KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

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DEPARTMENT OF ECONOMICS

IMPORT DEMAND, DUTCH DISEASE AND CAPITAL INFLOWS: THE CASE OF GHANA'S PETROLEUM REVENUE.

A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY, KUMASI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS DEGREE IN ECONOMICS.

BY

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DECLARATION

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

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DEDICATION

This work is dedicated to the entire Achala family. Specific mention must be made of my Big Brother, Mr. John A. Akansiaba, who exclusively encouraged and sponsored me for this programme.

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ABSTRACT

This paper examined the relationship between import demand, capital inflows and Dutch disease in Ghana. In examining this relationship, three models were constructed and the ARDL Bound test for cointegration applied. In the first model, an import demand function for Ghana was estimated: first to find out the impact of agriculture share in GDP (tradable sector contribution to GDP) on imports and second, to show the extent to which windfall inflows affect import demand. In this model, it was found that rising imports cannot be attributed to any Dutch disease effects in Ghana as the coefficient of the Dutch disease variable was not significant. Also, it was established that windfall inflows had significant positive impact on imports. Given this relationship, as well as the inability of Dutch disease to explain increased imports in Ghana, we interpreted this to mean that the increased imports are perhaps of capital and intermediate goods which generate positive externalities to the tradable sectors thereby neutralizing any Dutch disease effects.

The second model attempted to find out whether indeed windfall inflows in Ghana have led to exchange rate appreciation as it is the main channel of transmission of the Dutch disease. It was established that windfall inflows proxied by LNFDI did not appreciate the exchange rate and therefore does not cause Dutch disease in Ghana.

Finally, the estimated Dutch disease model also suggests that Ghana did not experience any Dutch disease effects as a result of its natural resource boom. Rather declined contribution of tradable agricultural sector to GDP is as a result of economic development theory.

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CHAPTER ONE
INTRODUCTION

1.0 Background of the Study

The recent discoveries of offshore oil and gas deposits in Ghana as well as the surge in commodity prices in recent times, such as gold and cocoa presents a new opportunity that has further raised the prospects of the country to become a frontrunner in African development. Increased access to energy and increased oil/commodity (including gold) revenues are new opportunities that can be used to chart a sustainable growth path that does not only create economic growth but also results in economic development whereby growth is fairly well distributed to facilitate poverty reduction (Bategeka and Matovu, 2011). However, these discoveries and commodity booms come in the midst of serious concerns and controversies that have characterized the empirical relationship between resource abundance and economic growth and development; particularly in the resource rich African countries.

The debate over best management practices of the oil revenue in Ghana to avert the so called Dutch disease that is said to have afflicted most resource rich economies has raged on among policy makers, NGOs, civil society, academicians and the media (Osei and Domfe, 2008), (Hobenu, 2010), (Moss and Young, 2009), (Document of the World Bank, 2009), (CEPA, 2010), (Bank of Ghana Policy Brief, 2007) (Breisinger, et al, (2009).These studies underscore the importance of factors such as sound macroeconomic governance, diversification of the economy, transparent and accountable governance, sound public financial management as well as strong laws and effective institutions in maximizing natural resources for sustainable growth and development. To this end, the Petroleum Revenue Management Act (PRMA) was passed by Parliament and assented to by the President of the Republic of Ghana in April 2011. The Act provides a framework for the collection, allocation and management of petroleum revenue in a responsible, transparent, accountable and sustainable manner for the benefit of all citizens of Ghana.

Many countries have failed to leverage their natural resource wealth into strong states. Experiences from other African countries like Nigeria, Angola, Equatorial Guinea and Zambia show that properly managing resource windfalls remains a challenge for many developing countries. Sachs and Warner (1995) show puzzlingly, that countries with great natural resources tend to grow slower than countries that have fewer resources at their disposal. Gylfason, (2001) also informs us that Nigeria, despite its vast oil riches, has the same gross national product (GNP) per capita that it had forty years ago. For some of these countries, oil, gas, and mineral wealth have become associated with high poverty rates, weak state institutions, corruption, and conflict (Sala-i-Martin and Subramanian 2003). Thus, natural resource discoveries and for that matter positive commodity price shock in Africa have been associated with the `resource curse syndrome (Bategeka and Matovu, 2011).

The situation in Ghana, as it joins the league of oil producing countries is however, slightly different particularly as it has been sighted and commended on its institutional strengths. This it is believed could guide against any mismanagement of the resource with its attended consequences. A document of the World Bank, (2009) contends that, despite the various challenges that are associated with natural resource (oil) management, Ghana benefits from a strong institutional basis. They buttressed this point in references to the World Bank's Country Performance Indicator Assessment (CPIA), where it ranked 5th among the 75 low-income countries in 2007. They also cited the successful democratic transition in 2008 as another important expression of the maturity of Ghanaian institutions at their highest level. Risks of institutional failures are thus reduced in comparison with other countries endowed with poorer institutions, and the range of policy options to address the risk of governance failure is probably wider (Document of the World Bank, 2009).

It is important to note that, the two terms – 'Natural Resource Curse' and the 'Dutch Disease' are not exactly the same although they both arise from resource riches. The Resource curse is the phenomenon whereby resource-rich countries tend to experience slower growth in output per worker than resource-scarce countries. Dutch Disease on the other hand refers to the process whereby resource exports lead to a rapid contraction of the non-resource traded goods sector. In other words, Dutch Disease is an economic phenomenon in which the revenues from natural resource exports damage a nation's productive economic sectors by causing an appreciation of the real exchange rate coupled with wage increases. This makes the tradable sectors, notably agriculture and manufacturing, less competitive in world markets (Bank of Ghana, 2007). Thus the Dutch Disease is a consequence of the resource curse. Even though this study is discussed in the context of the Dutch Disease, information regarding the resource curse syndrome is relevant to the study since the phenomenon of the Dutch Disease is just a consequence of the resource curse.

The argument that a real exchange rate appreciation is likely to occur following windfalls from the oil as well as the recent price hikes of gold and cocoa in Ghana which will put the country in the path of its counterparts (the Dutch disease syndrome is imminent), would be dampened if the import demand function for the country is significantly explained by export earnings. This paper argues that the expected appreciation of the exchange rate that will cause a Dutch disease in Ghana will be non-existent if there is a strong positive correlation between the country's import demand and export earnings. This is because a strong positive relationship between import demand and export supply implies that, as more revenue windfalls come from the price hikes of gold and cocoa as well as oil, these additional inflows are used to finance additional imports, and therefore the expected appreciation of the local currency may not occur or may be insignificant as to adversely ruin the tradable sector as suggested by the theory of the Dutch disease. Again, the tradable sector may even benefit more from these additional earnings from the capital inflows as a result of the natural resources, if capital and intermediate goods constitute a major import bill of the country.

As the Bank of Ghana reports in 2010, about 73.7 percent of Ghana's imports in 2009 were capital and intermediate goods. This figure increased to 77.1 percent in 2010 (ISSER, 2010). Thus this work sought to test the extent to which capital inflows, a proxy for natural resource windfalls, impacts on imports to determine the possibility of an exchange rate appreciation in Ghana, following the revenue inflows and how significant this exchange rate appreciation may be, to warrant Dutch disease occurrence that will bring about de-agriculturization in Ghana.

It is not uncommon in the literature of the Dutch disease to find researchers employing different measures of natural resource abundance/commodity price boom in their quest to analyze the impact of these resources on the economic performance of the countries that are endowed with these resources. For example, Sachs and Warner, (1995) in their study of "natural resource abundance and economic growth," used the share of primary exports in GDP as a proxy for natural resource abundance. Given that oil production has just started and for that matter actual time series data on revenue inflows from oil production is non-existent, the study uses foreign capital inflows as a proxy for windfall inflows from Ghana's natural resource revenue and draw analysis and conclusions. Specifically, the study uses foreign direct investment inflows (FDI) a component of foreign capital inflows as a proxy for windfalls of natural resources/oil.

1.1 Problem Statement

Crude oil and for that matter natural resource discovery can attract a lot of investments and development into a country, but when not managed well can as well cause a lot of destruction and conflict. Like fire, crude oil and for that matter any natural resource is a good servant but can be a bad master depending on how it is handled. The availability of natural resources (oil) and its ability to attract foreign investment does not guarantee economic development. The establishment of appropriate institutions, mechanisms and policies would ensure efficient use of oil revenue/commodity price windfalls for sustained economic growth. Oil production could thus attract more foreign direct investment and contribute to the economic development of Ghana only on condition that appropriate oil revenue management policies are implemented.

The literature on the Dutch disease phenomenon is enormous and diverse, ranging from the effects of resource booms and windfalls, official development assistance (ODAs) and foreign direct investment (FDIs) on the tradable sector of resource rich economies, as well as the effects of remittances on the tradable sector of recipient economies. Recent studies like, Lartey, (2008) and Fayad, (2010) have used DSGE models and dynamic pooled mean group (PMG) estimator respectively to assess the impact of a positive external shock in the case of a small open economy. These articles discuss the impact of a positive external shock as an increase of capital inflow (Lartey, 2008), or remittances (Fayad, 2010).

The approach of these studies have traditionally been through the exchange rate appreciation approach ignoring the nature of the import and export supply functions of the countries involved in the studies, which is crucial in explaining the extent to which exchange rate appreciation can ruin the tradable sectors of resource rich countries (Ismail, 2010), (Arezki and Ismail, (2010)), (Gylfason, (2001)), (Adenauer and Vagasky, (1998)) (Fayad, (2010)), just to mention a few.

As put by Mckinley, (2005), and LI and Rowe, (2006), if the inflows from the resource exports are used to purchase entirely imports, then there is no effect on exchange rate and for that matter no Dutch disease effect. Again, Mckinley, (2005) further argued that if the inflows are used to induce a supply response that more than offsets the demand response, then there would be no Dutch disease effects as well. Finally, if the inflows are used to import capital goods to boost domestic production, then the domestic tradable sector benefits from the resource exports and cannot be said to collapse as a result of the inflows. The question therefore is whether there is any evidence that the additional oil revenue inflows would have an adverse impact on the competitiveness of Ghana's tradable sector. Thus there is a gap in knowledge in the study of the Dutch disease phenomenon from the import demand export supply point of view approach which this research seeks to fill.

The study therefore sought to establish the Dutch disease syndrome in Ghana by estimating the nature and structure of the import demand of the country to determine first, the extent to which exogenous revenue inflows from natural resource windfalls may cause exchange rate appreciation which feeds through to cause the Dutch disease phenomenon, and then establish the extent to which the so called Dutch disease of the windfall gains from the natural resource ruins the competitive tradable sectors of the economy.

1.2 Objectives of the Study

The major objective of this study is to establish the relationship between the phenomenon of the Dutch disease, inflows and the nature of import demand in Ghana. Specific objectives of the study include:

1. To estimate an import demand function for Ghana that captures the effect of inflows.
2. To examine the extent to which inflows affect exchange rate in Ghana
3. To determine the extent to which exchange rate affect import demand in Ghana.
4. To examine the Dutch disease effects on the competitive agricultural sector.

1.3 Hypotheses

This research proceeds on the hypothesis that Ghana is unlikely to suffer from the Dutch Disease phenomenon following the discovery of oil and gas as has occurred in many developing countries that have discovered natural resources. Specifically, the study seeks to test the following hypotheses:

1. H_0: Inflows do not cause exchange rate appreciation in Ghana

   H_1: Inflows cause exchange rate appreciation in Ghana
2. H_0: Inflows are used to finance imports entirely

   H_1: Inflows are not used to finance imports entirely
3. H_0: Tradable agricultural sector does not contract with spending of windfall inflows

   H_1: Tradable agricultural sector contract with spending of windfall inflows

The research therefore aims to verify the veracity and validity of these hypotheses.

