fish, processed foods, wood products, etc. For example, in 1988, the government, through the Ministry of Trade and Industry and the Ghana Export Promotion Council (GEPC), embarked on a three-year export development plan (1988-1990). This resulted in a growth in the non-traditional sector from $1.91 million in 1984 to $62.34 million in 1990, amounting to about 9.6 percent of total exports (Bank of Ghana, 1997). Actual levels of performance were observed to have fallen below planned targets set by the government even though earnings increased and continue to increase (Sey, 1997).

In addition to supporting traditional export industries such as cocoa and gold, the government also attempted to diversify the content of Ghana's exports. To encourage nontraditional exports in the fishing and agriculture sectors, the government offered to refund 95 percent of import duties on goods destined for re-export and even to cancel sales taxes on manufactured goods sold abroad. In addition, the government devised a scale of tax rebates ranging from 20 percent to 50 percent determined by the volume of total production that was exported. These incentives generated considerable response. By 1988 more than 700 exporters were dealing in 123 export products, the major items being pineapples, marine and fish products (especially tuna), wood products, aluminum products, and salt. By 1990, the value of nontraditional exports had risen to US$62.34 million. In 1992 the government's Ghana Export Promotion Council announced a plan to raise nontraditional exports to US$335 million by 1997 through increased market research, trade missions, trade fairs and exhibitions, and training. Among its most ambitious specific targets were increases in tuna and shrimp sales to US$45 million and US$32 million, respectively, by 1995, and increases in

pineapple sales to US$12.5 million. In the manufacturing sector, wood products, aluminum goods, and processed rubber were targeted to yield US$44 million, US$42 million, and US$23 million, respectively. Earnings from salt were projected to rise to US$20 million. (World bank report 1993).

The performance of Ghana's export continued to improve further from the year 2001 when the new government assumed office due to major policies that were put in place. The prices of Ghana's major export commodities especially cocoa and gold rose continuously in 2003 contributing to better external sector performance than the previous year. Total exports receipts (fob) increased by 14% from $2,015.2m in 2002 to $2,297.2m in 2003. This fell marginally as a result of the closure of the VALCO which had been expected to contribute the difference with its aluminum exports. The splendid performance of Ghana's export sector in 2003 was as a result of notable developments and policy implementations that took place as outlined below:

- The Ghana Export Promotion Council (GEPC) facilitated the production and supply of 12,860 exportable mango seedlings and chili pepper seeds to 156 farmers groups in 26 districts in Ghana.
- In collaboration with the Association of Ghana Industries (AGI), GEPC concluded special market access programmes to four ECOWAS countries for six selected products. Made –in –Ghana exhibitions were held in Mali, Burkina Faso and Benin.
- The Ghana Standards board (GSB) attained ISO 9002 quality certification, which gives it worldwide recognition.
- The Ghana Free Zone Board registered 35 firms, this brought the number of people directly employed by free- zone enterprises at the end of 2003 to 13,760.

However, other trade and investment promotion programmes had been launched since 2001 under which the President's Special Initiatives (PSI) was also inaugurated. These are programmes to implement the export-led growth strategy, contribute significantly to foreign exchange generation, employment creation and poverty reduction (particularly in rural communities). The initiatives covered four products: cassava, garments and textiles, oil palm and salt.

The cassava Initiative: Cassava starch production by the Ayensu Starch Factory in Bawjiase (Central Region) started in June 2003 and about 240 tonnes were exported by September the same year. Two new starch production companies in the Eastern and Ashanti Regions were incorporated in 2003 but began operation in 2004.

Garment and textile initiative: clothing Technology Centre (CTTC) was set up to train 400 a month in sewing and other garment production technology. Around 4,500 sewing operators had been trained by end-2003 and the commercial production unit, Gold Collection Limited began exporting to the US market.

Oil palm initiative: About 1.2 million germinated oil palm seed nuts were raised by the Oil Palm Research Institute (OPRI) while 12 private nursery operators were selected to oil palm seedlings for out-planting in 2004

Salt Initiative: Six production zones were identified and 15 production units registered. Community sensitization programmes were organized for all salt-producing areas. The value of Ghana's merchandise exports (fob) rose steadily in the 2001-2003 period while that of merchandise imports dipped before recovering from the previous year. However, the Trade Intensity Index –the sum of exports and imports divided by GDP –continue to fall. This indicator of the importance of trade to Ghana's economic output (and also a measure of Ghana's openness) fell from a high 92% in 2000 to 64.1% in 2003.(source: BOG report,2004). Over the period, the

composition of Ghana's main export commodities remained unchanged, with cocoa, timber and minerals still the major items. Minerals continued to be the top export earner in 2003, increasing its contribution to total earnings by 1.5 percentage points over 2002 (Table 2.2). In contrast, revenue from cocoa (beans and products) rose from a low 20.4% in 2001 to 34.9% in 2003, while the share of timber earnings stayed at 9.1% in 2001 and 2002 before falling to 7.6% in 2003 (BOG, 2004). The contribution of other exports (mainly other non-traditional) progressed in 1999-2001 before plunging to 18.6 % in 2003. This sharp fall was a result of the shutdown of VALCO, which meant there were no aluminum ingots for export and therefore, nothing to follow the $157.8m earned from this item in 2002.

Cocoa:

Cocoa (beans and products) earned $802.2 million in 2003 compared to $474.4milion in 2002, an increase of 69.1%. This was attributed mainly to higher production, - 2002/2003 purchases totaled 496, 869 tonnes, the highest level since 1964-and higher world market prices. Despite the high production, the volume of cocoa export increased only 11.4%, from 311,425 tonnes in 2002 to 346,890 tonnes in2003. The unit price of cocoa beans rose 54.6% to $1,949 per tonne in 2003 and the unit price of cocoa products went up by 87.3% to $2,597.8 per tonne in 2003. While cocoa beans exports increased by 11.4% in volume from 2002 to 2003, the value rose 72.3% to reach $676.1million in 2003.Also, the value of cocoa products increased by 17.8% to 48,536 tonnes in 2003.

Minerals: As in the previous years, gold and other minerals were the largest source of export earnings for Ghana in 2003 .Gold accounted for 93% of the sub-sector's earnings while diamonds, bauxite and manganese provided the rest. Gold exports rose

by 2.3% in volume and, due to favourable world prices, were up by 20.5% in value. While diamond and manganese export earnings rose by 10.9% and 1.4% respectively in 2003, the interesting contrast was that the export volume of diamonds fell by 8.1% while that of manganese increased by 19 %.

Timber and timber products:

Total export receipts from timber declined in 2003 by 4.4%. This was accompanied by a 5.6% fall in the volume of timber exports in 2003. The world price rose from $387.8 per cubic metre in 2002 to $391.9 per cubic metre in 2003, an increase of 1.1%.

Non-traditional exports: The export of non-traditional commodities in 2003 yielded $588.7million, an increase of 16.8% over 2002. This upward trend in the total value of non-traditional exports began in 2001 after a period of stagnation between 1999 and 2000. The value of non-traditional exports, number of exporters and number of products all increased in 2003 by 16.8%, 3.2% and3.9% respectively. Agricultural products rose 61.1% in value in 2003 while their contribution to the total value of non-traditional exports was 23.5% .Similarly, the value of processed and semi-processed products increased by 9.7% in 2003 while their contribution to total earnings was 75.8%. Handicrafts recorded a 62.8% fall in export value in 2003 and contributed 0.7% of the total value of non-traditional exports. (State of Ghanaian Economy, 2003). Horticultural products including pineapples, continues to be the leading contributor to export receipts from agricultural exports, although their share of non-traditional agricultural products fell by 13.1%. This could be attributed in part to a taste shift in some markets in favour of the South American MD2 variety of pineapple.

The next major category of agricultural non-traditional exports was fish and seafood products. Total earnings from this sub-sector rose by 9.8 %. Tuna fish stood out as the most important commodity in the group with earnings of $8.9million in 2003, down by 27.1% on 2002. The number of tuna exporters fell and quantity exported fell from 17,810 tonnes in 2002 to 13,430 tonnes in 2003. Earnings from game and wildlife maintained their steep climb, with a 282.8% increase over 2002. While the number of products increased, the number of exporters declined. The increase in value was mainly due to live goat and sheep exports which rose by 1,517.5% in 2003. For processed and semi-processed non-traditional exports, total earnings rose by 9.7% although earnings of the three major products (wood, aluminum and prepared foods/ beverages) fell. The overall increase resulted from a 32.9% increase in the value of other processed and semi-processed products. Indicators of economic activity suggested that the economy experienced an upswing in 2004 with cocoa production of over 700,000 tonnes during the 2003/ 2004 crop season, the highest since the 580,000 tonnes recorded in 1984/85 crop season. Agricultural output increased by 7.5% and propelled the higher growth attained in 2004. As a result of the stability attained in 2002, (GDP) growth has improved significantly from an overall growth rate of 3.7% in 2000; higher growth rates of 5.2% and 5.8% were achieved in 2003 and 2004 respectively. Source, (BOG report, 2004).

Total merchandise export earnings were estimated at US$2,784.6m in 2004 compared with $2,562.4m in the previous year (2003). Cocoa exports grew strongly, recording a growth rate of more than 30% to push receipts beyond US$1.0 billion for the first time. The increase was mainly due to higher production rather than the price.

Direction of trade and Destination of Ghana's Exports:

In the early 1990s, Ghana continued to trade primarily with the European Community, particularly Britain and Germany. Britain continued to be the principal market for Ghanaian cocoa beans, absorbing approximately 50 percent of all cocoa beans exported. In 1992, Germany was the single most important destination of Ghana's exports, accounting for some 19 percent of all exports. Britain was next, accounting for about 12 percent; followed by the United States, 9 percent; and Japan, 5 percent. The same year, Britain supplied approximately 20 percent of Ghana's imports, followed by Nigeria, which provided 11 percent. The United States and Germany were third and fourth, respectively. The direction of trade statistics showed that Ghana's trading partners remains largely unchanged since 2000. Despite the fact that trade with Europe and the United States remain dominant, trade with ECOWAS countries, particularly Nigeria, is becoming increasingly significant.

The four top destinations of Ghana's exports in 2002 were the Netherlands (14.9%), the UK (9.9%), US (7.0%) and Germany (6.6%).The four countries together received 38.4% of Ghana's exports in 2002, and this share moved slightly to 38.9% by March 2003. On the West African market, the share of Ghana's total exports to Nigeria increased from 4.0% in 2000 to 5.0% in 2001 and then fell to 4.8% in 2002. By March 2003,Ghana's export to Nigeria were 4.6% of total exports and no other African or West African country appeared among the top 10 countries receiving Ghana's export. Since 2003, most of Ghana's Non-traditional Export (NTE) has gone to European rather than African markets. In 2003, 59.0% of total NTE went to the European Union market while only about 23.0% went to African markets. With ECOWAS countries making insufficient progress towards free trade among themselves as enshrined in Chapter VIII of the revised ECOWAS treaty, Ghana's

NTE trade with other ECOWAS countries increased by only 1.2% from, 2002 to 2003, whereas that of other African countries surged upwards by 62.0% within the same period. Statistics from the GEPC indicate that from 2000 to 2003, NTE to ECOWAS countries went mainly to Nigeria, Benin, Togo, Co^te d'Ivoire and Burkina Faso.

Table 2.1 Export of Goods and Services 1999-2004(US$m)

1999	2000	2001	2002	2003	2004
2,473.1	2,440.6	2,398.8	2,570.1	3,192.4	3,486.9

Source: Bank of Ghana Report, 2004.

Table 2.2Merchandise export earnings by sector, 1999-2003($m)

	1999	2000	2001	2002	2003
Gross exports	2,005.5	1,936.3	1,867.1	2,015.2	2,297.2
Of which					
1.Cocoa	552.3	437.1	382.7	474.4	802.2
% contribution	26.0	22.6	20.4	23.5	34.9
2. Minerals	749.1	755.9	691.4	753.9	893.6
% contribution	37.4	39.0	37.0	37.4	38.9
3. Timber	174.0	175.2	169.3	182.7	174.7
% contribution	8.7	9.0	9.1	9.1	7.6
4.Other exports	530.1	568.1	625.3	604.2	626.7
% contribution	27.9	29.4	33.5	30.0	18.6

Source: Bank of Ghana report, 2003.

CHAPTER THRE

METHODOLOGY

3.0 Introduction

This chapter consists of the Specification of the Model, the Definition and Measurement of the Variables, the Source of Data, and the Estimation Procedures. In this section, it is specified that the equation for real GDP for Ghana will be estimated and analyzed in the next chapter.