1.4 Methodology of the Study

The study relies basically on time series secondary data source, with a sample size of thirty one years (31), (1980 - 2010) to draw analysis and inferences on the subject matter in question. Data was sourced from such relevant national and international institutions such as the World Bank Development Indicator (WDI), the International Monetary Fund (IMF) International Financial Statistics (IFS), United Nation Conference on Trade and Development (UNCTAD) and the Bank of Ghana (BoG).

The methodological approach of this paper is an ARDL cointegration approach which has gained much ground in recent econometric time series analysis especially, in times series analysis of the Dutch disease effects. Undoubtedly, the standard most singular tool used in the examination of the time series properties is the augmented Dickey-Fuller (ADF) test, even though there are several other standard tests. Thus the ADF test is used in this paper to test for stationarity of the series. The study employs specifically, the ARDL Bounds test approach to cointegration analysis developed by Pesaran et al., (2001) to analyze the cointegration relationship among the variables as well as estimate and discuss the long run and short run effects of the variables.

The study relies on proxy values of foreign direct investment inflows (FDI) a component of capital inflows, as a measure of the revenue inflows from Ghana's natural resources (oil, gold and cocoa) to empirically draw analysis and conclusions. The choice of this variable (FDI) has gained much prominence in the studies of the Dutch disease in recent times. Notable among them include Opoku-Afari et al (2004), Lartey (2006), Sy and Tabarraei, (2009), to mention just a few. Capital inflows are defined as foreign aid, foreign direct investment, remittances and oil revenues (Sy and Tabarraei, 2009). Foreign direct investment (FDI) flows, portfolio investment and bonds have dominated net flows in the 1990s. FDI constituted the bulk of inflows with a share of 34%, while portfolio equity and bonds accounted for just 20% (Lartey, 2006). Based on the relative importance of FDI as a component of capital inflows as well as challenges with regards to data and measurement of other components of capital inflows, the study employs FDI as a proxy for windfall inflows from the country's natural resources (gold, cocoa and oil).

1.5 Rationale of the Study

There are myriads of studies on the Dutch Disease in many resource rich countries starting from the pioneering work of Corden and Neary, (1982). Even fascinating is the innumerable studies on both foreign direct investment and aid and the Dutch disease. However, in all of this literature, the empirical results are mixed. This study is largely motivated by the recent discussions concerning the Dutch disease in Ghana. Thus the study is justified on the grounds that many studies of the Dutch disease have failed to incorporate how revenue inflows have impacted on the import demand of the affected countries as key in the explanation of the Dutch disease occurrence. Thus a knowledge gap in the study of the Dutch disease using import demand function is filled here. Further, appropriate recommendations based on the findings of the study would be made to improve policy implementation that will help avert the negative consequences associated with the discovery of natural resources (oil) particularly the Dutch disease syndrome.

Again the study will be of immense contribution to the existing literature on the Dutch disease phenomenon, particularly in the developing country context. Thus people from the academia and policy makers in general will benefit immensely from this research work.

1.6 Organization of the Study

This work is organized as follows after this introductory chapter.

Chapter two covers the review of related literature and definitions of the study. The literature review consists of both theoretical and empirical literature, trends of imports in Ghana and the Ghana Petroleum Revenue Management Act (PRMA). Chapter three considers the methodology employed in carrying out the research. The research findings, data presentation and analysis are highlighted in chapter four. The theoretical and empirical analysis of the data is also captured herein; this involves interpretations and implications of the findings. The study is concluded with the fifth chapter which summarizes the major findings. Conclusions, recommendations and policy implications are given herein as well.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

After discovering oil in Ghana it is expected that the resource will bring improvements in the people's welfare through increased economic growth. However, the literature on Dutch disease warns us that the expected changes in a country's structure of production after a favorable shock such as a large discovery of oil, could deny benefits to the economic agents that are engaged in the tradable sector (Christine 2003). This chapter specifically reviews both the theoretical and empirical literature of the Dutch disease. An overview of import demand structure of the country is also provided. Section 2.1 contains the theoretical review, where as sections 2.3, 2.3, and 2.4 contains the empirical review of literature, trends in imports and exports in Ghana and the Ghana petroleum revenue management Act respectively.

2.1 Theoretical Literature

The Dutch disease is primarily associated with a natural resource discovery, but it can result from any large increase in foreign currency, including foreign direct investment, foreign aid or a substantial increase in the natural resource prices. The term was coined to describe the adverse impact on the economy of the Netherlands in the 1960s following the discovery of natural gas in the North Sea. The new found wealth caused the Dutch Guilder to appreciate in value, causing the exports of all non-oil products to become less competitive on the world market and eventually resulting in a decline in the manufacturing sector. A similar phenomenon occurred in the United Kingdom in the 1970s, when the price of oil quadrupled and it became economically viable to drill for North Sea Oil off the coast of Scotland. By the late 1970s, Britain had become a net exporter of oil; it had previously been a net importer. The Pound soared in value, but the country fell into recession when British workers demanded higher wages and exports became uncompetitive. Nigeria and other oil exporters also suffered catastrophically from Dutch disease in the 1970s when the oil prices boomed which actually contracted the agriculture sector, a highly tradable sector in Nigeria.

To appreciate the debate clearly, a vivid explanation of the Dutch disease problem will suffice. The phenomenon describes the situation whereby the additional revenues from the natural resources/commodity price windfall, put pressure on demand for domestic goods and services in a way that subsequently raises the value of the local currency (real exchange rate appreciation) and makes tradable goods uncompetitive. It is important to note that the main transmission mechanism of the Dutch disease is through exchange rate appreciation. Corden and Neary, (1982) are the cornerstones of a vast Dutch disease literature that developed around how a natural resource boom can trigger a process of "deindustrialization." The name "Dutch disease" arose from the effects presumably caused by the discoveries of North Sea gas on the Dutch manufacturing sector.

The Dutch disease is characterized by two main effects of a resource boom or capital inflow, namely; the "resource movement effect" and "spending effect." The seminal model of the Dutch disease was by Corden and Neary, (1982), who used a small open economy model to explain the resource movement effect and spending effect following technological progress in the tradable good sector. In response to a technological shock, the marginal product of the mobile factor (labor) in the technologically improved sector rises, drawing resources out of other sectors (resource movement). Higher real income from this sector leads to increased demand for non-tradable goods and rising non-tradable good prices (spending effect), which causes a further reallocation of resources toward the non-tradable sector, thereby hurting the tradable sector in the process.

The theoretical framework of the Dutch disease is that an increase in revenues (whether a substantial increase in the price of the natural resource or a new discovery) from oil/natural resource, will adversely affect the tradable sectors (manufacturing and agriculture) of a nation's economy by appreciating the local currency, which in turn makes manufacturing and agriculture less competitive. According to Corden and Neary, (1982) in their analysis of the Dutch disease, the economy can be divided into three sectors: the natural resource sector, the non-resource tradable sectors (in this case agriculture and manufacturing), and the non-tradables sector (which includes the non-tradable services and construction). The real exchange rate is defined as the price of tradables relative to the price of non-tradables. There are two mechanisms through which the Dutch disease can occur. These mechanisms include the spending effect and the resource movement effect.

The spending effect: First, the spending effect relates to higher domestic incomes as a result of the boom leading to extra-expenditure on both traded and non-traded goods. In a small open economy, the price of traded goods is determined by international market conditions and so does not rise despite the extra-domestic spending; in contrast, the price of non-traded goods is set in the domestic market, and thus does rise. The higher relative price of non-traded goods (non-tradable services and construction) makes domestic production of traded goods (manufacturing and agriculture) less attractive, and so their output declines. Increased demand is increasingly met out of rising imports as imports become cheaper (Arezki and Ismail, 2010), (Bategeka and Matovu, 2011).

The resource movement effect: A second effect emerges if, in addition, the booming sector shares domestic factors of production with other sectors, so that its expansion tends to bid up the prices of these factors. This takes place when the boom in the natural resource sector (oil) and the non-tradable sector (non-tradable services and construction) attract capital and labor away from other parts of the economy. Output declines in the tradables sector, where prices are fixed at world market levels. Since the natural resources sector can only absorb a small proportion of the labor force, the biggest proportion of the labor force seeks employment in the non-tradables sector. The resulting resource movement effect reinforces the tendencies towards appreciation of the real effective exchange rate (REER).

The ensuing consequence of both the spending and resource movement effects is a fall in the output share of non-natural resource tradables (agriculture and manufacturing) relative to non-tradables. Consequently, countries that suffer from Dutch disease are expected to experience some or the entire of the following phenomena (Bategeka and Matovu, 2011):

i. A decrease in the price of imports and subsequent increase in demand for imported goods and services;
ii. A rise in the prices of non-tradables (services and construction) due to increased demand and subsequent resource movement into those sectors (labour and capital); and consequently more production of non-tradables at the expense of tradables;
iii. Disincentive to invest in tradables (agriculture and manufacturing);

iv. Export concentration - production of tradables (agriculture and manufacturing) suffer and could get wiped out due to absence of competitiveness; jobs in manufacturing sector move to lower-cost countries;

v. Mixed welfare outcomes especially for people that were originally engaged in production of tradables; and

vi. Mixed growth outcomes.

It must be noted that, some views about the Dutch disease phenomenon point to assumptions which may not hold and therefore any possible adverse effects of increased capital inflows might be dampened if such assumptions are relaxed. A conspicuous assumption that is often made in the analysis and theory of the Dutch disease phenomenon is that the beneficiary countries have no idle productive capacity, or are operating on their production frontiers; yet it an undeniable fact that most developing countries do have excess capacity, which would increase the spending and absorptive capacity of more resources without Dutch disease (McKinley 2005). The phenomenon also presumes that all foreign currency inflows are not entirely used to purchase imports. There is also the assumption of a perfectly elastic demand for tradable goods. What is conspicuously clear here is that, the Dutch disease effects may be lessened if not entirely eliminated with a relaxation of any of these underlying assumptions. Li and Rowe (2006) for instance, have argued that the impact of the Dutch disease could be non-existent if the foreign exchange inflows are used to induce a rapid supply-side response in the economy that more than offsets the demand response. The Government could directly use its new stock of foreign currency to purchase imports instead of domestic goods and as such minimize the potential for inflation or better still, enhance this option by importing capital goods, which would raise domestic productivity (McKinley, 2005).

2.2 Empirical Literature

The literature on the Dutch disease phenomenon is enormous and diverse, ranging from the effects of resource booms and windfalls, official development assistance (ODAs) and FDIs on the tradable sector of resource rich economies, as well as the effects of remittances on the tradable sector of recipient economies. Recent studies like Sosunov and Zamulin (2007), Lartey (2008) and Acosta et al (2009) have used dynamic sectorial general equilibrium (DSGE) models to assess the impact of a positive external shock in the case of a small open economy. These articles discuss the impact of a positive external shock as an increase in capital infow (Lartey (2008), remittances (Acosta et al (2009) or of commodity price booms (Sosunov and Zamlin (2007).

The possibility of a Dutch disease in the UK triggered interest, which first started with the theoretical work of Codren and Neary, (1982) and the empirical analysis of Bruno and Sachs (1982) on examining the Dutch disease in the UK. In cross-country studies, there has been limited evidence of Dutch disease due to oil discovery. Gelb, (1988) provides an extensive empirical cross-country study of the Dutch disease, where the effect of windfall on oil exporters was examined for a group of oil exporting countries, most of whom have spent large amounts of the windfall they gained in the wake of the 1973 oil boom. However, virtually all countries in the study showed no Dutch disease in manufacturing. A possible explanation for the missing Dutch disease was that these sectors were initially too small, and that price controls and subsidies by the government combined with active promotion of the sector kept them from being adversely affected.

The empirical evidence to support the interaction between additional foreign inflows and Dutch disease effects has not been conclusive. The IMF (2005) study of the Dutch disease has reported on the absence of Dutch disease effects for five countries (Ghana, Ethiopia, Mozambique, Tanzania and Uganda) that experienced foreign exchange inflows through aid surges. The study reports that years in which aid inflows surged were associated with depreciations (not appreciations) of the real effective exchange rate. This is confirmed by Li and Rowe, (2006) who showed a strong negative and significant relationship between aid inflows into Tanzania and real effective exchange rate (REER). An earlier study by Nyoni, (1998) for the period 1967-93 also found out the similar results whereby aid inflows were associated with real exchange rate depreciation. All these empirical results contrast the predictions of the Dutch disease model.

A more related study pertaining specifically to Ghana is the one by Sackey, (2001), who estimated an empirical model on Ghana's real exchange rate with special focus on foreign aid. The results showed that although aid dependence is quite high, aid inflows lead to depreciations in the real exchange rate. Aid inflows were also found to have had a significant positive impact on export performance. Simulations run over the period 2009-2029 with a CGE model by the World Bank, (2009) also show that Ghana's long-term growth trajectory would shift down in comparison to a non-oil scenario. The long term per capita income growth rate would decelerate to 2.4 percent and by 2029 real per capita incomes would be 14 percent lower, indicating that Ghana may not benefit much from its oil.

There are also a number of cross-country studies that provide evidence of Dutch disease effects of inflows. Rajan and Subramanian, (2009) provide evidence of a systematic adverse effect of foreign aid on competitiveness of exports for 33 sampled countries over the 1980s and 15 countries for the 1990s. They found that a 1 percentage point increase in the ratio of aid to GDP is roughly associated with a 4 percentage point overvaluation of the exchange rate. According to Fayad, (2010), regression estimates from a sample of 73 aid-receiving countries for the period 1981-2000 indicate a strong negative relationship between the level of manufactured exports and the scale of aid, which is consistent with the theoretical Dutch disease model. The study by Prati et al, (2003) also indicates that a doubling of aid might lead to an appreciation of the real exchange rate of 4 percent in the short term and up to 30 percent over a decade.

Moreover, using a gravity model of trade to test the Dutch disease hypothesis, Stijns, (2003) found that a one percent increase in world energy price is estimated to decrease a net energy exporter's real manufacturing exports by almost halve a percent. Similarly, after instrumentation, a one percent increase in an energy exporting country's net energy exports is estimated to decrease the country's real manufacturing exports by 8 percent thereby lending credence to the Dutch disease. Furthermore, in their work "oil, disinflation and export competitiveness", Buiter and Purvis, (1980) concluded that monetary disinflation leads to reduced real balances, higher interest rates and a lower nominal exchange rate. They contend that in the short run, this causes a real appreciation and a decline in domestic manufacturing output. They also noted that, perhaps surprisingly, an increase in world oil prices can create similar effects even for a country which is a net exporter of oil. Although the direct effect of an oil price increase for such a country is an increase in the demand for the domestic manufacturing good, that effect may be swamped by a real appreciation created by the increased demand for the home currency which according to them corresponds rather closely to the recent experiences of several oil and gas exporting countries and is commonly referred to as the "Dutch disease" (Buiter and Purvis, 1980).

Quite interestingly, another strand of the literature argues that whether or not the Dutch disease phenomenon poses a threat depends on what the inflows are used for. If it finances infrastructure construction, and if this is the right kind of infrastructure, then these inflows will have a supply-expanding effect. This could be of sufficient scale to offset any Dutch disease effect or the latter might be present for a while until the infrastructure is built and then productivity effect begins to manifest (Adam and Bevan, 2006). Thus, the Dutch disease effects may be overturned given that there are productivity spillovers in both tradable and non-tradable sectors. Thus, Adam and Bevan, (2006) in their analysis of the possible short and medium term responses to alternative aid-financed public expenditure programs in Uganda, found out that public infrastructure augments the productivity of private factors and that there are potentially large medium-term gains from aid funded public investment, despite the presence of some short-run Dutch disease effects.

Bategeka and Matovu, (2011) used a dynamic Computable General Equilibrium Model to investigate how different spending options targeted at particular sectors affect the competitiveness of traded goods sector in Uganda and concluded that, there will be losers and winners under the various scenarios depending on what the oil revenues are used for. Their results show that, increased oil revenues would lead to significant appreciation of the currency in all scenarios. Also, as the theory predicts, they found that the demand for non-tradables (mainly the services sector) increases. However, for simulations where oil resources are used for productive activities, they found that the losses in competitiveness would be compensated for by growth in other sectors. For instance, as they put it; "directly investing in agriculture where the bulk of the population is employed, would lead to significant productivity gains in the sector resulting into significant poverty reduction for the rural poor. Likewise, using oil revenues to boost spending on education and health, would increase labor productivity of both the urban and rural population leading to both short and long-term growth. While investment in infrastructure could reinforce the Dutch disease effects given its strong effects on the appreciation of the exchange rate and the implications for higher demand for non-tradables, this is compensated for by the positive externalities generated for other sectors by having better public goods."

Studying the relationship between the degree of financial openness and the Dutch disease effects of capital inflows in developing countries, Lartey, (2011) revealed that, an increase in financial openness leads to an appreciation of the real exchange rate in more financially opened countries only. This corresponds to the Dutch disease symptoms. Hasanov and Samadova, (2010) studied the impact of real exchange rate on non-oil exports in Azerbaijan and concluded that real exchange rate has a negative impact on non-oil export performance. This they contend is the Dutch disease effect of oil production.

Additionally, a Survey by Radelet, Clemens, and Bhavnani, (2006) concluded that the consequences of aid on Dutch disease can vary widely using available econometric estimates. Their results generally depend on assumptions about the marginal productivity of additional aid and public expenditures or about the complementarities between public and private capital. The simulations conducted showed that public infrastructure augments the productivity of private factors and that there are potentially large-to medium-term gains from aid funded increases in public investment, despite the presence of some short-run Dutch disease effects. Again, Devarajan et al, (2008) argued that if aid is about the future and recipients are able to plan consumption and investment decisions optimally over time, then the potential problem of an aid-induced appreciation of the real exchange rate (Dutch disease) does not occur. The economic framework used in their study is the neoclassical growth model, based on the Salter-Swan characterization of an open economy, with full dynamic savings and investment decisions.

A case study Econometric analysis of Singapore's export competitiveness and exchange rate appreciation by Abeysinghe and Yeok, (1998) show that, in general, the higher the imported input content, the less the impact of exchange rate changes on exports. At one extreme, exchange rate changes had no effect on re-exports. At the other extreme, service exports, being relatively less intensive in imported inputs, were most affected by currency changes. Agenor et al, (2006); (cited in Betegeka and Matovu, (2010)) analyzed the link between foreign aid, the level and composition of public investment, growth and poverty reduction for Ethiopia and provide results that are consistent with Nkusu, (2004) which emphasizes that, in assessing the scope for Dutch disease effects associated with foreign aid, the possibility of a rapid supply response should not be discarded on a dogmatic basis. Under a flexible exchange rate regime, substitution effects between aid and debt-creating capital flows may have a large impact on the behavior of the nominal exchange rate and thus on the magnitude of the real appreciation associated with increases in foreign assistance. Younger, (1992) in his work on aid and the Dutch disease, draws attention to the macroeconomic problems confronting Ghana as a result of massive aid inflows. Jebuni et al, (1991) observed that in Ghana, liberalization with a real depreciation of the exchange rate was more prone to resulting into an improved export performance. Asea and Reinhart (1996) found that the failure to deal appropriately with the heavy capital inflows could derail the significant structural reform programme that had been undertaken.

An empirical review of the literature of the Dutch disease revealed that different kinds of inflows can lead to the phenomenon. As argued above, policy makers can use fiscal policy to mitigate the adverse effects of the Dutch disease depending on whether the foreign exchange inflows are perceived to be temporary or permanent. In case foreign exchange inflows are expected to be depleted fairly rapidly, it would be appropriate for policy makers to protect the vulnerable sectors - possibly through foreign exchange intervention to insulate the economy from the short-run disturbances of Dutch disease that will soon be reversed, (Christine, 2003). However, there will still remain the challenge of ensuring that the buildup of reserves does not lead to inflation and that the country's additional wealth is spent wisely and managed transparently.

In a nut shell, the theory of the Dutch disease came into the spot-light following the experience of the Netherlands over the discovery of gas in the North Sea. A similar experience occurred in the United Kingdom in the 1970s, this trigged research interest which first started with the work of Corden and Neary, (1982). Different kinds of foreign inflows can be used to study the Dutch disease phenomenon. The most frequently kinds of inflows that have been used in the Dutch disease literature includes: aid, capital inflows, oil revenue inflows, remittances and foreign direct investment (FDI).The empirical results that have been obtained in these studies have largely been mixed and inconclusive.

2.3 Trends of Imports in Ghana

Information about trends in import demand in Ghana is scanty and difficult to access. However, ISSER publications on "the state of the Ghanaian economy" in recent years have often given an indication of the official trade indices and direction in Ghana. Again, few studies such as the works of Oteng-Abayie and Frimpong, (2006) and CEPA, (1997) have provided some insight into the import composition as well as the importance of those components to the overall economic development of the economy.

The table below shows the overall trends of imports in Ghana from 1991-1996. It is clear from this table that imports in Ghana have fluctuated over the years. The growth rate of non-oil imports was phenomenal in the early 1990s, but decline to a negative figure of 10.5% in 1994. Oil imports in the early 1990s were in the negatives only to rise as much as 35.7% in 1996. This outrageous jump in the value of oil imports can be attributed to the oil price boom in the late 1990s.

Table 2.0: Overall Trends of Imports in Ghana (1991-1996)

Year	Imports (US$m)	Non-oil Imports (US$m)	Oil Imports (US$m)	Actual Growth Rate of Imports (%)	Actual Growth Rate of Non-oil Imports (%)	Actual Growth Rate of Oil Imports (%)
1991	1318.7	1553.6	165.1	9.4%	14.6%	-16.8%
1992	1456.5	1299.0	157.5	10.4%	12.6%	-4.6%
1993	1728	1574.4	153.6	18.6%	21.2%	-2.5%
1994	1579.9	1408.8	171.8	-8.6%	-10.5%	11.4%
1995	1697.8	1496.8	191.0	6.8%	6.2%	11.6%
1996	1823.0	1563.9	259.1	8.0%	4.2%	35.7%

Source: Extracted From CEPA, (1997), "Ghana Macroeconomic Review and Outlook", Table 5.4.