3.1Model Specification and Empirical Strategy

The econometric or empirical evidence for the Export –Led growth Hypothesis in Ghana is based on the aggregate production function Models (APFM). The APFM assumes that, along with ‘’conventional inputs” of capital and labour used in the neoclassical production function, unconventional inputs like the share of exports in GDP and other variables may be added to capture their contribution to economic growth. The problem with this approach to the study of export-led growth hypothesis is that it uses the real GDP instead of its growth rate as the dependent variable. However, this is not a serious setback of the APFM since increase in productivity lead to growth. The model is used among others, Feder (1983), Fosu (1990), Ukpolo (1994), Emilio J. Medina-Smith(2001), Jalali-Naini (2003) ,Sentsho(2003), Mansouri (2005) and Aryeetey and Fosu (2005), Adu G. (2006) and Mohan Ramesh and Nandwa Boaz (2007).

The starting point of an empirical study of export-led growth hypothesis in any given country is the growth model based on aggregate production function.

The study therefore goes beyond the traditional neoclassical theory of production by estimating an augmented Cobb□Douglas functional form, using labour force (L), capital (K), exports (X), inflation (INF) as a measure of macroeconomic volatility,

credit to private sector (CREPS) as a ratio to GDP as an indicator of financial development and political stability dummy (POLDUM); from 1960-2007 as inputs of production using a linear equation. This provides an alternative procedure to capture total factor productivity (TFP) growth. We model the relationship between GDP and exports not in a bivariate framework but in a multivariate one by including the other variables. This strategy is crucial given that a common criticism labeled at bivariate models is one of omitted variables bias. Following Emilio J. Medina-Smith (2001), Aryeetey and Fosu (2005)and Mohan Ramesh and Nandwa Boaz (2007), the following general formulation is estimated for real GDP growth in Ghana.

$Y_t = \boldsymbol{f}(A, L, K)$ …….. (3.1)

Where Y = real GDP

A = total factor productivity and L and K are the conventional inputs respectively.

L= Labour, measured by series of total labour force in Ghana

K= Capital, measured by real gross domestic capital formation.

In this case , 'A' captures the total factor productivity (TPF) of growth in output not accounted for by increase in labour and capital. Following the new endogenous growth theory, 'A' is endogenously determined by economic factors. Thus it is assumed that in Ghana,

$A = f(X, INF., DCRPS, D_o)$ …… (3.2)

Where X = Total or aggregate exports (real).

INF= Inflation as an indicator of macroeconomic volatility measured by (annual % change in CPI)

DCRPS= Domestic credit to private sector as an indicator of financial development measured as a ratio to GDP.

D_o= Dummy variable for political stability.

By substituting (3.2) into (3.1) we obtain the augmented Cobb-Douglas production functional form using a linearequation of the following form:

$GDP_t = F (K_t, L_t, X_t, INF_t, DCRPS_t, D_t)$ …… (3.3)

The specific operational model in non-linear form is:

$GDP_t = \beta_0 K^{\beta}{}_1 L^{\beta}{}_2 X^{\beta}{}_3 INF^{\beta}{}_4 DCRPS^{\beta}{}_5 D^{\beta}{}_6 e$……..

(3.4)

From (3.3), the specific operational model for real GDP growth for Ghana in log-linear form is:

$$LnGDP_t = \beta o + \beta_1 LnK_t \beta_2 LnL_t + \beta_3 LnX_t + \beta_4 LnINF + \beta_5 LnDCRPS + \beta_6 D_t + \varepsilon_t \ldots (3.1.5)$$

All the variables are as already defined before and ε_t is the stochastic random error term with zero mean and constant variance and β_0 is a constant parameter (the intercept of the growth equation) and Betas(β_s) are the partial elasticities of real GDP growth with respect to K_t, L_t, X_t,INF_t, $DCRPS_t$ and D_t respectively which also represent the percentage increase in

output resulting from a percentage change in the respective variables. Equation (3.5) shows the long-run equilibrium relationship among the variables. With the exception of inflation (INF), thus macroeconomic volatility, It is theoretically expected that the coefficients of the capital (K), labour (L), exports (X), credit to private sector (DCRPS) and political stability (D) be positive as these are growth enhancing all things being equal.

However, the detailed explanations, the expected signs on the coefficients and measurement of the relevant variables in the model based on theory are further stressed in section 3.2 below.

3.2. Definition and Measurement of Variables

3.2.1 Economic Growth

Economic growth is commonly measured as the annual rate of increase in a country's gross domestic product (GDP). There are many ways of measuring economic growth in a country. These include real per capita gross domestic product and real gross domestic product. This study however uses real gross domestic product (GDP) to measure economic growth. This measure has been chosen because it captures the total levels of economic growth. However this is also consistent with other relevant empirical studies, Aryeetey and Fosu (2005) andMohan Ramesh and Nandwa Boaz (2007). While the standard neoclassical growth model predicts that, labour and capital inputs are able to explain the bulk of economic growth patterns in a given country, there is still scope to account for the role of other explanatory variables in deriving output changes. Such factors may be considered on the basis of further theoretical foundations as well as country-specific characteristics. Among such factors, the recent literature on growth has centered on exports(X), Inflation (INF.), domestic credit to private sector (DCRPS/GDP) as ratio to GDP, and political stability (POLDUM). Equation (3.5) shows the long-run equilibrium relationship.

3.2.2 Gross Capital formation (K_t)

It is expected that capital (K), measured as gross domestic capital formation to be positively correlated with the rate of growth of real GDP. Adequate capital is one of the primary needs of economic growth. Capital flows out of savings and savings out

of income. More capital means more production and more production means more output and hence more growth. This is because with more capital available, a given number of workers will be able to produce more output, all things being equal. The bulk of the theoretical and empirical evidence indicates that the relationship between economic growth and capital formation is positive (Romer, 1986; Lucas, 1988; Rebelo, 1991). Consequently, the study expects the coefficient of capital formation (K) to be positive. Thus, β_1>1 0; the higher the rate of investment, the higher the rate of real GDP growth, all things being equal.

3.2.3Labour force (L)

Increase in labour input (L), which is measured here as the labour force is expected to lead to an increase in real GDP. All things being equal, the higher the labour force the higher the supply of labour and hence output. Therefore, the coefficient of labour must be positive and significant (β_2 >0).

3.2.4 Exports (X)

The initial wave of favourable arguments with respect to trade can be traced to the classical school of economic thought that started with Adam Smith and which was subsequently enriched by the work of Ricardo, Torrens, James Mill and John Stuart Mill in the first part of the nineteenth century. Since then, the justification for free trade and the various and indisputable benefits that international specialization brings to the productivity of nations have been widely discussed and are well documented in the economic literature (Bhagwati, 1978; Krueger, 1978).Since the late 1960s studies have been conducted to examine the role of export performance in the economic growth process. Majority of these studies have confirmed the significant effects of export to output growth in both developed and developing countries. It is therefore

imperative to include it in this study to capture the total effect of exports on growth as envisages by the export-led growth hypothesis. Thus, exports are theoretically expected to be positive (B_3>0).

3.2.5. Inflation (INFL)

Inflation rate (CPI) is a reflection of macroeconomic volatility. A high rate of inflation is generally harmful to growth and investment because it raises the cost of borrowing and thus lowers the rate of capital investment; but at low levels of inflation, the likelihood of such a trade-off between inflation and growth is minimal. Thus inflation is expected to negatively affect GDP growth. Thus, it is expected that the coefficient of inflation be highly negative, (β_4) <0.

3.2.6 Domestic credit to private sector

The private sector has generally been considered as the engine of growth of the Ghanaian economy as in all other countries. Rajan and Zingales (1998), uses cross-country comparisons to show that industry growth is positively correlated with financial development (for example, measured by the ratio between the total flow of credit to private sector in a country in a given year, divided by the country's GDP that year). The major concern is that; does financial development allow a country to grow faster, or just that countries that grow fast also happen to use a lot of finance? Of cause this question matters a lot because if finance causes growth, then a country wanting to grow faster such as Ghana should maybe reform its financial institutions, and make credit available to the private sector to boost up private sector outputs and thus aggregate output growth. Therefore it is theoretically expected that domestic credit to the private sector impacts positively on the total economic growth. It is therefore expected that the coefficient of domestic credit to private sector (β_5) >0.

3.2.7. Political Regimes (D_t)

Macroeconomic instability often induced by political and economic factors have been identified as a major cause of uncertainty, which is an important feature of developing countries. In most Sub-Saharan African countries, Ghana inclusive, political stability and the nature of government cannot be separated from the history of economic growth and development. Hence, the political dummy is included in the model to capture the nature of political regime and its effect on real GDP growth in Ghana. A year of military governance is designated zero whereas a year of civilian rule is assigned the value of one. Democratic regimes are more likely to respect civil liberties, the rule of law and property rights, features that are more conducive to economic growth. Ngowi (2001) argues that many developing countries have attracted little foreign direct investment (FDI) because they are regarded as "high risk and are characterized by lack of political and institutional stability and predictability". Fosu (1992) also argues that political instability has been one of the key factors that have had a negative impact on economic growth. In addition, Tsikata (1996), using dummy variables, found a high and statistically significant negative correlation between political instability and economic growth. The study also found that a democratic form of governance has a positive and significant relationship with growth. Since Ghana is now a democratic country and even a model and a beacon of hope for the developing countries sub-Saharan Africa, it is therefore important that we add political stability as this is growth enhancing. In other words, being nondemocratic appears to be more detrimental to growth in any given country.

3.3. Time Series Econometric Procedures

3.3.1 Stationarity Tests

The time series properties of the individual variables are first determined. The purpose is to determine the order of integration of each of the variables and the number of times that a particular variable would have to be differenced for the series to achieve stationarity.

Non-stationarity of the time series data has often been regarded as a problem in empirical analysis. Working with non-stationarity variables lead to spurious regression results and inaccurate t-statistic and Durbin-Watson (DW) statistic values. Also R^2 does not retain its traditional characteristics in the presence of non-stationarity (Granger and Newbold, 1974), thus further inferences are meaningless. Elbadawi and Soto (1995) points out that the test for stationarity also verifies whether a series could be represented more appropriately as a trend stationary process (TSP) or difference stationary process (DSP). According to Nelson and Plosser (1982), when a non-stationary series that is integrated of order one, *I*(1), achieves stationarity after taking the first difference, the process is called difference stationary process. Based on the DSP, it is possible to get processes of higher orders.

Standard test for the presence of unit root based on augmented Dickey-Fuller (1979, 1981) test is used to examine the order of integration of the variables in use in this study. The augmented Dickey-Fuller (ADF) test for unit root involves estimating the following equation:

$$\Delta y_t = \mu + \gamma^* y_{t-1} + \sum_{i=1}^{p-1} \phi \Delta y_{t-i} + \varepsilon_t \quad \text{.....3.6}$$

The unit root test is carried out by testing the null hypothesis that $\gamma^* = 0$ against the alternative that $\gamma^* < 0$.

The acceptance of the null hypothesis test of the existence of a unit root in the series implies that the variable is non-stationary and integrated of order one *I*(1) or higher. We reject the hypothesis if the series are stationary and integrated of order zero *I*(0).

3.3.2 Cointegration Test

In order to model the variables in a manner that captures the inherent characteristics of its time series properties, we use (SIC) and the Log-Likelihood ratio to determine the lag structure of the series. We test for the existence of long-run relationship among the variables by means of estimating equation (3.5) whiles the use is made of the vector error correction model to capture the short-run dynamics of the variables. The analysis of the time series properties of the data is done in four stages. The first step is to verify the order of integration of the variables through their stationarity properties as outlined above. The second step involves testing cointegration relationship among the dependent variable and the explanatory variables using the Johansen's cointegration test (Johansen, 1988). Two or more series are said to be cointegrated if each of the series taken individually is non-stationary with I(1), whiles their linear combination are stationary with I(0). In a multiple non-stationary time series, it is possible that there is more than one linear relationship to form cointegration. This is called the cointegration rank. The study therefore applies the maximum eigene value multivariate cointegration technique developed by Johansen (1990) to the system of the seven variables in the growth equation to investigate the existence or otherwise of the long-run equation relationships among the variables. The Johansen estimation method is based on the error correction representation of the VAR model with Gaussian error. The evidence of cointegration rules out the possibility that the estimated relationship is spurious.

Consequently, the next section of the empirical study investigates whether the series under scrutiny are cointegrated, so that a well-defined linear relationship exists among them in the long run. Thus, we proceed to test for cointegration between the variables on levels using the Johansen cointegration test, based on the null hypothesis of no cointegration. Third, pairwise granger-causality econometric technique (test) is also employed to verify the direction of causal relationships between GDP and the other explanatory variables. The fourth step involves the utilization of the vector error correction model (VECM). We invoke the Engle-Granger theorem (1987) which states that, in the presence of cointegration, there always exists a corresponding error correction representation which implies that changes in the dependent variable is a function of the level of disequilibrium in the cointegrating relationship, captured to be the error –correction factor (ECF), as well as changes in other explanatory variables to capture all short-run relationships among the variables.