According to Oteng-Abayie and Frimpong, (2006), the share of imports as a percent of GDP has been on the increase for the past three decades. They intimated that a significant portion – about 55 percent of Ghana's GDP was spent on import payments in 2002. It has however fluctuated in line with changes in GDP. Imports have tended to grow faster than exports in recent years. While the total import bill for 2008 rose by about 27 percent, from 8,066.11 million in 2007 to 10,260.97 million, total export receipts rose by about 26 percent from 4,194.71 million in 2007 to 5,275.33 million in 2008. Thus a trade deficit of 4,985.7 million was produced in 2008, which amounted to an increase of 26 percent over the 2007 outturn (ISSER, 2008).

It is quite interesting also to note that, even though, agriculture continued to be the largest contributor to GDP in Ghana, its share of GDP has been on the decline, while that of the industrial and service sectors are on the increase. The industrial sector though has shown some marginal increase over the years, it clearly points to the fact that the structure of the economy has not remained the same. Oteng-Abayie and Frimpong, (2006) has pointed out that the economy of Ghana has been going through structural changes in recent years and has therefore not remained a primarily agricultural economy. The structure of the economy of Ghana has however taken a new twist in recent years with the highest contributor to GDP being the service sector. The sectoral contribution to GDP for the years 2008, 2009 and 2010 are: agriculture, 31.0, 31.8 and 29.9 percent respectively; industry, 20.4, 19.0 and 18.6 percent respectively; and that of the service sector, 48.6, 49.2 and 51.4 percent respectively for the years 2008, 2009 and 2010 (ISSER, 2010).

Even though exports of goods and service have been rising, imports of goods and services are also on the increase which has been the main reason why Ghana has almost always had a trade deficit. For instance, exports of goods and services increased from 26.7 percent in 2008 to 41 percent in 2009 and then to 42 percent in 2010. At the same period, imports of goods and services increased from 47.5 percent in 2008 to 60.4 percent in 2009 and then reduced slightly to 55.1 percent in 2010 (Ghana statistical service, 2010). According to Oteng-Abayie and Frimpong, (2006), capital goods, crude oil and energy have constituted the most important items of imports in Ghana. This is clearly the case as the Bank of Ghana Annual Report for 2010 indicated that capital goods and intermediate goods import accounted for 77.1 percent of the total non-oil imports in 2010, compared with 73.7 percent recorded in 2009. They however contended also that the country imports a considerable amount of primary raw materials and other intermediate and consumable goods. This is apparently supported by their empirical results that investment expenditures as well as export expenditures are the aggregate components that mostly influence import demand in Ghana, with elasticities of 0.63 and 0.64 respectively.

2.4 The Ghana Petroleum Revenue Management Act

The discovery of oil in commercial quantities in Ghana presents a flamboyant and unparallel developmental opportunity for Ghana to propel herself in the path of total economic development. This however, comes at a time of increased attention to the problems of resource-rich countries, hence the need for calculated frameworks that would ensure an efficient and transparent management of the revenue inflows for the benefit of all Ghanaians. Results of most studies show that resource-rich countries have had varied experiences with economic growth and development. The experience has often been sluggish in developing economies. The studies underscore the importance of factors such as sound macroeconomic governance, diversification of the economy, transparent and accountable governance, sound public financial management as well as strong laws and effective institutions in maximizing natural resources for sustainable growth and development Gylfason, (2001), Sachs and Warner, (1995), World Bank, (2009), just to mention a few. Ghana therefore has a unique opportunity to learn from the industry forerunners, and take the necessary actions to minimize if not avoid any negative repercussions of an oil boom as in the studies referred to above.

It is not surprising at all to see Ghana taking a number of actions to avoid the path of development that has characterized resource-rich countries such as Nigeria and Angola. One notable action is the passage of the Petroleum Revenue Management Act into law. The Petroleum Revenue Management Act (PRMA) (Act 815) was passed by Parliament and assented to by the President of the Republic of Ghana in April 2011. The Act provides a framework for the collection, allocation and management of petroleum revenue in a responsible, transparent, accountable and sustainable manner for the benefit of all citizens of Ghana. Drawing on lessons from around the world, the Act incorporates several provisions aimed at ensuring a solid legal basis for the effective and efficient application of petroleum revenues in Ghana.

First, the Act provides for the establishment of petroleum funds and allocations. The Act establishes a Petroleum Holding Fund (PHF) at the Bank of Ghana to receive and disburse petroleum revenue due the Republic of Ghana. In addition to the e PHF, the Act also establishes the Ghana Stabilization Fund and the Ghana Heritage Fund. The objective of the Ghana Stabilization Fund is to cushion the impact on or sustain public expenditure capacity during periods of unanticipated revenue shortfalls while the objective of the Ghana Heritage Fund is to provide an endowment to support development for future generations when petroleum resources are depleted. These two funds are collectively known as the Ghana Petroleum Funds. Both funds according to the law shall receive from the PHF, petroleum revenue in excess of the Annual Budget Funding Amount (ABFA). The law mandates the Ministry of Finance to set out the benchmark revenue based on the formula provided. Again the law allows for not more than 70% of the benchmark revenue to be paid into the ABFA which is the amount paid into the consolidated fund to support the budget. Also, the Act permits the use of only the ABFA as collateral for debts and other liabilities of Government for a period of not more than 10 years after the commencement of the Act. On the other hand, the Act prohibits every form of borrowing against the amount in the PHF earmarked for transfer into the Ghana Petroleum Funds. This provision is to limit government on its ability to commit the country to unsustainable debts that may have dire consequences for future generations.

The PRMA also provides a framework for reporting on various levels. Based on their mandates, reports are due either monthly, quarterly, semi-annually or annually. The reports which require publication are to be published in two state owned national dailies and on the relevant websites. The following are the reporting authorities.

- The Ghana Revenue Authority
- The Ministry of Finance and Economic Planning
- The Bank of Ghana
- The Investment Advisory Committee
- The Auditor-General and
- The Public Interest and Accountability Committee

In addition to the reporting framework which makes it difficult for corruption to take place, the law further addresses transparency and accountability issues as provided in clauses 50 to 53 of the PRMA. It mandates full public disclosure of expenditures and regular scrutiny by the Public

Interest and Accountability Committee whose membership is diverse. The Accountability Committee would publish semi-annual and annual reports in two state owned newspapers, publish copies of the report on the Committee's website and hold meetings twice a year to discuss the reports with the public. The Committee would also be required to submit a copy of its semi-annual and annual reports to the President and to Parliament. Also, the Auditor-General provides external audits of the Petroleum funds each year, while Bank of Ghana conducts internal audits with the Governor submitting quarterly reports.

It must be noted that, efficiency, accountability and transparency in the management of the oil revenues involves identification of roles and responsibilities and proper allocation of these roles. To this end, the PRMA has recognized and put in fantastic frameworks for role identification and proper role allocation.

To conclude, Ghana has learnt greatly from the experiences of other oil/resource-rich countries and as a result has put specific policies in place, notably the PRMA which seeks to maximize the receipts from oil for the benefit of its citizens. However, there is absolutely no doubt that there would be challenges and difficulties with regards to implementation and adherence to the legal framework. Ghana's success story can be told to the world if we are able to effectively manage the challenges and difficulties that would emerge. Effective coordination between the various institutions established by the Act, a strong political will on the part of government, the continued support of development partners and the vigilance of civil society will be crucial to the effective implementation of this Law to ensure prudent management of petroleum revenues. Other factors such as sound macroeconomic management, improved public financial management, and good governance are also crucial in ensuring optimization of the oil revenue for the development of the country.

CHAPTER THREE
METHODOLOGY AND DATA

3.0 Introduction

This chapter explains the study's methodological approach. It clearly lays down the tools and various estimation procedures that are used by the study to achieve its set aims and objectives. The chapter among other things clearly identifies sources from which data was sourced for the study, the econometric specifications of the models, and the method of data analysis chosen for the study. It must be stated that the level of analysis in this study is three fold. The first step is to find out how capital inflows from the natural resources of Ghana (gold, cocoa and now oil) have impacted on imports. The second step is to evaluate the impact of these inflows on the exchange rate in Ghana. The last step is to establish any evidence of the contraction of Dutch disease especially, in the wake of the revived debate of the issue following the recent oil discovery and production in Ghana, drawing particularly from the experience of the net capital inflows that have accompanied gold and cocoa production in Ghana.

3.1 Data Sources, Type and Sample Size

Data for the study is sourced from the World Bank Development Indicators (WDI) (2011), the International Monetary Fund (IMF) International Financial Statistics (IFS) (2011), UNCTAD Handbook of Statistics, (2011) and Bank of Ghana (BoG). Specifically, data on constant GDP, imports, private consumption, and Agriculture share of GDP, came from the World Bank WDI; data on real effective exchange rate, openness of the economy, per capita income and FDI came from the IMF's IFS; data on terms of trade was sourced from UNCTAD and BoG. Openness of the economy was calculated as the sum of exports and imports as a ratio of constant GDP. Cyclical income (YAG) which is a proxy for declined tradable agricultural sector was calculated as the ratio of agricultural value added to non-primary resource GDP. The non-primary resource GDP was obtained by subtracting the contribution of primary exports to GDP from GDP. Time series data is employed in this study and spines from the period 1980-2010, constituting a sample size of 31 years.

3.2 Modeling the Import Demand Function

The standard specification of the import demand model is similar to any other demand model. It treats quantity of imports demanded as dependent on import prices and income. In modeling the aggregate import demand function for Ghana, the study follows the imperfect substitutes model in which the key assumption is that neither imports nor exports are perfect substitutes for domestic goods (Goldstein and Khan, 1985). Since Ghana imports only a small proportion of the world's supply of imports, it is quite realistic to assume that the world supply of imports to Ghana is perfectly elastic. This assumption seems to be more realistic in the case of Ghana because the rest of the world may be able to increase its supply of exports to this country even without an increase in prices. The idea of infinite import supply elasticity assumption reduces our model to a single equation model of an import demand function.

In this model, import prices and income (GDP) variables are crucial, because the effectiveness of import trade policy is highly dependent upon the size of their elasticities. The import demand function employed in this study is embedded in the traditional consumer theory where real imports are a function of real income and relative prices, Goldstein and Khan, (1985). Relative prices can include price indices for both the traded and non-traded sectors as these commodity types form part of the consumption basket of consumers (Holder and Williams, 1995). The real exchange rate is however included in this study to allow for the transmission of terms of trade shocks to import demand behavior.

The theoretical framework of the Dutch disease is that, as a result of the inflows, there is a decline in the local tradable sector (agricultural sector as is the case in developing countries, or manufacturing sector, as it is often the case of advanced economies). To deduce a relationship between the model of the Dutch disease and import demand in Ghana, a variable of the Dutch disease must be included in the import demand function. The measure of this variable in this work is agricultural share in non-primary resource GDP (YAG), which Holder and Williams, (1995) referred to as real cyclical income. It is expected that, evidence of any Dutch disease which in this model is a reduction in the share of agriculture in cyclical income should lead to increase in imports. Thus a priori expectation of this variable is negative. The import model is therefore stated as:

$$Mt = f(GDPt, TOTt, CONt, YAGt, FDIt, TRADE, REERt) \qquad (1)$$

Where: M is the demand for imports, GDP is the gross domestic product at constant prices, TOT is the terms of trade (relative price of exports and imports), CON is the level of private consumption, YAG is the share of agriculture in non-oil/non-resource GDP, FDI is net direct investment inflows, which is a proxy for foreign exchange inflows, TRADE is the openness index (trade liberalization index), REER is the real effective exchange rate and‘t’ is time.