3.3.3 Granger-Causality Test

One often applied method to investigating the causal relationship between variables empirically is Granger –Causality analysis. The basic principle of granger –causality analysis (Granger, 1969) is to test whether or not lagged values of one variable help to improve the explanation of another variable from its own past. A time series X, is said to Granger-cause another time series Y, if using past values of X improves the prediction of current values of Y. In other words, if changes in X precede changes in Y, X is said to Granger-cause changes in Y. This can be tested by running a regression of Y on past values of X.

The Granger-causality is validated only on the assumption that the variables are stationary. If the variables are integrated of order one, the Granger-causality test are

applied to the first difference of the variables which are stationary. In this case, if X and Y are both integrated of order one, the models for the Granger-causality test are:

$$\Delta X_t = \text{ø} + \sum_{i=0}^{p} \beta_i \Delta X_{t-1} + \sum_{i=0}^{q} \gamma_i \Delta Y_{t-j} + \varepsilon_{1t} \quad \text{..... (3.7)}$$

$$\Delta Y_t = \text{ø} + \sum_{i=o}^{p} \beta_i \Delta Y_{t-1} + \sum_{i=0}^{q} \gamma_i \Delta X_{t-j} + \varepsilon_{2t} \quad \text{..... (3.8)}$$

Testing causal direction among the variables in the Granger sense involves using F-test of the joint significance to test whether logged information on a variable Y provides any statistically significant information about a variable X in the presence of lagged X. If not then, we say" Y does not Granger-cause X". In this study, Granger-causality test is conducted on GDP against each of the explanatory variables particularly exports to examine the directional relationships between GDP and real exports including all other explanatory variables. Running the test in the reverse manner checked feedbacks (See appendix).

3.3.4 Short-Run Dynamics of the Growth Equation

Having established that a cointegrating relationship exists among the variables, a Vector Error-Correction Model (VECM) is estimated to determine the dynamic behaviour of the growth equation. We estimate the short –run VECM (equation 3.3.8) based on the following specifications derived from a general –to- specific modeling:

The general modeling based on the i_{th} adjustment to equilibrium period is

$$\Delta \ln GDP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta \ln K_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta \ln L_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta \ln X_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_{5i} \Delta \ln INF_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta \ln DCRPS_{t-i} + \sum_{i=0}^{n} \beta_{7i} D_{t-i} + \lambda ECF_{t-1} + \varepsilon_{t-i} \text{.....(3.9)}$$

The specific modeling based on i=1 adjustment –to –equilibrium period is:

$$\Delta \ln GDP_t = \beta_1 \Delta \ln GDP_{t-1} + \beta_2 \Delta \ln K_{t-1} + \beta_3 \Delta \ln L_{t-1} + \beta_4 \Delta \ln X_{t-1} + \beta_5 \Delta \ln INF_{t-1} + \beta_6 \Delta \ln DCRPS_{t-1} + \beta_7 D_{t-1} + \lambda ECFt_{-1} + \varepsilon_{t-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.10)$$

where all the variables are as previously defined while *Dt* is a dummy denoting the period of political stability in Ghana and ECF_{t-1} is the lag of the error correction factor such that,

$$ECF = \ln GDP_t - \beta_1 \ln K_t - \beta_2 \ln L_t - \beta_3 \ln X_t - \beta_4 \ln INF_t - \beta_5 \ln DCRPS - \beta_6 D_t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.11)$$

The coefficient of the error correction factor (λ) measures the speed of adjustment to obtain equilibrium in the event of shocks to the system. The error correction model captures the short run dynamics of the system. The empirical results presented in the next section are from the estimated equations (3.5) and (3.9).

3.3.5 Sources of Data:

The data on the relevant variables are real and are taken from the world Development Indicators CD- ROM, 2009 constructed by the World Bank.

CHAPTER FOUR

RESULTS, ANALYSIS AND DISCUSSIONS

This chapter deals with the empirical estimation of the growth equation and the analyses of the regression results.

4.1 The Results of the Unit Root Tests.

To test the order of integration of the variables that were employed in the growth equations and to avoid spurious regressions, we first conducted a stationarity test using the well-known Augmented Dickey -Fuller (ADF) test proposed by Dickey and Fuller (1979). The aim is to determine whether the variables follow a non-stationary trend and are in fact of the order of 1 denoted as $I(1)$ or whether the series are stationary, i.e. of the order of 0 denoted as $I(0)$.

The tests for stationarity are conducted using log levels and the first differences of the variables in the growth equation. The entire results from the test suggest that all the variables are I(1) in the levels and log levels at the 95 per cent confidence level but I(0) in first difference at the 95 per cent confidence level, indicating the presence of unit root in the data for all the variables used. Table 4.1 below shows the results of the (ADF) unit roots test for all the variables of interest. The Ln (.) shows the variables in the log levels where as ΔLn (.) indicates the first difference of the log variables. The log difference formulation is a representation of proportionate changes in the variables. The results of the unit root underscore the presence of non-stationarity in the variables and adverse consequence of neglecting it. The appropriate remedy is to use the first difference of the variables for estimation and analysis. However, valuable long-run relationships among the variables would be lost after differencing. In the presence of cointegration, the valuable long-run relationship can be preserved since estimation will not be spurious, so long as the variables are integrated by same

order and are cointegrated. The results of the unit root tests performed corroborate previous findings in the empirical literature, i.e. as with most macroeconomic series, the variables under consideration in this study appear to be nonstationary and trended in levels. Only their first differences are stationary. Considering that the data appear to be stationary in first differences, no further tests are performed. The next section presents the results of the cointegration test.

Table 4.1a ADF test for Unit Root (Variables in levels).

Variable	ADF Statistic	5% Critical Value	Order of integration
Ln GDP	1.245331	-2.926622	I(1)
Ln K	0.090603	-2.926622	I(1)
Ln L	-0.387859	-2.926622	I(1)
Ln X	0.894375	-2.926622	I(1)
Ln INF.	-2.607484	-2.931404	I(1)
Ln DCRPS.	-0.909461	-2.926622	I(1)

Notes: For the ADF test on levels, the critical value for the rejection of the null hypothesis of a unit root is -2.931404 at the 5% level of significance.

Table 4.1b ADF test for Unit Root (Variables in first difference).

Variable	ADF Statistics	5% Critical Value	Order of Integration
ΔLn GDP	-4.080446	-2.928142	I(0)
ΔLn K	-5.998156	-2.928142	I(0)
ΔLn L	-2.897229	-2.928142	I(0)
ΔLn X	-3.818684	-2.928142	I(0)
ΔLn INF.	-6.298188	-2.935001	I(0)
ΔLn DCRPS.	-5.014437	-2.928142	I(0)

Note: For the first difference, the critical value for the rejection of the null hypothesis of a unit root is -2.935001 at 5% level of significance.

4.2. Results of the Cointegration Test

Table (4.2) below and of Appendix B presents the Johansen's (1988, 1990) Trace and]maximum Eigene Value tests to determine the number of cointegration vectors for this specifications suggested by the selection criteria. The cointegration trace test statistic for the variables, first-order vector autoregression of lnGDP, lnK, lnL, lnX, lnINF., lnDCRPS, indicate the presence of one cointegrating vector in the system {H_0: r = 0} is rejected, but the null hypothesis that there exist at most one cointegrating vector{H_0: r = 1} is not.

The long-run maximum Eigene Value test however indicates two (2) cointegration equations at 5% critical level. From the maximum eigene value test results, for H_0: r = 0, the reported Long-Run statistic is (***60.47138)*** which is greater than the 5% critical value of ***(47.07897),*** thus suggesting that the null hypothesis is rejected. However, for the H_0: r = 2, the reported long-Run statistic is **(19.83982)** which is less than the 5%

critical value of (***34.80587)***. Thus, the null hypothesis that H_0: r = 2 cannot be rejected at 5% critical level. The results therefore confirm the existence of only two (2) cointegrating vector at 5% critical level. These findings establish the existence of an underlying long-run equilibrium relationship between the dependent variable; real GDP and all the explanatory variables, Capital(K), Labour(L), Export(X), Inflation(CPI), Domestic credit to private sector as a ratio to GDP(DCPS/GDP) and Political stability dummy(POLDUM).

Table 4.2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.754954	163.0623	134.6780	0.0004
At most 1	0.620024	102.5910	103.8473	0.0604
At most 2	0.369594	60.98216	76.97277	0.4355
At most 3	0.285517	41.14234	54.07904	0.4142
At most 4	0.260644	26.68590	35.19275	0.3049
At most 5	0.194643	13.70097	20.26184	0.3105
At most 6	0.097112	4.392764	9.164546	0.3568

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 4.3 Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.754954	60.47138	47.07897	0.0011
At most 1 *	0.620024	41.60880	40.95680	0.0422
At most 2	0.369594	19.83982	34.80587	0.8230
At most 3	0.285517	14.45644	28.58808	0.8523
At most 4	0.260644	12.98493	22.29962	0.5582
At most 5	0.194643	9.308208	15.89210	0.4015
At most 6	0.097112	4.392764	9.164546	0.3568

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

4.3. Results of the Granger- Causality Test

In this section, a two-way pair wise Granger-causality test is conducted between GDP and each of the explanatory variables individually particularly exports. To implement this test, equations (3.5 and 3.6) are estimated by replacing Y with log of change in GDP and X with each of the explanatory variables. This is done because the tine series properties conducted on the variables revealed that they are only stationary after first difference. Since the Granger–causality test is only valid for stationary data; we

use the log of the first difference of the variables which are stationary. The results of the Granger-causality tests are in table (4.4). The results show that the Null hypothesis that, exports ('X') does not cause GDP is not rejected at 5% level of significance. This implies that a change in X has no strong impact on country's real GDP growth. In other words, the above results indicate that exports do not cause GDP growth in Ghana.

Table 4.4

Pairwise Granger- Causality Tests

Date: 08/12/09 Time: 01:05

Sample: 1960 -2007

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLNK does not Granger Cause DLNGDP	46	0.33528	0.56559**
DLNGDP does not Granger Cause DLNK		1.76949	0.19046**
DLNL does not Granger Cause DLNGDP	46	0.05335	0.81843**
DLNGDP does not Granger Cause DLNL		0.11979	0.73095**
DLNX does not Granger Cause DLNGDP	46	0.18367	0.67038**
DLNGDP does not Granger Cause DLNX		8.41261	0.00585
DLNDCRPS does not Granger Cause DLNGDP	46	0.01838	0.89279**
DLNGDP does not Granger Cause DLNDCRPS		3.52939	0.06708
DINFL does not Granger Cause DLNGDP	46	2.74001	0.10515**

DLNGDP does not Granger Cause DINFL		3.76771	0.05882
DCRPS does not Granger Cause DLNGDP	46	1.21733	0.27602**
DLNGDP does not Granger Cause DCRPS		5.04779	0.02985
DUMMY does not Granger Cause DLNGDP	46	0.00984	0.92143**
DLNGDP does not Granger Cause DUMMY		0.76008	0.38814**

Notes: (**) accepts the null hypothesis at 5% level of significance.

The results of the granger causality test shown from the table above indicate that there are significant feedback relationship between gross exports and gross domestic product (GDP). The implication is that other factors that determine the level of export expansion in Ghana indirectly affect the rate of real GDP growth. However, there is a unilateral causality running from GDP to exports (X).

In the case of other variables, causality was either way or at least one direction of causality at 5% level of significance. Therefore, it is important that these variables are retained in the model as underscored by literatures on growth theories. Thus, the null hypothesis of no causality between GDP growth and exports is rejected; we conclude that GDP growth Grange-causes exports, and not vice versa. We find that the reported results confirm the rejection of the export-led growth hypothesis for Ghana. That is, exports indeed do not lead to higher GDP growth in the Ghanaian context as advocated by the hypothesis but the other way round.

4.4. The Results of the Long-Run Growth Equation

The normalized Long-run growth equation presented in table 4.3 is based on the conceptual model in equation (3.5) in the previous chapter. The model shows theoretically correct signs for the explanatory variables with the exception of labour and exports which are incorrectly signed. The coefficients of these variables in the long-run equation are long-run elasticities.

Table 4.5. The Results of the long-Run cointegrating growth Equation

Dependent Variable: Ln GDP (Log of real GDP).

Regressors	Coefficient	t-statistic
Constant	-2.977219	-4.524993
Ln K	0.026874	1.628727
LnL	-0.754016	-51.015968
Ln X	-0.370079	-10.167005
LnDCRPS	0.046703	1.769723
Ln INF	0.019636	2.143668
Do	0.044062	3.163101

Notes: Log Likelihood: 208.3084

- *There is no R^2 in the long run growth equation. This is because of the unit root which makes the regression of the long run relations possibly spurious. But the error correction terms that are stationary, are not subject to the spurious regression problem.*
- *N= 47*

The elasticity measurements of all the variables indicate that they are all inelastic. The sign on the capital variable supports the theoretical conclusion that capital contributes positively to growth of GDP since the coefficient of capital in this long-run growth equation is positive. This coefficient of (0.026874) indicates that a one percent change in capital input results in 0.026874 percentage change in real GDP; holding all other factors constant. Thus, the capital coefficient is the elasticity of output with respect to capital. This is true for all **log-log models**. The positive relationship between capital and real GDP and its growth as shown in table 4.5. is consistent with the results obtained by Aryeetey and Fosu (2005), Sentsho (2005) and Adu G. (2006).

The most theoretically amazing results from the estimated Long-Run relationship between GDP and the explanatory variables is the coefficients of labour(L) and exports(X) respectively which are negatively signed. It is expected that additional labour adds to output and not to reduce it. However, our result indicates the reverse. A careful investigation reveals that this is not all that strange. The coefficient of labour in most growth regressions in developing countries is negative in most cases, Aryeetey and Fosu (2005), Sentsho (2005) and Adu, G. (2006). Probably, the negative contribution of labour in our model and other developing countries is due to the fact that labour is proportionately too larger than capital such that the marginal productivity of labour is negative, as our results indicate. Another potential source of negative role of labour in Ghana with regards to real GDP growth may be due to data problems. Due to inadequate statistics on employment and underemployment in most developing countries and for that matter Ghana; thus, the labour force is normally used as s proxy for labour supply (employment).

The negative coefficient of labour is an indicative of growing unemployment problem in the country. This is because the Ghanaian economy is based on land intensive agriculture and capital intensive mining and construction both of which have limited employment benefits for the country. That is exactly what we use in this study to capture the contribution of labour to output and hence growth. Taking into account, the low quality of the labour force in terms of nutrition, health, education and mass unemployment and the public sector underemployment that are widespread in the country implies that large proportion of the work force are not working. Thus, additional labour does not add anything to output, they rather reduce it as can be seen from our results and confirm by those of Aryeetey and Fosu (2005) and Adu (2006).

Another theoretically shocking result from the estimated Long-Run relationship between GDP and the explanatory variables is the coefficient of real exports (X) which is negative; contrary to the expectation of this study. This is quite implausible, the study expects that trade and for that matter increases in exports adds to total output and thus growth and not to reduce as pressed home by the advocates of the Export-Led Growth Hypothesis. According to the Export-Led growth hypothesis (ELGH), most authors as well as multilateral institutions would agree that promoting exports and achieving export expansion are beneficial for both developed and developing countries(DCs) for many reasons. Among them include generating a greater capacity utilization; taking advantage of economies of scale; bringing about technological progress; creating employment and increasing labour productivity etc. and hence growth. However, our results or the Ghanaian data indicate the reverse of this theoretical assertion. Besides, a careful review of the Export-Led Growth Hypothesis empirical literature reveals that this is not all that surprising. The coefficient of exports(X) in most growth regressions in testing this hypothesis for

developing as well as developed countries has been found negative in most cases; Sheehey(1993), Greenaway and Sapsford (1994), who in their conclusions rejected the hypothesis implying that trade is detrimental to growth in Ghana. Probably, the negative contribution of trade (exports) to growth in our model and other developing countries may be due to the unfavourable terms of trade due to the fact that most of Ghana's exports are basically primary commodities whose prices are constantly fluctuating with a general downward trend. Thus, the negative coefficient of exports should not be a surprise in the Ghanaian context.

The coefficient of domestic credit to private sector as ratio to GDP is positive as expected theoretically. The results suggest that in the long-run, domestic credit to private sector as a ratio to GDP is essential to growth. This confirms the theoretical expectation of classical and monetarists views on the role of government in the macro economy. The positive contribution of domestic credit to private sector on growth of real GDP in the long-run may be due to the fact that the private sectors are able to do more productive investments, make efficient use of technology, create employments, increase output and thus growth. This is because most of government expenditures are consumables rather than investment in infrastructures. The bulk of government spending in Ghana goes into the payment of public sector employees and debt servicing which have little or no effect on output growth as these draw resources from the economy. Another potential reason is the possible crowding-in effect of more effective private investments as the inefficient public sector activities gradually shrinks in size as the government reduces competition with the private sector for the insufficient available domestic credit in the economy. It is a well-known fact that the

private sector is the engine of growth. Larger public sector implies smaller private sector and hence reduction in output.

Inflation and economic growth rates are two of the most important and most closely watched macroeconomic variables. High inflation rate is a very common phenomenon in most developing countries, Ghana inclusive. A high inflation rate is generally harmful to growth but such a negative trade-off could be minimal at moderate levels of inflation. Contrary to our expectations, inflation turned positive which has a diverse effect on real GDP growth. As a measure of macroeconomic volatility, it means that government's efforts at achieving stability through structural reforms are not yielding any meaningful results that can impact positively on the economy. Unfortunately, the average annual inflation in Ghana has never been less than 15 percent since 1973.The lowest rate was 10.0 percent in the year 1985 and 1992 (World Bank Database, 2006). This also means that the government's efforts to achieving a single inflation digit have not been successful.

The coefficient of the political dummy is positive. Thus, the positive effects of political stability on both short and long-run growth is enormous for developing countries particularly Ghana. Thus, Ghana's current level of growth has been partly contributed by political stability (democracy). Macroeconomic instability often induced by political and economic factors have been identified as a major cause of uncertainty, which is an important feature of developing countries. In most Sub-Saharan African countries, Ghana inclusive, political stability and the nature of government cannot be separated from the history of economic growth and development. Ngowi (2001) argues that many developing countries have attracted little foreign direct investment (FDI) because they are regarded as "high risk and are

characterized by lack of political and institutional stability and predictability". Fosu (1992) also argues that political instability has been one of the key factors that have had a negative impact on economic growth. Even though there has been some military interventions and counter coups in Ghana, the results indicate that democracy has a greater impact on Ghana's export promotion policies and thus, long run growth. Another potential reason may be that Ghana is now a model and a beacon of hope for countries Sub-Sahara Africa in terms of democracy which has a major impact on long-run growth as shown from the estimated results.

4.5. The Results of the Short-Run Vector Error Correction Equation

The results presented in table 4.6 are based on the assumption of one year adjustment-to- equilibrium period instead of an instantaneous adjustment-to-equilibrium. In the short-run dynamic growth equation presented in the table, the coefficients of the variables provide interesting results as they maintained their signs as in the long-run equation except the coefficients of labour and domestic credit to private sector as a ratio to GDP variables whose coefficients changed from negative to positive and vice versa respectively. Besides, almost all the short run coefficients are insignificant at 5% level of significance. The coefficients are also short-run elasticities.

Table 4.6. The Results of the Short-Run Error Correction Growth Equation

Dependent Variable: $\Delta \ln GDP_t$ (first difference of the log of real GDP).

Regressors	Coefficient	Standard Error	t-statistic
Constant	0.0077961	0.01180	**0.67458**
$\ln\Delta GDP_{t-1}$	0.605588	0.18543	3.26589**
$\ln\Delta K_{t-1}$	0.015609	0.02986	0.52274
$\ln\Delta L_{t-1}$	0.139312	0.34755	0.40084
$\ln\Delta EX_{t-1}$	**-0.052581**	**0.05240**	**-1.00349**
$\ln\Delta DCRPS_{t-1}$	-0.026910	0.02672	-1.00723
$\ln\Delta INFL_{t-1}$	0.015546	0.00936	1.66179
Do	0.031580	0.01906	1.65664
ECF_{t-1}	-0.644097	0.15604	- 4.12767**

R-squared	**0.438545**	**Determinant resid covariance (dof adj.)**	**4.72E-13**
Adj.R-squared	**0.306438**	**Determinant resid covariance**	**9.12E-14**
Sum sq.reids.	**0.046656**	**Log likelihood**	**218.4414**
S.E equation	**0.037044**	**Akaike information criterion**	**-6.904250**
F-statistic	**3.319614****		
Log likelihood	**85.74808**	**Schwarz information criterion**	**- 4.037180**
Akaik AIC	**-3.569678**		
Schwarz SC	**-3.201055**		
Mean dependent	**0.028045**		
S.D.dependent	**0.044481**		

N = 47

(**) denotes 5% significance level

The coefficient of the capital variable in the dynamic growth equation is positive and insignificant at 5% level of significance. This is consistent with the results of the Long-Run growth equation. This indicates the real crucial role that capital plays in Ghana's growth process as its coefficient is positive in the dynamic growth model just as in the long-run model. By invoking the Inada conditions, this is an indication that investments or capital formation is inadequate in Ghana as the model indicates high marginal productivity of capital. The problem of low capital relative to labour in Ghana is the result of the low saving and investment rates in Ghana. This implies that to accelerate Ghana's growth the rates of savings and investment must increase which will in turn increase capital stock and thus gross capital formation.

The coefficient of labour in the dynamic growth equation is positive surprisingly unlike the negative one in the long-run growth equation. This is an indication that the severity of the unemployment and underemployment in Ghana in the short-run is not felt heavily by the economy in terms of output loss; even though the unemployment rate is increasing. This may be due to some ad hoc measures employed by the governments in solving unemployment problems in Ghana. However, the long-run growth equation reveals that unemployment will impact negatively on output and hence growth. The problem will be further be worsened by the poor quality in terms of education, health and nutrition of the labour force.

The coefficient of exports still turned negative and insignificant at 5% significance level in the dynamic growth equation just as the long run growth equation although it was significant in the first place. This is consistent with other studies for testing the Export-Led Growth Hypothesis for some developing countries such as Ghana, Fosu (1990), Sheehey(1993), Greenaway and Sapsford (1994). Probably, the negative contribution of trade (exports) to growth in our model and other developing

countries may be due to the unfavourable terms of trade due to the fact that most of Ghana's exports are basically primary commodities whose prices are constantly fluctuating with a general downward trend. Thus, the negative coefficient of exports should not be a surprise in the Ghanaian context. This also implies that Ghana's export promotion and diversification policies are not yielding enough fruits to counter the unfavourable terms of trade to enhance growth eventually. Another potential reason may be that, the contribution of Ghanaian industrial and service output growth for export is not significant if not negative. Therefore the necessary push needed from this sector to realize the economic benefits from export activities is not forthcoming to spur the wheel of growth for Ghana.

The most interesting results in the short-run growth equation is the coefficient of the domestic credit to private sector which has a negative sign and insignificant at 95% confidence interval as can be seen from the table above. The results of the short-run growth equation from the table indicate a negative relationship between GDP and credit to private sector in the short-run, indicating a possible perverse effect of the private sector dominance in the short-run. This implies that in the short-run monetary expansion and financial institutional reforms will not have any expansionary effect on real GDP and its rates of growth. However, in the long-run the positive effect of financial development on growth increases and output expands. The behaviour of the credit to private sector variable is consistent with the classical and Keynesians arguments. The classical argument that government or public sector crowds out efficient private sector investment is valid in the long-run whiles the argument by Keynesians that government has expansionary effect is valid in the short-run as far as the Ghanaian economy is concerned. The implication is that in the long-run Keynesian macroeconomic management has no place in the country's bid to

accelerate growth. This is not to discredit Keynesian policies as it is obvious that Keynesian policies are short-run oriented and have the desired results. This is supported by what Keynes himself once said '' In the Long-Run, we are all dead''. Therefore, the role of private sector as an engine of growth in the short-run macroeconomic management cannot be employed. In the dynamic growth equation, the coefficients of other variables (inflation and political stability) are all positive as in the Long-Run equation. This implies that in the short-run the impact of increase in democracy is growth enhancing. On the other hand, the positive coefficient of the inflation variable is an indication that general price levels are high which in turn has a perverse condition on the macro economy.

The estimated coefficient of the error correction term is statistically significant at the 5% level of significance and with the appropriate negative sign. A highly significant negative coefficient confirms a stable long run relationship among the variables, according to Bahmani Oskoee (2001). This is an indication of joint significance of the long run coefficients. This suggests the validity of a long run equilibrium relationship among the variables in the long run growth equation. The estimated coefficient of the error correction term (ECT_{t-1}) is less than one (-0.644097) in absolute terms, indicating that the system corrects its previous period's disequilibrium in more than one year to its equilibrium level following a shock. The ECT_{t-1} coefficient of -0.644097, indicates that the speed of adjustment of GDP to its steady state level following a shock is high. Thus, the possibility of sluggish adjustment from disequilibrium to the steady state level is ruled out.