It must be made clear that the root cause of the Dutch disease is not a decline in agriculture share per se, but as a result of foreign capital inflows following the discovery and extraction of the country’s natural resources. Thus it is interesting particularly to find the separate effect of foreign inflows on import demand at first and then evaluate the impact on the exchange rate, to clearly establish if foreign capital inflows lead to exchange rate appreciation and for that matter Dutch disease in Ghana. A prior expectation of the sign of FDI which is our proxy measure of foreign capital inflows is that, increased inflows must be associated with increased import demand. Increases in net capital inflows that can arise for reasons that include removal of domestic capital controls, increases in net borrowing, discovery of a new resource, increases in direct foreign investment or aid inflows tend to appreciate the real exchange rate through increased spending on all goods including imports. There is therefore a positive relationship between foreign inflows and import demand.

Undoubtedly, one most singular factor that affects international trade is the issue of trade restrictions. Saleh-Isfahani, (1989) has argued that the exclusion of quantitative restrictions in a standard import demand function leads to misspecification such that the error term will account for the difference between actual and desired imports. This informs the inclusion of the trade liberalization index (TRADE) in the import demand function. A higher quantitative trade restrictions means the economy is less open to international trade and hence a reduction in imports. Thus trade liberalization should lead to increased import demand in Ghana and hence a priori positive sign is expected of this variable.

The long-run coefficients of the import demand function can be specified as:

$$LNM_t = \beta_0 + \beta_1 LNGDP_t + \beta_2 LNTOT_t + \beta_3 LNYAG_t + \beta_4 LNCON_t + \beta_5 LNFDI_t + \beta_6 LNTRADE_t + \beta_7 LNREER_t + \mu_t \quad (2)$$

Where all variables are as defined in equation one, and LN is the natural logarithm of the variable in question.

3.3 Modeling the Exchange Rate

The second step in this study is to evaluate the impact of the revenue inflows proxied by FDI on the exchange rate in Ghana. The real exchange rate is defined as the unit price of one currency in terms of another currency. Specifically, the price of a unit of Dollars in terms of Cedis is the official nominal exchange rate between the two currencies. We obtain a real exchange rate when we factor inflation into the calculation of the nominal exchange rate.

Fundamentally, economic or real factors such as the terms of trade, capital inflows, openness of the economy, and the level of private consumption are assumed to be of major importance, in accounting for the effectiveness of the real exchange rate in influencing economic behavior. The real exchange rate is a major transmission mechanism for policy through changes in the domestic price level. Variability in the real exchange rate therefore affects economic performance by acting as a mechanism through which resources are allocated between the tradable and non tradable sectors, thus affecting productivity, adjustment costs as well as the length of the investment horizon.

Generally, Terms of Trade (TOT) is defined as the relative price of exports and imports. Terms of trade measure the impact of demand and supply of external factors on the tradable sector (Opoku-Afari et al, 2004). An improvement in the terms of trade causes a rise of wages in the tradable sector as predicted by the Dutch disease theory. Improvement in the terms of trade means an increase in real income and increased purchasing power to consumers. Thus consumers are able to afford extra expenditure on all goods. Favorable terms of trade shocks that are associated with a reduction in profitability in the tradable sector have been described as the "Dutch disease" phenomenon (Holder and Williams, 1995). An improvement in the terms of trade can be decomposed into a substitution and an income effect. Due to the income effect more goods can be bought as the terms of trade improve. The substitution effect is due to the fall of relative prices of imported goods and a fall in demand for non-tradable goods, which reflects in the depreciation of the real exchange rate. Consequently, an improvement in the real exchange rate causes an appreciation of the real exchange rate if the income effect dominates the substitution effect. Thus the sign of the terms of trade variable can either be negative or positive depending on whether the income effect or the substitution effect dominates.

The degree of openness of the economy (a measure of trade liberalization) is the sum of exports and imports as a percentage of GDP. This is a very important determinant of exchange rate in every economy. This variable gives an insight into the country's commercial policies (implicit and explicit trade barriers) (Lendjoungou, 2009). Reduction of customs duties and other quantitative restrictions increases demand for foreign goods and this helps to worsen the trade deficit and hence depreciates the local currency. If the tradable goods are perfect substitutes to the non-exchangeable ones in consumption, the real exchange rate will have to depreciate in order to re-establish external balance.

Capital inflows are defined as foreign aid, foreign direct investment (FDI), remittances and oil revenues (Sy and Tabarraei, 2009). Capital inflows in this model are proxied by FDI. According to Sy and Tabarraei, (2009), all three types of capital inflows can be used in the analysis of the Dutch disease model. They however contend that, the Dutch disease model is best suited for oil exporting economies. FDI can either appreciate or depreciate the domestic currency depending on the use of these inflows. This is because increases in net capital inflows that can arise for reasons that include removal of domestic capital controls, increases in net borrowing, increases in direct foreign investment or aid inflows tend to influence the real exchange rate through increased spending on all goods. If FDI is used to finance imports, it does not affect equilibrium real exchange rate and therefore no Dutch disease effects, however, its use for domestic non-tradables will lead to the appreciation of domestic currency and hence Dutch disease (Baffes, 1999; cited in Hafeez-ur-Rehman et al, 2010). In the context of the Dutch disease, a priori expectation of increased capital inflows from the natural resources (gold cocoa and oil) is to appreciate the local currency (negative). FDI which is a proxy for capital inflows in this study should therefore lead to appreciation of the real effective exchange rate in Ghana.

Again, increases in private consumption augmented by the distribution of any exogenous revenue as inflows and for that matter oil windfall will trace through to domestic prices resulting in an appreciation or depreciation of the real exchange rate depending on the composition of private consumption. An increase in the consumption of non-tradable goods will lead to an increase in the price of these goods and as such an appreciation of the exchange rate. Increase in private consumption of tradable goods however leads to depreciation of the exchange rate since the price of this type of consumption is internationally determined. Similarly, we expect continuous accumulation of international reserves (RES) to strongly influence the exchange rate. The reserves are basically held to achieve a balance between demand for and supply of foreign currencies, for intervention, and to preserve confidence in the country's ability to carry out external transactions Aruna, (2005). Thus we expect increase in reserves to have appreciating effect on the exchange rate. Inflation (INFL) obviously should influence the exchange rate as well. The effect of the domestic price level on the exchange rate can be viewed in the direct sense. In the direct sense, higher inflation means increased demand for imports which obviously will lead to scarcity of foreign currency, hence a depreciation of the local currency.

Given this fundamental information, we can specify the real exchange rate equation as a function of real factors as these fundamentals tend to be the determinants of equilibrium real exchange rate.

$$REERt = f\,(TOTt, CONt, TRADEt, FDIt, RESt, INFLt) \qquad (3)$$

Where TOT, is the terms of trade, CON is private consumption, TRADE is the degree of openness of the economy, FDI is foreign direct investment inflows, a proxy for foreign capital inflows, RES is the level of international reserves and INFL is the domestic price level (inflation). We can find the long-run coefficients of the model by re-writing (3) in logarithmic form.

$$LNREER_t = \delta_0 + \delta_1 LNTOT_t + \delta_2 LNCON_t + \delta_3 LNFDI_t + \delta_4 LNTRADE_t + \delta_5 LNRES_t + \delta_6 LNINFL_t + e_t \qquad (4)$$

All variables are as previously defined and e_t is the error stochastic term that captures the influence of other variables on the exchange rate that are not included in this model as explanatory variables.

3.4 Modeling the Dutch Disease

Using the spending effect of the Dutch disease, the paper formulates an empirical model of the Dutch disease that includes a measure of Dutch disease as the dependent variable and presents explanatory variables that attempt to capture the impact of the essential theoretical element of the spending effect of the Dutch disease. It must be clearly stated that, the Dutch disease occurs due to capital inflows either as a result of; a natural resource discovery and production such as oil, or aid, increased FDI and increased remittances. Increases in any of these activities appreciates the exchange rate and makes output in the tradable sector which in most developing countries is agriculture uncompetitive in international markets, since the price of such outputs are internationally determined. Thus a standard model of the Dutch disease should take into account the declining effect of the tradable sector of the economy. The decline in the manufacturing or agriculture sector is hypothesized to be a function of the spending effect and the resource-movement effect.

Decline in Manufacturing or Agric = f(Spending effect + Resource Movement effect)   *(5)*

Most people argue that modeling the Dutch disease using agriculture share of GDP is most appropriate for developing countries since agriculture seems to be the competitive tradable sector in most less developed countries; while the share of manufacturing output is appropriate for developed countries ((Rudd, 1995), (Saleh-Isfahani, 1989), (Holder and Williams, 1995)). Based on these arguments as well as the observable facts over the years which indicate that in fact, agriculture has been the major contributor to GDP than any single sector until the last few years, we model the Dutch disease dependent variable in Ghana as a decline in Agriculture share in GDP.

Again, since the spending effect is due to an increase in expenditures in the domestic economy as the oil/natural resource windfall flows into the country; and that most of the increased spending arises from the government sector as it is the substantial recipient of the revenues (through direct ownership or levying taxes on domestic oil/resources producers), a variable of government expenditures as a proxy would capture most of the aspects of the spending effect. However, it must be recalled that as national income rise, there is an excess demand for products which is mitigated only by an increase in the price level. The increase in the domestic price level affects the real exchange rate, causing the country's agriculture products to become less competitive. Production of those goods should therefore decrease as the real exchange rate appreciates. If this is so, then perhaps the real exchange is a suitable proxy for the spending effect.

It is expected from the Dutch disease theory that the government expenditures variable and the real exchange rate variable should be highly correlated. A correlation coefficient between the two variables that is not high can guarantee the inclusion of both variables in the regression without any worry for multicollinearity between them. However, from an econometric perspective it is confusing to include both in the model. This confusion results from a fundamental principle of regression analysis (that all other variables are held constant when examining the effects of any one variable). For example, when examining the effects of the government expenditures variable, it is necessary to hold constant the real exchange rate if it is included in the model. However, in theory the government expenditures variable works through the changing real exchange rate. Including both in the regression prevents them from functioning econometrically according to theory. Therefore, it is necessary to decide which one to include.
The real exchange rate variable is used in this model. The real exchange rate, REER, is preferable to the researcher based on the following reasoning. Since many LDCs finance government expenditures through the printing of money, the government expenditures variable, therefore, takes into account much more than just the increase in oil revenue/windfalls. In fact, the increase in revenue from oil/resource may be totally lost, or at least distorted, if the government does indeed print a large amount of money to finance its expenditures.

The resource-movement effect could be proxied by a wage variable in the booming sector. As workers in the booming sector become more productive, their wages are bid up. As a result, other workers migrate to the booming sector, leaving a dearth of tradable sector workers. Faced with fewer workers and/or having to pay higher wages to keep their workers, farmers or manufacturers will have to decrease production, and this traded goods sector will decline.

Therefore, it is hypothesized that as wages in the booming natural resource sector rise, agriculture's percentage share of non-oil/resource GDP for LDCs and manufacturing's percentage share of nonoil/resource GDP for MDCs should fall. Thus a proper proxy for the resource-movement effect is the wage in the domestic booming sector. Unfortunately, consistent and reliable wage data is not readily available. The constraint in wage data availability implies that the resource-movement effect cannot be modeled in this study. However, most researchers conclude that this effect is minimal since the domestic oil/resource sector is usually an enclave. Consequently, the model should perform almost as well as if a resource-movement variable was included.