4.6: The Results of the Correlation Matrix

From the results of the error correction model, it was revealed that almost all the coefficients of the explanatory variables were not significant at the 5% significance level. Thus the problem of multicollinearity was suspected. It is therefore imperative to conduct correlation matrix test to unravel the cause of this problem.

Table 4.7: Correlation Matrix Test for Multicollineaarity

	LNX	LNK	LNDCRPS	LNL	LNINFL
LNX	1.000000	0.849390	0.881817	0.401035	-0.451371
LNK	0.849390	1.000000	0.763546	0.517045	-0.294996
LNDCRPS	0.881817	0.763546	1.000000	0.279045	-0.568154
LNL	0.401035	0.517045	0.279045	1.000000	-0.020054
LNINFL	-0.451371	-0.294996	-0.568154	-0.020054	1.000000

Bivariate correlations between the explanatory variables were conducted. The test showed that, correlation relationships among real exports, capital formation and domestic credit to private sector as a ratio to GDP are the highest. All the explanatory variables have positive correlation among themselves with the exception of the inflation variable which showed a negative bivariate relationship between the rests of the variables as expected theoretically. However, there was relatively low correlation between Labour force and domestic credit to private sector as a ratio to GDP. The correlation matrix showed high inter-correlation among the explanatory variables, an indication of serious problem of multicollinearity (see also appendix). This situation explains the reasons why almost all the coefficients of the explanatory variables in the short-run dynamic growth equation are insignificant at 5% significance level.

However, multicollinearity is God's will, not a problem with OLS or statistical technique in general (Blanchard, O.J, 1967).

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of Findings

In this section, the main findings of the study are summarized as follows:

a) The study refuses to accept the Export-led Growth Hypothesis for Ghana for the period 1960 to 2007. In essence, there was a negative relationship between the growth of real GDP and real exports. This finding confirms those of Fosu (1990), Sheehey (1993) and Greenaway (1994).

b) The most surprising result in the study was the coefficient of exports. The study found out strangely that export has a perverse impact on GDP growth both in the Long-run and short-run. The long run relationship between real GDP and real export is negative. The results suggest that one percent increase in exports result in a decrease in real GDP by -0.370079 percentage change in real GDP. The implication is that both in the long and short run exports expansion has contractionary effect on real output and thus growth due to the fact that Ghana's exports are mainly primary whose prices are fluctuating with a downward trend.

c) The Granger-Causality test conducted revealed that export does not Granger-cause GDP. In other words, the hypothesis of export growth encouraging GDP growth could not be accepted by the study. This refuses to confirm that exports have a significant impact on the development of a country according to Export-Led Growth Hypothesis (ELGH) in the Ghanaian context. In essence, the study found a negative relationship for the Ghanaian data. This is consistent with results of other studies, Ahmad and Kwan (1991), Ukpolo

(1994). It was however, revealed by the Granger-causality that, the null hypothesis'' GDP does not Granger –cause exports could not be rejected at 5% error level. Thus, one could be 95% sure that lagged values of GDP can help explain present values of export.

d) Inter alia , the study also finds that, the long run relationships between real GDP and Inflation (INF), domestic credit to private sector as a ratio to GDP(DCRPS/GDP) and political dummy (POLDUM) are positive, except the coefficient of export and labour force which are negative. Also the elasticity with respect to all the variables in the long run growth equation is inelastic.

e) The study finds a negative relationship between real GDP and labour. In this study, the labour force is used to account for labour's contribution to output. The negative relationship between real GDP and the labour force is consistent with the findings of Sentsho and Aryeetey and Fosu. The results indicate that one percentage change in the labour force will change output in the opposite direction by 0.754016. Besides, the short run dynamic growth equation indicated a positive and insignificant relationship between real GDP and labour force variable, implying that labour in essence contributes to growth in the short run but the impact is not strong in the Ghanaian context.

f) The results of the long run growth equation indicate that there is a positive relationship between real GDP and the capital stock (gross capital formation). The results show that a percentage change in the capital formation leads to 0.026874 Percentage change in real GDP. The positive coefficient of the capital formation variable is consistent with the findings of Aryeetey and Fosu (2005), Adu (2006) and Sentsho (2003).

g) The short run dynamic error correction model indicates that the estimated coefficient of the error correction term is statistically significant at the 5% level and with the appropriate negative sign. This suggests the validity of the long run relationship among the variables in the long run growth equation. The speed of adjustment to equilibrium is very high, but less than one with the implication that the model is dynamically stable. Furthermore, all the variables maintained their signs as in the long run relationships except LABOUR FORCE and DOMESTIC CREDIT TO PRIVATE SECTOR as ratio to GDP, whose signs changed from negative to positive and positive to negative respectively. This implies that in the short run, monetary expansion and financial reforms as an indicator of financial development does not have the needed contribution to growth. Thus the saying that ‘’the private sector is the engine of growth ‘’ is not applicable in the short-run in the context of Ghana; hence, government's participation in the short-run development of Ghana is paramount as argued for by the Keynesians. The positive coefficient of labour shows that in the short-run an increase in labour force has some level of impact but lacks the needed contribution to realize the necessary expansionary effect on output.

h) The test for Stationarity indicates that all the variables entering the growth equation are non-stationary at the levels and log levels by the relevant test for stationarity (ADF). However, all the variables became stationary after taking their first differences. The implication is that the variables in the growth model are difference stationary and thus integrated of the first order (I(1)) in the levels and integrated of order zero (I(0)) at the first difference.

i) The Johansen's tests for cointegration between the variables in the growth model indicate that the variables are cointegrated, with one cointegration vector. The findings establish the existence of long run equilibrium relationship between the dependent variable on one hand and the explanatory variables on the other hand. The cointegration among the variables rule out the possibility of the existing relationship being ''spurious''.

5.2 Policy Implications of Findings

As afore-concluded as per section 5.2, the study does not accept the null hypotheses of Export-Led Growth Hypothesis for Ghana. The implication of the rejection of the hypothesis is that, the Ghanaian economy, under the current macroeconomic environment with respect to export policies and performance does not have the potential of raising its growth to the level of that of say US, Japan and OECD countries. There is therefore the need for much research into the issues about export developments in the Ghanaian economy. More importantly, effort should be on the diversification strategy to swiftly shift from the primary exports to manufactured and service sectors of Ghana's export base. This will help enhance Ghana's export performance against the major trading partners to achieve the current level growth of say the US, Japan and Germany as well as those of other high income countries whose exports are more valuable and weightier than Ghana whose exports are mainly primary with downward trend fluctuating prices.

The growth equation shows that there is a positive relationship between the capital formation and real GDP. The implication is that Ghana can achieve a faster rate of economic growth by increasing its savings and investment rates. The question is how can savings rate in Ghana be increased? The Ghanaian economy has been caught in

the vicious circle of poverty for very long. There is a problem of low labour productivity, leading to low income, with low income leading to low savings and investment and consequently low capital formation leading to low productivity again. The chain continues like that. The Government and policy makers therefore need to be serious on policies aimed at reducing poverty in Ghana. When this is done well, savings and investment rates will increase to promote growth. Conducive and investor friendly environment needs to be created to encourage the inflow of foreign capital to complement domestic capital so as to accelerate the rate of growth of real GDP. Another interesting result from the growth equation which must be factored into policies aimed at promoting growth and reducing poverty in Ghana is the inverse relationship between real GDP and labour force. This is an indication of how serious the unemployment problem is. It also indicates the poor quality of the work force in terms of education, health and nutrition as well as attitudes towards work. Growth can be stimulated by improving the quality of the labour force through education, improved health and nutrition and positive change in labour's attitude towards work.

The short run dynamic growth equation shows that in the short run, fiscal expansion and aggressive government participation can be used to stimulate the rate of growth of real output. Thus, the government has to create the necessary enabling environment by putting down the needed infrastructures for the private sector to take up the mantle of development in the long-run. This can be achieved by increasing government spending relative to its revenues. However, the long run effect of such an expansionary fiscal policy is detrimental to growth due to possible crowding-out effects of efficient private sectors. Thus making credits available to private sector is very essential for long-run growth. This can be seen from the positive coefficient of the DCRPS variable in the long run growth equation. Thus, there is a possible positive

trade-off between financial reforms and credit expansion to private sectors as far as real GDP and its growth are concerned. An expansionary fiscal policy will increase real GDP and its rate of growth in the short run, but decreases it in the long run. An expansionary financial reform with respect to credit to private sector on the other hand will increase the rate of output growth in the long- run, but decrease it in the short run.

Export cannot be relied on in achieving long run economic growth in Ghana. The study finds that the contribution of exports to real GDP and its growth in both the long run and short run is negative. The implication is that the economy can do better by reducing its primary exports and for that its trade openness, as far as real GDP growth is concerned. The export variable has a negative impact on growth in the short run, as well as in the long run. This implies that excessive liberalizations with the hope of promoting trade will in the short and long run reduce the rate of growth of real GDP. The negative sign of the export variable in the short run and the long run growth equations indicate a possible gloomy future for Ghana's liberalization polices (''open border'' policies). Thus, liberalization or exports for that matter will only be growth enhancing when the primary products (raw goods) which form the bulk of Ghana's exports base is refined and develop the manufacturing and services sector so well to make them more competitive with stable international prices like our trading partners. Whiles trade (exports) promotes growth as argued for by trade theorists such as Kruger (1978) and Bhagwati (1978) for developing countries, it is more appropriate in the Ghanaian context to endorse the restrictive trade policies (Import Substitution Strategy) to protect the young manufacturing and services sectors as perceived by policymakers at independence to continue develop the export sector so

well. This is because export hampers growth both in the short and long run according to the Ghanaian data.

5.3 Conclusion

The export-led growth hypothesis has been the subject of considerable research in the last two decades. Yet the link between exports and economic growth, which has been subjected to empirical scrutiny, remains a subject of debate. From the voluminous literature on the relationship between export expansion and economic growth it is clear that the results obtained depend not only on the theoretical approach used but also even on the econometric methodology employed.

The objective of this study has been finding evidence in favour or against the Export-Led growth hypothesis, and to examine the major factors behind the poor rate of growth of real GDP in Ghana hence the long and short run export-led growth model was estimated. It was hypothesized that the export-led hypothesis does not hold for Ghana. These were accomplished by employing modern time series analysis of unit root, Granger-Causality test, cointegration and the associated error correction model or methodology to a set of annual data from 1960 -2007. The empirical results suggest that the hypothesis of Export-Led growth that all developing countries can achieve growth in GDP through exports expansion does not hold for Ghana as it does for other developing countries mainly due to the nature of Ghana's exports products. However, the granger-causality test conducted revealed that there is a unidirectional relationship between GDP growth and export. Thus, the null hypothesisthat export does not Granger-cause GDP growth is not rejected. It is thus, concluded that export does not Granger-cause GDP but rather the opposite.

Both the long run and short run dynamic error correction model show that growth of real GDP in Ghana is greatly influenced by factors such as the level of capital formation, the labour force, domestic credit to private sector as a ratio to GDP, exports, inflation and political stability . In both functions the coefficient of capital is positive whiles that of Export is negative. The coefficients of Labour and DCRPS are negative and positive in the long run model, but positive and negative respectively in the short run dynamic growth equation.

5.4 Recommendations

Based on the findings of the present study, the following recommendations are made:

- More resources should be committed into the empirical studies of growth determinants particularly issues of export expansion and development to ascertain the findings of the present study. There has not been much research in the areas of export expansion and real GDP growth based on time series analysis (The export-led growth hypothesis).
- More importantly, effort should be on the diversification strategy to swiftly shift from the primary exports to manufactured and service sectors of Ghana's export base. This will help enhance Ghana's export performance against the major trading partners whose exports are more valuable and weightier than Ghana whose exports are mainly primary with downward trend fluctuating prices.
- The negative contribution of export variable in the short run and the long run growth equations indicate a possible gloomy future for Ghana's liberalization polices (''open border'' policies). Thus, liberalization or exports for that matter will only be growth enhancing when the primary products (raw

goods) which form the bulk of Ghana's exports base is refined and develop the manufacturing and services sector so well to make them more competitive with stable international prices like our trading partners.

- The study found a negative relationship between export expansion and real GDP growth. This implies that export performance from (1960-2007) has not contributed significantly to the current level of growth of Ghana. The Granger-Causality test conducted showed that causality rather ran from GDP to export. Hence, more resources and aggressive policies should be ear-marked for the development of Ghana's export industries to achieve the needed competitive edge in order to contribute its significant quota to Ghana's GDP growth. This also means that the other determinants of growth besides exports should also be encouraged as growths from these sectors also help the exports sector to grow as shown from the study.