It is necessary to consider possible alternative explanations for the contraction of the manufacturing or agricultural sector. It is entirely possible that some other factor(s), other than Dutch disease, could lead to the contraction of the tradable sector. Therefore, it is important to account for these other explanations by using several control variables. One such variable that easily comes to mind is the decline in agricultural share of GDP as a country develops, which Rudd, (1995) referred to as "the natural development process." He argues that agriculture sector may decline due to other factors other than Dutch disease. In developing economies, it is possible that much of this decline is attributable in part to the natural tendency for the agriculture sector to contract as LDCs begin to develop. To this end, per capita GDP is used as a proxy for the natural development process, since it is widely used as the measure of development of a country.

Other possible explanations would be the substantial removal of tariffs and quotas that leave the tradable goods sector exposed to foreign competition. Contractions, due to foreign competition crippling the domestic tradable sector, could result concurrently with the resource boom. Thus openness to trade, which is often expressed as the ratio of the sum of exports and imports, to GDP is included in the model as an explanatory variable of interest. Since the prime interest of this study is to establish evidence or otherwise of the contraction of the Dutch disease in Ghana as a result of the foreign capital inflows that accompanies the natural resource/oil extraction in Ghana and not to diagnose exactly what might be responsible for a decline in the tradable sector in Ghana, the study does not include so many control variables. The Dutch disease model is therefore specified as:

$$AGRICt = f(REERt,\ PYCt, TRADEt) \quad (6)$$

Where the variable AGRIC which is the Dutch disease dependent variable in (5) is the share of agriculture in real non-oil/non-resource GDP, REER is the real effective exchange rate, a proxy for the spending effect, PCY is the per capita income and TRADE is the variable for the degree of trade liberalization, otherwise known as the degree of openness of the economy. The long run relationship between the variables is exploited using the log linear form of the equation above.

$$LNAGRIC_t = \pi_0 + \pi_1 LNREER_t + \pi_2 LNPYC_t + \pi_3 LNTRADE_t + u_t \quad (7)$$

3.5 The ARDL Method of Estimation and Data Analysis

This part of the chapter presents the method of estimation adopted and the specific procedures and tools of analysis. The autoregressive distributed lag (ARDL) bounds testing procedure developed by Pesaran, et al, (2001) is used in this paper to examine the cointegration relationship between the variables in the various models. The use of the bounds technique is based on three validations. First, Pesaran et al, (2001) advocated the use of the ARDL model for the estimation of level relationships because the model suggests that once the order of the ARDL has been recognised, the relationship can be estimated by OLS. Second, the bounds test allows a mixture of I(1) and I(0) variables as regressors. That is, the order of integration of appropriate variables may not necessarily be the same. Therefore, the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. Third, this technique is suitable for small or finite sample size (Pesaran et al, 2001).

Pesaran et al, (2001) espoused that, to apply the bounds test procedure; a conditional unrestricted error correction model (UECM) of interest can be specified to test the cointegration relationship between import demand, and its determinants as:

$$\Delta LNM_t = \beta_0 + \beta_1 LNM_{t-1} + \beta_2 LNGDP_{t-1} + \beta_3 LNTOT_{t-1} + \beta_4 LNYAG_{t-1} + \beta_5 LNFDI_{t-1} + \beta_6 LNTRADE_{t-1} + \beta_7 LNREER_{t-1} + \sum_{i=0}^{p} \Phi_{1i} \Delta LNM_{t-i} + \sum_{j=0}^{p} \Phi_{1i} \Delta LNM_{t-j} +$$

$$\sum_{k=0}^{q} \Phi_{3k} \Delta LNTOT_{t-k} + \sum_{l=0}^{q} \Phi_{4l} \Delta LNYAG_{t-l} + \sum_{m=0}^{q} \Phi_{5m} \Delta LNFDI_{t-m} + \sum_{n=0}^{q} \Phi_{6n} \Delta LNCON_{t-n} + \sum_{r=0}^{q} \Phi_{7r} \Delta LNTRADE_{t-r} + \sum_{s=0}^{q} \Phi_{8s} \Delta LNREER_{t-s} + \mu_t \qquad (8)$$

Where, all variables are as previously defined and Δ is the first difference operator. Testing for cointegration relationship between the variables in the above conditional UECM involves three steps. The first step involves the estimation of the conditional UECM equation above by OLS, and conducting an F-statistic test to determine the joint significance of the coefficients of the lagged levels of the variables as:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$

H_1: not H_0

Two asymptotic critical values bounds provide a test for cointegration when the independent variables are I(d) (where $0 \leq d \leq 1$): a lower value assuming the regressors are I(0) and an upper value assuming purely I(1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no cointegration between the variables is rejected regardless of the orders of integration for the time series, otherwise the null hypothesis is accepted and there is cointegration among the series. The test is however inconclusive if the F-statistic falls between the lower and the upper critical values.

The second step of the ARDL bounds approach calls for the specification of a conditional ARDL (p, q_1, q_2, q_3, q_4, q_5, q_6, q_7), long-run model for LNMt based on the UECM equation (8) once cointegration is established.

$$LNM_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta LNM_{t-i} + \sum_{i=1}^{q1} \alpha_2 \Delta LNGDP_{t-i} + \sum_{i=0}^{q2} \alpha_3 \Delta LNTOT_{t-i} + \sum_{i=0}^{q3} \alpha_4 \Delta LNYAG_{t-i} + \sum_{i=0}^{q4} \alpha_5 \Delta LNFDI_{t-i} + \sum_{i=0}^{q5} \alpha_6 \Delta LNCON_{t-i} + \sum_{i=0}^{q6} \alpha_7 \Delta LNTRADE_{t-i} + \sum_{i=0}^{q7} \alpha_8 \Delta LNREER_{t-i} + \mu_t \qquad (9)$$

This involves selecting the lags length of the ARDL (p, q_1, q_2, q_3, q_4, q_5, q_6, q_7) model in the variables using Akaike Information Criterion or the Schwarz Bayesian Criterion. The selection of the appropriate lag length of the model is based on the Schwarz Bayesian Criterion (SBC).

The final step consists of the construction of an error correction model that captures both the short run and the long run dynamics of the variables. The error correction model is specified as follows:

$$\Delta LNM_t = \gamma_0 + \sum_{i=0}^{p} \gamma_{1i} \Delta LNM_{t-i} + \sum_{j=0}^{q} \gamma_{2j} \Delta LNGDP_{t-j} + \sum_{k=0}^{q} \gamma_{3k} \Delta LNTOT_{t-k} + \sum_{l=0}^{q} \gamma_{4l} \Delta LNYAG_{t-l} + \sum_{m=0}^{q} \gamma_{5m} \Delta LNFDI_{t-m} + \sum_{n=0}^{q} \gamma_{6n} \Delta LNCON_{t-n} + \sum_{r=0}^{q} \gamma_{7r} \Delta LNTRADE_{t-r} + \sum_{s=0}^{q} \gamma_{8s} \Delta LNREER_{t-s} + \lambda ecm_{t-1} + \mu_t \quad (10)$$

Where γ_s are the short-run dynamic elasticities of the model's convergence to long-run equilibrium and ecm_{t-1} is the error correction model and λ is the speed of adjustment to long run equilibrium of the variables following a shock.

Again, we follow suit in the analysis of the exchange rate equation as has been done for the import demand function. This starts with the construction of the conditional unrestricted error correction model (UECM) as:

$$\Delta LNREER_t = \delta_0 + \varphi_1 LNREER_{t-1} + \varphi_2 LNTOT_{t-1} + \varphi_3 LNCON_{t-1} + \varphi_4 LNFDI_{t-1} + \varphi_5 LNTRADE_{t-1} + \varphi_6 LNRES_{t-1} + \varphi_7 LNINFL_{t-1} + \sum_{i=0}^{p} \delta_{1i} \Delta LNREER_{t-i} + \sum_{j=0}^{r} \delta_{2j} \Delta LNTOT_{t-j} + \sum_{k=0}^{r} \delta_{3k} \Delta LNCON_{t-k} + \sum_{l=0}^{r} \delta_{4l} \Delta LNFDI_{t-l} + \sum_{m=0}^{r} \delta_{5m} \Delta LNTRADE_{t-m} + \sum_{n=0}^{r} \delta_{6n} \Delta LNRES_{t-n} + \sum_{p=0}^{r} \delta_{7p} \Delta LNINFL_{t-p} + v_t \quad (11)$$

Similarly, the long run model is specified as in the case of the import demand model. The appropriate lag length of the ARDL model is selected based on the Schwarz Bayesian information Criterion (SBC).

$$LNREER_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta LNREER_{t-i} + \sum_{i=0}^{r1} \alpha_2 \Delta LNTOT_{t-i} + \sum_{i=0}^{r2} \alpha_3 \Delta LNCON_{t-i} + \sum_{i=0}^{r3} \alpha_4 \Delta LNFDI_{t-i} + \sum_{i=0}^{r4} \alpha_5 \Delta LNTRADE_{t-i} + \sum_{i=0}^{r5} \alpha_6 \Delta LNRES_{t-i} + \sum_{i=0}^{r6} \alpha_7 \Delta LNINFL_{t-i} + v_t \quad (12)$$

The error correction model pertaining to the exchange rate equation is specified, where the short run dynamics of the model's adjustment to long run equilibrium are given by the coefficients $\omega_1, \omega_2, \ldots\ldots, \omega_7$.

$$\Delta LNREER_t = \omega_0 + \sum_{i=0}^{p} \omega_{1i} \Delta LNREER_{t-i} + \sum_{j=0}^{r} \omega_{2j} \Delta LNTOT_{t-j} + \sum_{k=0}^{r} \omega_{3k} \Delta LNCON_{t-k} + \sum_{l=0}^{r} \omega_{4l} \Delta LNFDI_{t-l} + \sum_{m=0}^{r} \omega_{5m} \Delta LNTRADE_{t-m} + \sum_{n=0}^{r} \omega_{6n} \Delta LNRES_{t-n} + \sum_{s=0}^{r} \omega_{7r} \Delta LNINFL_{t-s} + \sigma ecm_{t-1} + v_t \quad (13)$$

Finally, the Dutch disease equation (7) also follows the bound testing procedure for cointegration as outlined in the import demand function and the exchange rate models. Thus the conditional UECM for equation seven (7) is:

$$\Delta LNAGRIC_t = \pi_0 + \Omega_1 LNAGRIC_{t-1} + \Omega_2 LNREER_{t-1} + \Omega_3 LNPYC_{t-1} + \Omega_4 LNTRADE_{t-1} + \sum_{i=0}^{p} \pi_{1i} \Delta LNAGRIC_{t-i} + \sum_{j=0}^{u} \pi_{2j} \Delta LNREER_{t-j} + \sum_{k=0}^{u} \pi_{3k} \Delta LNPYC_{t-k} + \sum_{l=0}^{u} \pi_{4l} \Delta LNTRADE_{t-l} + e_t \quad (14)$$

The long-run cointegration equation of the Dutch disease model can be specified as:

$$LNAGRIC_t = \rho_0 + \sum_{i=1}^{p} \rho_1 \Delta LNAGRIC_{t-i} + \sum_{i=0}^{u1} \rho_2 \Delta LNREER_{t-i} + \sum_{i=0}^{u2} \rho_3 \Delta LNPYC_{t-i} + \sum_{i=0}^{u3} \rho_4 \Delta LNTRADE_{t-i} + v_t \quad (15)$$

The lag length in the ARDL model is selected based on Schwarz Bayesian Criterion (SBC) and Criterion. The error correction model of the Dutch disease model is given by:

$$\Delta LNAGRIC_t = \Psi_0 + \sum_{i=0}^{p} \Psi_{1i} \Delta LNAGRIC_{t-i} + \sum_{j=0}^{u} \Psi_{2j} \Delta LNREER_{t-j} + \sum_{k=0}^{u} \Psi_{3k} \Delta LNPYC_{t-k} + \sum_{l=0}^{u} \Psi_{4l} \Delta LNTRADE_{t-l} + \vartheta ecm_{t-1} + e_t \quad (16)$$

Again, Ψ_1, Ψ_2, Ψ_3 and Ψ_4 are the short-run dynamic elasticities of the model's convergence to long-run equilibrium, and ϑ is the speed of adjustment.