5.5 Concluding Remarks

The data used in this analysis have a number of limitations, and they should be highlighted. First, the sample period is limited to 1960-2007 because of the non-availability of official national account data prior to this period. Consequently, the estimates obtained using some of the current econometric techniques have some limitations that must be taken into account.

Second, owing to the shortage of reliable quarterly data for most of the variables under consideration for the entire period, the periodicity of all the data used in this investigation is annual.

Third, because of the inherent difficulties in measuring the stock of physical capital (KT), the lack of official and credible series of aggregated and disaggregated terms for the period studied restricted the inclusion of certain variables and limited the

testing of certain models and hypotheses. Thus, one strategy would have been to construct a capital stock series; however, for that task we needed two basic sets of information that to our knowledge do not exist: the initial base year for the capital stock and the rate of depreciation.

Therefore, the only plausible strategy at this stage to overcome these obstacles was to use data related to investment, specifically Gross capital formation at constant 2000 prices in millions of dollars, taken mainly from data published by the Word bank. It is important to note that this strategy has been widely used by researchers engaged in testing the ELGH for both cross-section and country case studies of developing countries (DCs) and even for industrialized nations. Unfortunately, the statistics regarding employment within the economy was not obtainable for the period under investigation; therefore, we decided not to use the employment series and relied on labour force series for this investigation.

REFERENCES

Adu, G., (2006), ‘‘*Economic Growth in Ghana: Determinants and Convergence’’*. (Unpublished MA Thesis), Department of Economics, KNUST, Kumasi.

Adams, N. A. (1973): ‘‘*A note on trade as a handmaiden of growth’’*. Economic Journal, Vol.83, pp.329.

Ahmad, J. and Kwan, A. C. C. (1991): ‘‘*Causality between Exports and Economic Growth: Empirical Evidence from Africa’’*. Economic Letters," Vol. 37, pp. 243-248

Ahmad, J. and Harnhirun, S. (1995): ‘‘*Unit Roots and Cointegration in estimating causality between exports and economic growth: empirical evidence from the ASEAN countries’’*. Economic letters 49,329-34.

Afxentiou, P. C. and Serletis, A. (1991):*‘‘Exports and GNP Causality in the industrial countries’’*. 1950-1980.Kyklos, 44, 2.

Al-Yousif, Y. K. (1997): ‘‘*Exports and economic growth: Some empirical evidence from the Arab Gulf countries’’*. Applied economics, 29, and 693-97.

Amoateng, K. and Amoako-Adu, B. (1996): ‘‘*Economic growth, exports and external debt causality: The case of African countries’’*. Applied economics, 28, pp.21-27

Aryeetey, E. and Harrigan, J. (2000): ‘‘*Economic reforms in Ghana: The Miracle and the Mirage’’.* African Development Review, Vol. 14, pp. 1-17

Aryeetey, E. and Fosu, A. K. (2002): ‘‘*Explaining African Economic Growth Performance: The case of Ghana’’.* AERC Research Project.

Aryeetey, E. and Fosu A. K. (2005): ‘‘*Economic growth in Ghana: 1960-2000’’.* Cambridge, AERC Growth Project Workshop.

Bahmani-Oskooee, M., Mohtadi, H., and Shabsigh, G. (1991): ‘‘*Exports, growth and causality in LDCs: A re-examination’’.* Journal of development economics, 36, 405-15

Bahmani-Oskooee, M. and Alse, J. (1993): ‘‘*Exports growth and economic growth: An application of cointegration and error correction modelling’’*. The Journal of developing Areas, Vol.27, pp. 535-42.

Bahmani-Oskooee, M., Economidou, C., and Goswani, G. G. (2005*): ‘‘Export-Led growth hypothesis revisited: A panel cointegration approach’’.* Scientific Journal of administrative development, Vol.3.

Balassa, B. (1978a): ‘‘*Export and economic growth: Further evidence’’*. Journal of development economics, Vol.5, pp.181-9.

Balassa, B. (1978b): ‘‘*export incentives and export performance in developing countries: A comparative analysis*.” *Weltwirtschaftlichesarvhive 114, 24-61*.

Balassa, B. (1980): ‘‘*The process of industrial development and alternative development strategies’’.* Princeton Essays in international Finance, No. 141.Princeton University, department of economics.

Balassa, B. (1985): ‘‘*Exports, policy choices, and economic growth in developing countries after the 1973 oil shock’’*. Journal of development economics, Vol. 4, pp.23-35

Bank of Ghana Report (1997): *Ghana's economy at half century. An overview of stability, Growth and poverty.*

Bank of Ghana Report (2004): *Economic development report.*

Barro, R. J. and Sala-i-Martin, X. (1995): *Economic growth*. New York, McGrawHill.

Barro, R. J. (2001): ‘‘*Determinants of Economic Growth: A Cross-country Empirical Study’’.* Lionel Robbins Lectures, Cambridge, Mass., MIT Press.

Barro, R. J. and Sala-i-Martin, X. (2003): *Economic growth*: 2nd Edition, MIT Press, Cambridge.

Bhagwati, J. (1978): *Anatomy and consequences of exchange control regimes: Liberalization attempts and consequences*. Cambridge, MA. Bellinger.

Blanchard, O. J. (1967): ‘‘*Comment’’.* Journal of Business and Economic Statistics, volume 5, pp449-451.

Boltho, A. (1996): ‘‘*Was Japanese growth export-led’’?* Oxford economic papers, Vol. 48, pp.3.

Bruton, H. and J. (1989): *Import substitution as a development strategy*. Handbook of Development Economics, Vol. II, edited by H.B. Chenery and T.N. Srinivasan. Amsterdam: North Holland: 1601-44.

Crafts, N. F. R. (1973): ‘‘*Trade as a handmaiden of growth: An alternative view’’.* Economic Journal, Vol. 83, pp. 331.

Dickey, D. A. and Fuller, W. A. (1979): ‘‘*Distribution of the Estimators for Autoregressive Time series with a Unit’’.* Journal of the American Statistical association, 77, pp. 427-431

Edwards, S. (1998): ‘‘*Openness, productivity and growth: What do we really know’’?* Economic Journal, 108, pp.383-98.

Edwards, S. (1992): ‘‘*Trade orientation, distortions and growth in developing countries’’.* Journal of development economies, Vol. 39.

Elbadawi, I. A. and Soto, R. (1995): ‘‘*Real exchange rate and macroeconomic adjustment in Sub-Saharan Africa and other developing countries’’.* Journal of African economies.

Emery, R. F. (1967): ‘‘*The relation of exports and economic growth*’’. Kyklos, 20.

Emery, R. F. (1968): ‘‘*The relation of exports and economic growth*: *A reply’’*. Kyklos, 21, 4.

Engel, R. F. and Granger, C. W. J. (1987): ‘‘*Cointegration and error correction representation, estimation and testing’’*. Econometrica, 55, 251-76.

Feder, G. (1983): ‘‘*On exports and economic growth’’*. Journal of Development Economics, 12, 59-73.

Fosu, A. K. (1990): ‘‘*Export composition and the impact of exports on economic growth in developing economies’’.* AERC, Nairobi Kenya.

Fosu, A. K. (1990): ‘‘*Exports and economic growth: The African Case’’*. World Development Journal, Vol.18, pp.831-35

Frankel, J. A. and Romer, D. (1999): ‘‘*Does trade cause growth’’?* American Economic Review, 89, 379-99

Ghana-Vision 2020(The First Step: 1996-2000), *Presidential Report on Co-ordinated Programme of Economic and social Development Policies, (1995).*

Giles, J. A. and Williams, C. L. (2000): ‘‘*Export-led growth: A survey of the empirical literature and some non-causality results, Part 1’’*. Journal of International Trade and economic development, Vol.9, pp.261-337

Granger, C. W. J. and Newbold, P. (1974): ‘‘*Spurious regression in econometrics’’*. Journal of Econometrics, 2, 111-20.

Granger, C. W. J. (1981): ‘‘*Some properties of Time Series Data and their use in Econometric Model Specification’’*. Journal of Econometrics, Annals of Applied Econometrics, 16,121-30

Greenaway, D. Sapsford, D. (1994): ‘‘*What does liberalization do for exports and growth’’?*WeltwirtschafflichesArchiv, 130, 1: 152-74.

Grossman, G. M. and Helpman, E. (1991): ‘‘Trade, knowledge spillovers and growth’’. European Economic Review, 35, pp. 517-526.

Heller, P. S. and Porter, R. C. (1978): ‘‘*Exports and growth: An empirical re-investigation’’.* Journal of Development Economics, 5, 191-93

Henriques, I. and Sardosky, P. (1996): ‘‘*Export-led growth or growth-driven exports? The Canadian Case’’.* Canadian Journal of Economics, 29, 541-55

ISSER (2004): *The State of the Ghanaian Economy*

Islam, M. N. (1998): ‘‘*Exports expansion and economic growth: Testing for Cointegration and Causality’’.* Applied Economics, 30, 415-25

Jalali-Naini, A. R. (2003): ‘‘*Economic growth in Iran: 1950-2000*’’. IRPD.

Jin, J. C. (1995): ‘‘*Exports-led growth and the Four Little Dragons’’.* Journal of International Trade and Economic Development, 4, 203-15

Johansen, S. (1998): ‘‘*Statistical analysis of Cointegration Vectors’’.* Journal of Economic Dynamics and Control, 12(6), pp.231-254.

Jung, W. S. and Marshall, J. P. (1985): ‘‘*Exports, Growth and Causality in Developing Countries’’.* Journal of Development Economics, Vol. 18. Pp.1-12

Kavoussi, R. M. (1984): ‘‘*Export expansion and economic growth: Further empirical evidence’’.* Journal of Development Economics, 14, 241-50.

Kravis, I. and B. (1970): ‘‘*Trade as handmaiden of growth*: *Similarities between the nineteenth and twentieth centuries’’*. Economic Journal, 80, 320. 850-72.

Kravis, I. B. (1973a*): ‘‘A reply to Mr. Adams’’*. Economic Journal,83, 329 (March): 212-17

Kravis, I. B. (1973b): ‘‘*A reply to Mr. Crafts’ Note’’*. Economic Journal ,83, 331(September): 885-89

Kruger, A.O. (1978): *Foreign Trade regimes and economic development: Liberalisation attempts and consequences*. Cambridge, MA: Ballinger.

Kugler, P. (1991): ‘‘*Growth, exports and cointegration: An empirical investigation’’.*Weltwirtscaffliches Archive, 127, 1: 73-82.

Levine, R. and Rennelt, P. (1992): ‘‘*A sensitivity analysis of cross-country growth regression’’.* American economic review, Vol. 82, 4.

Little, I. Scitovsky, T. and Scott, M. (1970): *Industry and trade in some developing countries: A comparative study*. Oxford University Press, London.

Lucas Robert, Jr. (1998): ‘‘*On the Mechanics of Economic Development’’*. Journal of Monetary Economics 22, 3-42

Lussier, M. (1993): ‘‘*Impacts of exports on economic performance: A comparative study’’.* Journal of African economies, Vol. 21, pp. 106-27.

Mansouri, B. (2005): ‘‘*The Iterative Impact of FDI and Trade Openness on Economic Growth: Evidence from Morocco’’.* Economic Research Forum, Cairo.

Medina-Smith, E. J. (2001): ‘‘*Is the export-led growth hypothesis valid for developing countries? A case study of Costa Rica’’.* UNCTAD policy issues in international trade and commodities study series No. 7.

Michaely, M. (1977): ‘‘*Exports and economic growth; an empirical investigation’’.* Journal of development economies; Vol. 4, pp. 49-53

Moschos, D.(1989): ‘‘*Export expansion, growth and the level of economic development: An empirical analysis’’.* Journal of Development Economics, 30, 1, 93-102.

Nelson, C. R. and Plosser, C. I. (1982): ‘‘*Trends and Random walks in Macroeconomic Time series: some evidence and implications’’.* Journal of Monetary Economics, Vol. 10, pp.139-162

Ngowi, H. P. (2001): ‘‘*Attracting new foreign direct investments to Tanzania’’. Instititute of Development Management*. Tanzanet Journal, Vol.1 (2), pp.32-39.

Philips, P. C. and Perron, P. (1988): ‘‘*Testing for Unit Roots in Time Series Regression’’.* Biometrica, pp. 335-346

Ram, R. (1987): ‘‘*Exports and economic growth in developing countries: Evidence from time-series and cross-section data’’.* Economic development and cultural change Vol.36, pp. 51-72.

Rajan, R. G. and Zingales, L. (1998): ''*Financial dependence and growth''*. Journal of American Economic Association, Vol.88

Ramesh, M. and Boaz, N. (2007): ''*Testing export-led growth hypothesis in Kenya: An ADRL Bounds Test Approach''*. MPRA Paper No. 5582

Rodrik, D.(1999): ''*The new global economy and developing countries: Making openness work''*. Washington D.C. Overseas Development Council, Essay No. 24.

Romer, D. (1996): *Advanced Macroeconomics*. McGraw-Hill, New York.

Sentsho, J. (2003): ''*Export revenues as determinant of economic growth: Evidence from Botswana''*. Department of Economics, University of Botswana.

Serven, A. K. (1968): ''*The relation of exports and economic growth: Comment''*. Kyklos, 21.3.

Sey, E. (1997): ''*Export development in Ghana: An overview of the institutional framework''*.Legon Export Outlook, Danida Centre for International Business.

Shan, J. and Sun, F. (1998): ''*On the export-led growth hypothesis: The econometric evidence from China''*. Applied economics, Vol.30, pp.8

Sheehey, E. J. (1993): ''*Exports as a factor of production. A consistency test''*. World development Journal, 21, 1.

Solow, R. M. (1956): ‘‘*A contribution to the Theory of Economic Growth’’*. Quarterly Journal of Economics, Vol.70, No. 1

Syron, R. F. and Walsh B. M. (1968): ‘‘*The relation of exports and economic growth: A note’’*.kyklos, 21, pp. 3

State of the Ghanaian Economy (2003): *Global and Ghanaian economic performance.* Institute of Statistical, social and economic Research (ISSER), University of Ghana.

Tyler, W. (1981): ‘‘*Growth and export expansion in developing countries: some empirical evidence’’.* Journal of development economies Vol.9, pp.121-30.

Ukpolo, V. (1994*): ‘’Export composition and growth of selected low-income African Countries: Evidence from Time Series Data’’*. Applied Economics, 26,445-449.

Were, M., Ndungu, N. S., Geda, A., and Karingi, S.N. (2002): ‘‘*Analysis of Kenya’s export performance: An empirical evaluation’’.*Kipra Discussion Paper No. 22. Kenya Institute for Public Policy Research and Analysis, Nairobi, Kenya.

Wood, A. and Mayer, J. (1998): ‘‘*African development in a comparative perspective’’*. UNCTAD Series, Study No. 4

World Bank Report (1993): ‘‘*Adjustment and structural transformation in Sub-Sahara Africa’’.* Economic Geography, JSTOR.

World Bank Database (2006): *World Development Indicators*. Washington D.C.

APPENDICES

APPENDIX A: RESULTS OF THE UNIT ROOT TEST

Table A.1: The Results of the ADF Test for Unit Root (H_0: Unit roots)

Null Hypothesis: LNGDP has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.245331	0.9980
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

Null Hypothesis: D(LNGDP) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.080446	0.0026
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGCF has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.090603	0.9616
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGCF) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.998156	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNLABOUR has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.387859	0.9026

Test critical values:	1% level	-3.581152
	5% level	-2.926622
	10% level	-2.601424

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNLABOUR) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.897229	0.0536
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNEX has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.894375	0.9946
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNEX) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.818684	0.0053
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDCRPS has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.909461	0.7764
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDCRPS) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-5.014437	0.0002
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNINF has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.607484	0.0993
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNINF) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.298188	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNM2 has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.821630	0.8034
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNM2) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.915776	0.0002
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

APPENDIX B: RESULTS OF THE COINTEGRATION TEST

Table B.1: The Results of Johansen's Test For Co integration Vectors

Ho:	H_1:	Maximum Eigen value	L.R.test statistic	5% critical value
r=0	r=1**	0.754954	60.47138	47.07897
r≤1	r≥2**	0.620024	41.60880	40.95680
r≤2	r≥2	0.369594	19.83982	34.80587
r≤3	r≥3	0.285517	14.45644	28.58808
r≤ 4	r≥ 4	0.260644	12.98493	22.29962
r≤5	r≥5	0.194643	9.308208	15.89210
r≤6	r≥6	0.097112	4.392764	9.164546

** denotes rejection of the null hypothesis at 5 % significance level.

APPENDIX C: FULL RESULTS OF THE GROWTH EQUATION

Date: 07/21/09 Time: 12:29

Sample (adjusted): 1962 2007

Included observations: 43 after adjustments

Trend assumption: No deterministic trend (restricted constant)

Series: LNGDP LNGCF LNLABOUR LNEX LNDCRPS LNINF

POLDUM

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05

No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.754954	163.0623	134.6780	0.0004
At most 1	0.620024	102.5910	103.8473	0.0604
At most 2	0.369594	60.98216	76.97277	0.4355
At most 3	0.285517	41.14234	54.07904	0.4142
At most 4	0.260644	26.68590	35.19275	0.3049
At most 5	0.194643	13.70097	20.26184	0.3105
At most 6	0.097112	4.392764	9.164546	0.3568

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.754954	60.47138	47.07897	0.0011
At most 1 *	0.620024	41.60880	40.95680	0.0422
At most 2	0.369594	19.83982	34.80587	0.8230
At most 3	0.285517	14.45644	28.58808	0.8523
At most 4	0.260644	12.98493	22.29962	0.5582
At most 5	0.194643	9.308208	15.89210	0.4015
At most 6	0.097112	4.392764	9.164546	0.3568

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
-23.94912	-0.643605	18.05803	8.863075	-1.118506	-0.470274	-1.055257	71.30178
14.44559	-0.098693	-12.78708	0.102539	-2.733899	0.674988	-0.483387	-115.3241
-1.821229	-0.233835	1.066876	-3.180148	4.268675	2.095113	-0.087204	80.80350
-4.370754	-0.759586	2.563183	1.769745	-1.260084	0.302091	1.198640	35.32113
10.05152	-2.608002	-7.260011	2.947169	-1.226104	0.192442	-2.223574	-112.2063
-0.960990	1.404574	2.505164	1.289996	-2.544719	-0.200959	-0.850003	-68.42984
-5.143532	1.971546	2.229600	-0.136146	-0.528722	-0.657574	-1.628311	44.18788

Unrestricted Adjustment Coefficients (alpha):

D(LNGDP)	0.015797	-0.025453	0.004666	-0.001463	-0.004693	0.004583	0.001384
D(LNGCF)	0.110500	-0.055969	0.008724	-0.014642	0.045769	0.005365	-0.041667
D(LNLABOUR)	-0.006192	-0.007224	-0.000425	0.010565	0.003866	6.64E-05	0.001707
D(LNEX)	-0.048302	-0.016269	0.001217	-0.042859	-0.036614	0.038095	-0.014460
D(LNDCRPS)	0.064196	0.029704	-0.061028	0.026627	-0.043939	0.050392	-0.019221
D(LNINF)	-0.001733	-0.126725	-0.257931	-0.071503	0.137963	-0.117100	0.058208
D(POLDUM)	0.088093	-0.038050	0.003793	-0.057063	0.072746	0.084270	0.032032

1 Cointegrating Equation(s): Log likelihood 208.3084

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.026874	-0.754016	-0.370079	0.046703	0.019636	0.044062	-2.977219
	(0.01650)	(0.01478)	(0.03640)	(0.02639)	(0.00916)	(0.01393)	(0.65795)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.378319
	(0.15171)
D(LNGCF)	-2.646376
	(0.76846)
D(LNLABOUR)	0.148299
	(0.09711)
D(LNEX)	1.156779
	(0.60552)
D(LNDCRPS)	-1.537442
	(0.80536)
D(LNINF)	0.041506
	(2.56723)
D(POLDUM)	-2.109747
	(1.17082)

2 Cointegrating Equation(s): Log likelihood 229.1128

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.000000	-0.858601	-0.069354	-0.141427	0.041235	-0.017749	-6.968623

		(0.02574)	(0.06459)	(0.04707)	(0.01642)	(0.02544)	(1.19607)
0.000000	1.000000	3.891683	-11.19026	7.000512	-0.803713	2.300046	148.5238
		(1.03969)	(2.60849)	(1.90102)	(0.66302)	(1.02731)	(48.3064)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.746000	-0.007655
	(0.13004)	(0.00303)
D(LNGCF)	-3.454886	-0.065594
	(0.85753)	(0.01996)
D(LNLABOUR)	0.043951	0.004698
	(0.10814)	(0.00252)
D(LNEX)	0.921760	0.032693
	(0.70295)	(0.01637)
D(LNDCRPS)	-1.108344	-0.044249
	(0.92997)	(0.02165)
D(LNINF)	-1.789119	0.013622
	(2.93761)	(0.06839)
D(POLDUM)	-2.659405	-0.052942
	(1.35544)	(0.03156)

3 Cointegrating Equation(s): Log likelihood 239.0327

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.000000	0.000000	-12.37779	11.59542	4.160457	0.851497	206.7402

			(3.94846)	(2.98772)	(1.02835)	(1.61127)	(76.9636)
0.000000	1.000000	0.000000	44.59881	-46.19776	-19.47445	-1.639886	-820.1300
			(17.4891)	(13.2336)	(4.55489)	(7.13684)	(340.898)
0.000000	0.000000	1.000000	-14.33546	13.66973	4.797599	1.012398	248.9036
			(4.61279)	(3.49041)	(1.20137)	(1.88236)	(89.9128)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.754499	-0.008746	0.615705
	(0.12842)	(0.00317)	(0.10150)
D(LNGCF)	-3.470774	-0.067634	2.720402
	(0.85836)	(0.02119)	(0.67843)
D(LNLABOUR)	0.044725	0.004798	-0.019906
	(0.10835)	(0.00267)	(0.08564)
D(LNEX)	0.919543	0.032408	-0.662895
	(0.70442)	(0.01739)	(0.55676)
D(LNDCRPS)	-0.997198	-0.029978	0.714314
	(0.88596)	(0.02187)	(0.70025)
D(LNINF)	-1.319367	0.073936	1.313972
	(2.67824)	(0.06611)	(2.11684)
D(POLDUM)	-2.666313	-0.053829	2.081381
	(1.35819)	(0.03353)	(1.07349)

4 Cointegrating Equation(s): Log likelihood 246.2609

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.000000	0.000000	0.000000	-2.418761	-1.661624	1.582184	-11.17681
				(0.71810)	(0.53034)	(0.73625)	(2.60953)
0.000000	1.000000	0.000000	0.000000	4.297162	1.503275	-4.272647	-34.94650
				(1.88086)	(1.38907)	(1.92838)	(6.83488)
0.000000	0.000000	1.000000	0.000000	-2.560924	-1.945302	1.858650	-3.479120
				(0.83285)	(0.61509)	(0.85390)	(3.02652)
0.000000	0.000000	0.000000	1.000000	-1.132203	-0.470365	0.059032	-17.60548
				(0.14407)	(0.10640)	(0.14771)	(0.52353)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.748106	-0.007635	0.611956	0.119970
	(0.12979)	(0.00470)	(0.10203)	(0.04384)
D(LNGCF)	-3.406777	-0.056513	2.682871	0.919975
	(0.86589)	(0.03136)	(0.68072)	(0.29248)
D(LNLABOUR)	-0.001454	-0.003228	0.007176	-0.035573
	(0.09726)	(0.00352)	(0.07646)	(0.03285)
D(LNEX)	1.106871	0.064963	-0.772752	-0.509489
	(0.68267)	(0.02473)	(0.53668)	(0.23060)
D(LNDCRPS)	-1.113577	-0.050204	0.782564	0.813222
	(0.88753)	(0.03215)	(0.69774)	(0.29980)
D(LNINF)	-1.006846	0.128248	1.130697	0.665363
	(2.68884)	(0.09739)	(2.11385)	(0.90825)
D(POLDUM)	-2.416906	-0.010484	1.935119	0.663824

	(1.34710)	(0.04879)	(1.05903)	(0.45503)

5 Cointegrating Equation(s): Log likelihood 252.7534

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.000000	0.000000	0.000000	0.000000	-0.635278	-0.444313	-19.35579
					(0.17313)	(0.24886)	(0.65678)
0.000000	1.000000	0.000000	0.000000	0.000000	-0.320127	-0.672379	-20.41576
					(0.34654)	(0.49814)	(1.31466)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.858632	-0.286955	-12.13882
					(0.18621)	(0.26766)	(0.70641)
0.000000	0.000000	0.000000	1.000000	0.000000	0.010059	-0.889556	-21.43400
					(0.18863)	(0.27115)	(0.71561)
0.000000	0.000000	0.000000	0.000000	1.000000	0.424327	-0.837825	-3.381474
					(0.20773)	(0.29860)	(0.78806)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.795280	0.004605	0.646029	0.106138	0.079433
	(0.13561)	(0.01263)	(0.10568)	(0.04517)	(0.02470)
D(LNGCF)	-2.946726	-0.175879	2.350586	1.054865	0.028990
	(0.88865)	(0.08277)	(0.69251)	(0.29602)	(0.16184)
D(LNLABOUR)	0.037407	-0.013311	-0.020893	-0.024179	0.006807
	(0.10129)	(0.00943)	(0.07894)	(0.03374)	(0.01845)
D(LNEX)	0.738839	0.160454	-0.506930	-0.617398	0.202600