3.6 Augmented Dickey-Fuller (ADF) Test

Most macroeconomic time series tend to display an upward trend over time leading to the question of differencing in conferring of stationary properties to the variable. The idea of a common trend in time series data has motivated the concept of cointegration developed by Engle and Granger (1987). The standard practice in cointegration analysis is to examine the time series properties of the data. This begins with the determination of the univariate properties of the series.

In time series literature unit root tests like the Dicky Fuller (DF) test is widely used for testing stationarity (non-stationarity) in economic data. If the variables are found to be non-stationary at the levels and they are determined to be stationary in their first-differences, they are said to be integrated of order one, I (1). For this reason, the Augmented Dickey-Fuller (ADF) test is used to test the stationary status of the variables used in this study. The presence of unit root in the series indicates that the variable is non-stationary, hence the degree or order of integration is one or higher. The absence of unit root however, implies that the variables are stationary and the order of integration is I (0).

3.7 Cointegration Test

A test for cointegration analysis means looking for stable long-run equilibrium relationships among non-stationary economic variables. If the results indicate the absence of cointegrating vectors between the variables, it means that there is long-run stable relationship between them. This study applies the Autoregressive Distributed Lag (ARDL) Cointegration Test otherwise called the Bounds Test developed by Pesaran *et al* (2001) to test for the cointegration relationships among the variables in the various models specified.

CHAPTER FOUR
PRESENTATION AND DISCUSSION OF RESULTS

4.0 Introduction

This chapter presents a thorough analysis and discussion of the econometric estimations of the models discussed in chapter three. The chapter is organized into four (4) main sections, each section consisting of a number of subsections. The first main section entails the processes in the estimation of the import demand model. This major section is further divided into subsections. The unit root test, the Bounds test for cointegration, and the diagnostic and stability tests of the coefficients of the import demand function are presented in Subsections one, two and three respectively. The discussion of the long run results as well as the results of the estimated error correction model are however presented in subsections four and five respectively.

The second major section of this chapter involves the estimation of the exchange rate equation. Again this is also divided into subsections. The Bounds test for cointegration and the diagnostic and stability tests are presented in subsections one and two of this major section respectively. Estimation and discussion of long run and short run coefficients are presented in subsections three, and four respectively. The third major section of this chapter is the estimation of the Dutch disease model. In this main section, Bounds test for cointegration, and diagnostic and stability tests of the coefficients of the Dutch disease model are presented in subsections one, and two respectively. Subsections four and five however contained the discussions of the long run results and the results of the short run error correction model respectively. The last main section of this chapter is the conclusion.

4.1.0 The Import Demand Model

This section is the first of the four main sections in this chapter, which is further also divided into subsections as mentioned in the introduction of this chapter. It involves first; the examination of the time series properties of the data for the estimations and subsequently; the estimation, presentation, analysis and discussion of the results of the import demand function.

4.1.1 Time Series Properties of the Data

In any time series data, it is always important to examine the time series properties of the data before further analysis and inferences can be made, as most series are non-stationary in their levels. A test for statioarity of the data involving all three basic model estimations was done to ensure that the variables were not integrated of order two (that is, I(2) stationary) so as to avoid spurious results. The ARDL breaks down with I (2) series since the computed F-statistics provided by Pesaran *et al* (2001) are not valid in the presence of I (2) variables. This is so because the bounds test is based on the assumption that the variables are integrated of order zero (that is, I (0)) or integrated of order one (that is, I (1)).

The Augmented Dickey-Fuller (ADF) test was utilized to check for unit root and order of integration of the variables. The results of the unit root test are presented in Table 4.1.0. The test regression included both a constant, as well as a constant and trend for both the log-levels and the first differences.

Table 4.1.0: Augmented Dickey-Fuller (ADF) Test for Unit Root

Variable	Levels				First Difference			
	Constant	Status	Constant and trend	Status	Constant	Status	Constant and trend	Status
LNMT	0.4222	I(1)	0.04538	I(0)	0.0000	stationary	0.0000	Stationary
LNRGDP	0.9932	I(1)	0.00199	I(0)	0.0000	stationary	0.0001	Stationary
LNREER	0.1381	I(1)	0.5815	I(1)	0.00674	stationary	0.00722	Stationary
LNYAG	0.2049	I(1)	0.08373	I(1)	0.00347	stationary	0.001247	Stationary
LNTOT	0.2353	I(1)	0.558	I(1)	0.0000	stationary	0.0000	Stationary
LNFDI	0.9349	I(1)	0.1289	I(1)	0.00059	stationary	0.001738	Stationary
LNCON	0.9786	I(1)	0.9245	I(1)	0.03659	stationary	0.0313	Stationary
LNPYC	0.9408	I(1)	0.9391	I(1)	0.03082	stationary	0.0316	Stationary
LNINFL	0.0357	I(0)	0.7763	I(1)	0.0000	stationary	0.0000	Stationary
LNRES	0.1381	I(1)	0.5815	I(1)	0.00674	stationary	0.00722	Stationary
LNAGRIC	0.8351	I(1)	0.02203	I(0)	0.0000	stationary	0.0000	Stationary
LNTRADE	0.05072	I(1)	0.5556	I(1)	0.0000	stationary	0.0000	Stationary

Note: I(0) indicates stationarity in the levels where as I(1) indicates stationarity in the first difference.

A test for unit root in the variables as shown in the table above indicated the presence of unit root in the log-levels of the variables. This therefore suggests that the variables could be stationary either in their first differences or higher. As can be seen from the table, taking first differences of the variables achieves stationarity either with a constant or with a constant and trend. We can therefore conclude that, most variables are I(1), and therefore the ARDL model applied.

4.1.2 ARDL Bounds Test for Cointegration.

The achievement of stationarity of the variables in their first differences implies the application of the ARDL bounds test procedure for cointegration. The results of the bounds test for cointegration are presented in table 4.1.1 below.

Table 4.1.1: Results of the Bounds Test for Cointegration in the Import Demand Function

Number of parameters (k)	Computed f-statistic	Bounds test critical values					
		At 1%		At 5%		At 10%	
8	7.6388[.019]	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		2.79	4.10	2.22	3.39	1.95	3.06

From table 4.1.1, the computed ARDL F-statistic is 7.6388 with a probability value of [.019]. Since the computed F-statistic is greater than the upper bound critical values at the 1% (4.10), 5% (3.39) and 10% (3.06) respectively, the null hypothesis of no cointegration between the variables is rejected and instead the alternative hypothesis accepted. This implies that, there is cointegration (long run) relationship between the variables in the import demand function even at the 1% level of significance.

Since there is evidence of cointegration between imports and its regressors, it is only a matter of procedure that we estimate the conditional autoregressive distributed lag model (ARDL) in order to conduct the diagnostic and stability test of the coefficients. To do this, there is the need to select maximum lag order of the variables based on structured lag selection criterion. This paper sets the maximum lag order of the variables to one (1) based on the Schwarz Bayesian Criterion

(SBC) using Microfit 4.1 software package. The results of the conditional ARDL model are provided in appendix I, table 1.

4.1.3 Diagnostic and Stability Tests

In time series econometrics analysis, it is always convenient and proper to carry out diagnostic tests to ensure that the results meet the standard classical linear regression assumptions, to detect any possible spurious results and correct such defects if any, to avoid the possibility of spurious results and conclusions. This is done in this work by using Microfit 4.1software and employing a variable deletion test and the results are illustrated in table 4.1.2.

Table 4.1.2: Results of the Diagnostic Tests

Test statistic	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 4.1685[.410]	2.5819[.128]
B:Functional Form	CHSQ(1)= 3.8704[.490]	2.3700[.143]
C:Normality	CHSQ(2)= .71263[.700]	Not applicable
D:Heteroscedasticity	CHSQ(1)= .57528[.448]	.54743[.466]

Note:

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

The null hypotheses testing autocorrelation, correct functional form, normality and heteroscedasticity includes: no autocorrelation, correct functional form, normally distributed residuals and no heteroscedasticity (homoscedasticity) respectively. From table 4.1.2, it is clear that, the null hypotheses cannot be rejected at the 5% significance level for the given probability values 0.041, 0.049, 0.7 and 0.448 respectively. Thus the import demand function passes all the diagnostic tests. This implies that the import demand function does not suffer from any problem related to serious serial correlation, functional form, normal distribution and heteroscedasticity respectively. Again, in standard econometric analysis, and for that matter cointegration analysis, the stability of coefficients in the regression is crucial. This paper utilizes the CUSUM (Cumulative sum) and the CUSUMSQ (Cumulative sum of squares) of recursive residuals to test for the stability of the coefficients in the import regression model. This test is basically a graphical test and is illustrated in appendix II, figures 1 and 2.

4.1.4 Results and Discussion of the Long Run Coefficients of the Imports Demand Model

After checking for the existence of cointegration, stability and other diagnostic tests, the next step in the ARDL procedure is the estimation of the long run relationship between the variables in the import demand function. The long run coefficients of the model were estimated from the ARDL (0, 1, 0, 0, 0, 1, 1, 1) model based on the Schwarz Bayesian Criterion (SBC), using Microfit 4.1 and the results so generated are displayed in table 4.1.3.

Table 4.1.3: Estimated Long Run Coefficients using the ARDL Approach

ARDL(0,1,0,0,0,1,1,1) selected based on Schwarz Bayesian Criterion (SBC)
Dependent variable is LNMT

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNRGDP	.63395	.53594	1.1829[.253]
LNTOT	-.14712	.084061	-1.7501[.098]*
LNYAG	-.0031121	.074769	-.041622[.967]
LNFDI	.031703	.013129	2.4147[.027]**
LNREER	-.036828	.044024	-.83654[.414]
LNCON	.89286	.053344	16.7380[.000]***
LNTRADE	.93948	.065513	14.3403[.000]***
C	-11.3856	10.5693	-1.0772[.296]
T	-.024938	.032761	-.76123[.457]

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis.*

Since all variables in the model are expressed in logarithms, the coefficients of the model can be interpreted in terms of elasticities. It is clear from table 4.1.3 that all the coefficients of the import model are inelastic since they are all less than one. The elasticity of imports with respect to real GDP (LNGDP), (.63395) has the expected sign and is inelastic. It is however not significant in explaining import behavior in Ghana for the period under review. The elasticity associated with LNGDP (.63395) though insignificant, implies that, all things being equal, a 10%

increase in real GDP (LNGDP) results in an increase in imports by 6.3%. This is perhaps the reality on the ground in Ghana over the years as it is observed that economic growth in Ghana is often accompanied with trade deficit. The elasticity of imports with respect to terms of trade (TOT), which is a measure of the relative price of exports and imports is (-.14712). This is significant in explaining import behavior in Ghana only at the 10% level of significance. The magnitude of the terms of trade coefficient indicates the fact that Ghanaians are less responsive to changes in import prices, since a 10% change in import prices only change imports by 1.4% at the 90% confidence level all things being equal.