	(0.69990)	(0.06519)	(0.54543)	(0.23314)	(0.12746)
D(LNDCRPS)	-1.555234	0.064390	1.101563	0.683726	-0.393199
	(0.91469)	(0.08520)	(0.71281)	(0.30469)	(0.16658)
D(LNINF)	0.379895	-0.231561	0.129081	1.071964	-0.831689
	(2.76498)	(0.25754)	(2.15472)	(0.92104)	(0.50354)
D(POLDUM)	-1.685695	-0.200207	1.406981	0.878220	0.004392
	(1.38043)	(0.12858)	(1.07575)	(0.45983)	(0.25140)

6 Cointegrating Equation(s): Log likelihood 257.4075

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNGCF	LNLABOUR	LNEX	LNDCRPS	LNINF	POLDUM	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.577377	-21.33558
						(0.22793)	(0.22242)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.739432	-21.41340
						(0.44189)	(0.43120)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.466801	-14.81467
						(0.28550)	(0.27860)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-0.887449	-21.40265
						(0.26651)	(0.26007)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.748946	-2.059098
						(0.35713)	(0.34850)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-0.209457	-3.116408
						(0.40754)	(0.39769)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.799685	0.011043	0.657511	0.112051	0.067769	-0.017099
	(0.13366)	(0.01392)	(0.10470)	(0.04487)	(0.02682)	(0.01016)
D(LNGCF)	-2.951882	-0.168343	2.364026	1.061786	0.015337	-0.068160
	(0.88868)	(0.09254)	(0.69613)	(0.29832)	(0.17835)	(0.06753)
D(LNLABOUR)	0.037343	-0.013217	-0.020727	-0.024093	0.006638	0.001068
	(0.10134)	(0.01055)	(0.07939)	(0.03402)	(0.02034)	(0.00770)
D(LNEX)	0.702230	0.213961	-0.411496	-0.568256	0.105659	-0.013365
	(0.67288)	(0.07007)	(0.52708)	(0.22587)	(0.13504)	(0.05113)
D(LNDCRPS)	-1.603660	0.135170	1.227804	0.748731	-0.521433	-0.148539
	(0.87849)	(0.09148)	(0.68814)	(0.29489)	(0.17630)	(0.06675)
D(LNINF)	0.492427	-0.396036	-0.164273	0.920906	-0.533703	-0.596636
	(2.70143)	(0.28130)	(2.11609)	(0.90682)	(0.54214)	(0.20528)
D(POLDUM)	-1.766678	-0.081843	1.618091	0.986928	-0.210051	-0.079339
	(1.31285)	(0.13670)	(1.02839)	(0.44070)	(0.26347)	(0.09976)

Vector Error Correction Estimates

Date: 07/21/09 Time: 13:53

Sample (adjusted): 1962 2007

Included observations: 43 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNGDP(-1)	1.000000

LNGCF(-1)	0.024771
	(0.01548)
	[1.60049]
LNLABOUR(-1)	-0.769536
	(0.01387)
	[-55.4813]
LNEX(-1)	-0.327259
	(0.03415)
	[-9.58437]
LNDCRPS(-1)	0.019485
	(0.02475)
	[0.78717]
LNINF(-1)	0.022484
	(0.00860)
	[2.61509]
POLDUM(-1)	0.034802
	(0.01307)
	[2.66345]

C	-3.597335						

Error Correction:	D(LNGDP)	D(LNGCF)	D(LNLABOUR)	D(LNEX)	D(LNDCRPS)	D(LNINF)	D(POLDUM)
CointEq1	-0.644097	-3.355040	0.008781	1.344860	-1.228051	-1.379107	-2.590163
	(0.15604)	(0.86461)	(0.09778)	(0.70730)	(0.94141)	(2.97225)	(1.35994)
	[-4.12767]	[-3.88041]	[0.08980]	[1.90140]	[-1.30448]	[-0.46399]	[-1.90462]
D(LNGDP(-1))	0.605588	2.664517	-0.030965	1.066348	1.087614	-2.617631	1.356238
	(0.18543)	(1.02742)	(0.11620)	(0.84049)	(1.11868)	(3.53196)	(1.61603)
	[3.26589]	[2.59340]	[-0.26648]	[1.26872]	[0.97223]	[-0.74113]	[0.83924]
D(LNGCF(-1))	0.015609	-0.073265	-0.004634	-0.073859	0.329034	-0.366759	0.127559
	(0.02986)	(0.16545)	(0.01871)	(0.13535)	(0.18014)	(0.56876)	(0.26023)
	[0.52274]	[-0.44283]	[-0.24765]	[-0.54570]	[1.82649]	[-0.64484]	[0.49017]
D(LNLABOUR(-1))	0.139312	0.803730	-0.048609	0.122613	3.061291	-2.290204	0.370109
	(0.34755)	(1.92571)	(0.21779)	(1.57534)	(2.09676)	(6.61997)	(3.02893)
	[0.40084]	[0.41737]	[-0.22319]	[0.07783]	[1.46001]	[-0.34595]	[0.12219]
D(LNEX(-1))	-0.052581	-0.174719	-0.014235	0.188685	-0.013761	-0.261222	-0.459557
	(0.05240)	(0.29033)	(0.03284)	(0.23750)	(0.31612)	(0.99805)	(0.45665)
	[-1.00349]	[-0.60180]	[-0.43352]	[0.79445]	[-0.04353]	[-0.26173]	[-1.00636]
D(LNDCRPS(-1))	-0.026910	-0.256952	-0.008518	0.266884	-0.032089	0.348936	-0.598597

	(0.02672)	(0.14803)	(0.01674)	(0.12110)	(0.16118)	(0.50889)	(0.23284)
	[-1.00723]	[-1.73577]	[-0.50876]	[2.20383]	[-0.19909]	[0.68568]	[-2.57085]
D(LNINF(-1))	0.015546	0.077790	-0.007017	0.092024	-0.029450	-0.356211	-0.160061
	(0.00936)	(0.05184)	(0.00586)	(0.04240)	(0.05644)	(0.17819)	(0.08153)
	[1.66179]	[1.50071]	[-1.19702]	[2.17014]	[-0.52180]	[-1.99901]	[-1.96318]
D(POLDUM(-1))	0.031580	0.096976	-0.001338	0.039496	0.107350	-0.053774	0.127289
	(0.01906)	(0.10562)	(0.01195)	(0.08641)	(0.11500)	(0.36310)	(0.16613)
	[1.65664]	[0.91813]	[-0.11198]	[0.45710]	[0.93344]	[-0.14810]	[0.76619]
C	0.007961	-0.041327	0.028611	-0.008686	-0.103384	0.156651	-0.040264
	(0.01180)	(0.06539)	(0.00740)	(0.05349)	(0.07120)	(0.22480)	(0.10285)
	[0.67458]	[-0.63200]	[3.86869]	[-0.16238]	[-1.45202]	[0.69686]	[-0.39147]
R-squared	0.438545	0.382830	0.054476	0.406660	0.247752	0.201977	0.287960
Adj. R-squared	0.306438	0.237614	-0.168000	0.267051	0.070753	0.014207	0.120421
Sum sq. resids	0.046656	1.432359	0.018321	0.958564	1.698120	16.92714	3.543641
S.E. equation	0.037044	0.205252	0.023213	0.167908	0.223483	0.705590	0.322839
F-statistic	3.319614	2.636275	0.244863	2.912847	1.399735	1.075664	1.718765
Log likelihood	85.74808	12.12601	105.8449	20.76131	8.466725	-40.97030	-7.349381
Akaike AIC	-3.569678	-0.145396	-4.504416	-0.547038	0.024803	2.324200	0.760436
SchwarzSC	-3.201055	0.223227	-4.135792	-0.178415	0.393427	2.692823	1.129060
Mean dependent	0.028045	0.042879	0.025201	0.041906	0.022588	-0.003705	-0.023256
S.D. dependent	0.044481	0.235071	0.021479	0.196126	0.231835	0.710656	0.344229

Determinant resid covariance (dof adj.)	4.72E-13
Determinant resid covariance	9.12E-14
Log likelihood	218.4414
Akaike information criterion	-6.904250
Schwarz criterion	-4.037180

APPENDIX D: FULL RESULTS OF THE GRANGER-CAUSALITY TEST

Pairwise Granger- Causality Tests

Date: 08/12/09 Time: 01:05

Sample: 1960 -2007

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLNK does not Granger Cause DLNGDP	46	0.33528	0.56559
DLNGDP does not Granger Cause DLNK		1.76949	0.19046
DLNL does not Granger Cause DLNGDP	46	0.05335	0.81843
DLNGDP does not Granger Cause DLNL		0.11979	0.73095
DLNX does not Granger Cause DLNGDP	46	0.18367	0.67038
DLNGDP does not Granger Cause DLNX		8.41261	0.00585
DLNDCRPS does not Granger Cause DLNGDP	46	0.01838	0.89279
DLNGDP does not Granger Cause DLNDCRPS		3.52939	0.06708
DINFL does not Granger Cause DLNGDP	46	2.74001	0.10515
DLNGDP does not Granger Cause DINFL		3.76771	0.05882
DCRPS does not Granger Cause DLNGDP	46	1.21733	0.27602
DLNGDP does not Granger Cause DCRPS		5.04779	0.02985
DUMMY does not Granger Cause DLNGDP	46	0.00984	0.92143
DLNGDP does not Granger Cause DUMMY		0.76008	0.38814
DLNL does not Granger Cause DLNK	46	0.01750	0.89536
DLNK does not Granger Cause DLNL		0.00357	0.95266
DLNX does not Granger Cause DLNK	46	1.94155	0.17066

DLNK does not Granger Cause DLNX		0.51926	0.47506
DLNDCRPS does not Granger Cause DLNK	46	0.36416	0.54938
DLNK does not Granger Cause DLNDCRPS		4.24564	0.04543
DINFL does not Granger Cause DLNK	46	0.00523	0.94269
DLNK does not Granger Cause DINFL		0.78579	0.38031
DCRPS does not Granger Cause DLNK	46	1.61262	0.21095
DLNK does not Granger Cause DCRPS		3.80846	0.05753
DUMMY does not Granger Cause DLNK	46	0.07837	0.78086
DLNK does not Granger Cause DUMMY		1.49794	0.22765
DLNSER01 does not Granger Cause DLNL	46	0.01346	0.90819
DLNL does not Granger Cause DLNX		0.11366	0.73765
DLNDCRPS does not Granger Cause DLNL	46	0.38301	0.53926
DLNL does not Granger Cause DLNDCRPS		0.57346	0.45302
DINFL does not Granger Cause DLNL	46	0.20568	0.65245
DLNL does not Granger Cause DINFL		0.00481	0.94502
DCRPS does not Granger Cause DLNL	46	3.95937	0.05299
DLNL does not Granger Cause DCRPS		0.92483	0.34159
DUMMY does not Granger Cause DLNL	46	0.16465	0.68692
DLNL does not Granger Cause DUMMY		0.18705	0.66754
DLNDCRPS does not Granger Cause DLNX	46	4.19994	0.04656
DLNX does not Granger Cause DLNDCRPS		0.00017	0.98965
DINFL does not Granger Cause DLNX	46	3.47974	0.06896
DLNX does not Granger Cause DINFL		0.15227	0.69830

DCRPS does not Granger Cause DLNX	46	4.40963	0.04164
DLNX does not Granger Cause DCRPS		0.39043	0.53538
DUMMY does not Granger Cause DLNX	46	5.49189	0.02380
DLNX does not Granger Cause DUMMY		0.40693	0.52691
DINFL does not Granger Cause DLNDCRPS	46	0.02837	0.86702
DLNDCRPS does not Granger Cause DINFL		0.01966	0.88914
DCRPS does not Granger Cause DLNDCRPS	46	0.67806	0.41480
DLNDCRPS does not Granger Cause DCRPS		0.15181	0.69874
DUMMY does not Granger Cause DLNDCRPS	46	1.04979	0.31128
DLNDCRPS does not Granger Cause DUMMY		0.84962	0.36180
DCRPS does not Granger Cause DINFL	46	0.11352	0.73781
DINFL does not Granger Cause DCRPS		0.49951	0.48353
DUMMY does not Granger Cause DINFL	46	0.00915	0.92423
DINFL does not Granger Cause DUMMY		0.92833	0.34068
DUMMY does not Granger Cause DCRPS	47	5.26049	0.02665
DCRPS does not Granger Cause DUMMY		0.21934	0.64186