The variable LNYAG which is of particular interest in this study is what is called cyclical income and is measured by non-major natural resource GDP. Its elasticity (-.0031121) has the expected sign although highly inelastic and insignificant in explaining variations in imports in Ghana. The magnitude of its coefficient tells us that, for a 10% decrease in cyclical income, imports are expected to increase by 0.03%. Since this variable in this study captures the Dutch disease effects (decline in agric shares), the study's proposition that Ghana is unlikely to suffer from the Dutch disease effect following its natural resource windfall inflows, given its economic, social, and political environment seems to have been vindicated by the empirical results obtained from the data. William and Holder, (1996) who studied the Trinidad and Tobago's economy however, found that increased imports were partly attributable to Dutch disease effects (decline agricultural shares) following the oil price boom in the 1970s. Thus the results tell us that some other factors are more responsible for rising imports in Ghana other than declining agricultural shares of GDP (Dutch disease).

Furthermore, the elasticity of foreign inflows (LNFDI) is statistically significant at the 5% level of significance. The elasticity of imports with respect to LNFDI (.031703) informs us that for a 10% increase in net capital inflows, imports of goods and services would go up by 0.3%. The observed relationship between imports demand and capital inflows is not out of place, since the exploration of the natural resources such as gold and oil normally begins with the importation of heavy duty equipment and expertise. In most developing economies such as Ghana, the demand for imported inputs to boost domestic production is often quite high since these inputs are not available at the domestic level. The need for inputs to boost economic growth in Ghana and the non-availability of these inputs locally means increased importation of intermediate and capital goods to meet this need. Therefore the inflows from the natural resources almost exclusively leave the country in the form of imported inputs to further domestic output growth. Oteng-Abayie and Frimpong, (2006) have established that investment demand and export expenditures are the major determinants of import demand in Ghana. The significance of LNFDI pre-informs us that, as foreign inflows come as a result of natural resources, these inflows are returned in the form of imports, and therefore the expected appreciation of the currency that would cause a Dutch disease is minimized if not eliminated entirely.

Again, the elasticity of imports with respect to the real effective exchange rate (LNREER) (-.036828) though insignificant has the expected sign. The magnitude of LNREER implies that all things being equal, a 10% appreciation or depreciation of the exchange rate increases or decreases imports of goods and services for Ghana by approximately 0.4%. This is particularly true since the empirical results indicated that the elasticity of imports with respect to relative price term (TOT) is inelastic. The statistical insignificance of LNREER means exchange rate movement has no or little influence on import demand in Ghana. This is particularly true as observations indicate that, import demand in Ghana did not reduce in the midst of exchange rate depreciation, especially in the 1990s and early 2000s as economic theory would have predicted.

The elasticity coefficients associated with private consumption (LNCON) (.89286) and the openness index otherwise called the trade index (LNTRADE) (.93948) are highly statistically significant even at the 1% significance level. LNCON has the expected sign and informs us that, ceteris paribus, import behavior varies by approximately 8.9% for a 10% variation in private consumption. This means that, a 1% rise in private consumption raises imports of goods and services by 8.9%. Since a great deal of the revenue inflow from the natural resource ordinarily accrues to government in the form of taxes and royalties, any government policy that is geared toward a rise in private consumption; such as a policy of drastic increase in emoluments and personal income tax cuts, which may serve as a direct distribution of the windfalls from the natural resource to its citizenry, has the tendency of significantly increasing the import bill of the country and subsequently an adverse effect on its balance of trade. This is probably the reason why Ghana has often produced a trade deficit in recent decades. With regards to trade liberalization, a 10% reduction in trade restrictions sours up imports by approximately 9.4%. The elasticity coefficient associated with the openness index (trade liberalization) is nearly unitary and highly statistically significant even at 1% level of significance. The surge in private consumption in the midst of substantial removal of trade barriers in recent years coupled with inadequate domestic supply and incipient taste for imported goods means a rise in imports with more liberalization of trade. Thus much of the variations in imports are explained by variations in the trade index (LNTRADE) and private household consumption (LNCON).

4.1.5 Results and Discussion of the Import Demand Error Correction Model

The existence of cointegration in the import demand function implies the construction of an error correction model that captures the short run dynamics of the import demand model. The error correction model thus enables us to estimate coefficients that tell us the speed at which the variables adjust to their long run equilibria following any shock in the short run. The results of the error correction model are given in table 4.1.4.

Table 4.1.4: Results of the Import Demand Error Correction Model

ARDL(0,1,0,0,0,1,1,1) selected based on Schwarz Bayesian Criterion
Dependent variable is Dlnmt

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNRGDP	2.7448	.79954	3.4329[.003]***
LNTOT	-.14712	.084061	-1.7501[.095]*
LNYAG	-.0031121	.074769	-.041622[.967]
LNFDI	.031703	.013129	2.4147[.025]**
LNREER	.057420	.050481	1.1375[.269]
LNCON	1.0046	.068792	14.6030[.000]***
LNTRADE	1.1012	.069820	15.7716[.000]***
C	-11.3856	10.5693	-1.0772[.294]
T	-.024938	.032761	-.76123[.455]
Ecm	-1.0000	0.00	*NONE*

ecm = LNMT -.63395*LNRGDP + .14712*LNTOT + .0031121*LNYAG -.031703*LNFDI + .036828*LNREER -.89286*LNCON -.93948*LNTRADE + 11.3856*C + .024938*T

R-Squared	.99129	R-Bar-Squared	.98514
S.E. of Regression	.034952	F-stat. F(9, 20)	215.0214[.000]
Mean of Dependent Variable	.11286	S.D. of Dependent Variable	.28677
Residual Sum of	.020768	Equation Log-	66.5652

Squares		likelihood	
Akaike Info. Criterion	53.5652	Schwarz Bayesian Criterion	44.4574
DW-statistic	1.6206		

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis d is the difference operator.*

From the table, all the variables maintained their respective signs except the real exchange rate (LNREER) which has a positive sign this time, but still insignificant. This means that in the short run, appreciation of the exchange rate reduces imports, though this reduction is insignificant. Further, the following variables are statistically different from zero (0) even at the 1% alpha level: LNGDP, LNCON and LNTRADE; whereas the terms of trade and capital inflows (LNFDI) are only significantly different from zero at the 10% and 5% alpha level respectively as was the case in the long run estimation. Again, it is also observable from table 4.1.4 that, LNGDP which was statistically insignificant is now highly significant. This tells us that an increase in the level of income of the country in the short run leads to increase in import demand. Thus economic growth and import demand are highly related in the short run than in the long run. This is probably because in the long run, the economy is expected to be self-sufficient than in the short run. The magnitude of the error term (ecm) in this model is -1.00, which implies that given any shock in the variables in the short run, there is 100% adjustment of the variables to their long run values. Thus there is a perfect short run adjustment of the variables to their long run equilibrium positions.

Evidence from table 4.1.4 also indicates that, the error correction model passed the diagnostic tests. A Durbin Watson (DW) value of (1.6206) implies no serious autocorrelation problems. Also, the overall regression is highly statistically significant as shown by the F-statistic and p-value 215.0214[.000] and has high explanatory power as indicated by both the R-Squared and the R-Bar-Squared values of .99129 and .98514 respectively. The R-Squared of .99129 for instance tells us that about 99% variation of imports in Ghana is explained by variations in the independent variables in the import demand model.

The short run elasticity of imports with respect to GDP (LNRGDP) is 2.7448, which is elastic and is statistically significant at the 1% alpha level. Its magnitude tells us that, for a given variation in the GDP of Ghana, imports varies by 2.7448 holding all variables constant. This is in line with economic theory as well as the classical traditional import demand function, which postulates GDP as a positive function of income. In the traditional import demand model, an improvement in the country's income has two effects: substitution effect and income effect. The income effect of an increase in GDP implies an increased demand for all goods and services including imports, hence the underlying positive relationship between imports and GDP. The substitution effect relates to a fall in the relative price of imports thereby increasing its demand. In effect, economic growth and import demand are highly related in the short run than in the long run. This is probably because in the long run, the economy is expected to be self-sufficient than in the short run.

Secondly, the coefficient of the terms trade (LNTOT) has an elasticity value of -.14712 (inelastic) and is only statistically important in explaining changes in imports in Ghana over the period of study in this research at the 10% level of significance. Its sign is negative as in the case of the long run elasticity. Its magnitude shows that for a 1% deterioration of the terms of trade which correspond to a rise in import prices or improvement in export prices, imports decrease by approximately .14712 in the short run, all other things equal. This is consistent with the finding of Oteng-Abayie and Frimpong, (2006) who obtained a negative and inelastic short run coefficient for the terms of trade of Ghana as -0.28471.

Thirdly, the elasticity associated with the cyclical income variable (LNYAG) is -.0031121 which is inelastic and again has no statistical importance in explaining import demand in Ghana. It also maintained its negative sign as in the case of the long run, which implies that all things being equal, approximately .031703 variations in imports are due to a decline in agriculture shares of non-resource GDP (LNYAG). Also, LNFDI has an elasticity coefficient of .031703 which is statistical different from zero at the 5% alpha level. Its sign is positive as was the case in the long run, indicating that holding all things constant, increases in capital inflows (LNFDI) would account for increases in imports up to .031703. This observation is in line with the thinking underlining the studies of the effects of capital inflows on economies. This finding is consistent with the empirical evidence by William and Holders, (1998); that capital inflows to the extent that they are not sterilized by the central bank tend to increase spending on all goods, raising the prices of domestic goods and hence appreciating the exchange rate which eventually leads to increased imports, since the price of imports are internationally determined. On the other hand, as argued by Mckinley, (2005) and Li and Rowe, (2006), spending the inflows on imports may not have any impact on exchange rate and therefore no Dutch disease effects. Thus increased demand for imports as a result of inflows does not necessarily appreciate exchange rate and for that matter Dutch disease.

An important objective of this research is to find out the extent to which exchange rate movement affect import demand in Ghana. In this study, it is established that real exchange rate has no significant impact on import demand given the inelastic coefficient of the LNREER variable (.057420) and the probability value of [.269]. Its sign however is positive in the short run and is therefore contrary to the long run sign. The positive sign associated with the LNREER variable means an increase in the exchange rate (depreciation) by say 10% leads to a corresponding increase in imports by 0.57420 holding other variables constant. The positive relationship between exchange rate and import demand in Ghana in the short run though not in tandem with economic theory, seems to depict the particular circumstances that are currently being observed. This relationship is reinforced by the irresponsiveness of Ghanaians to import prices given the elasticity of the terms of trade variable (relative price of exports and imports). LNREER is therefore not an important determinant of import demand in Ghana in both the short run and long run.

A non-negative unitary elasticity coefficient (1.0046) is obtained for the private consumption variable. A probability value of [.000] indicates that private consumption is extremely important in explaining variations in import demand in Ghana in the short run, as was the case in the long run. The significance of LNCON indicates that private consumption in Ghana is increasingly met out of imports; probably due to a domestic short-fall in output as well as incipient taste for imported goods. The sign and magnitude of LNCON is consistent with economic reasoning as well as empirical evidence such as the works of Holder and Williams, (1995) and Oteng-Abayie and Frimpong, (2006). This coefficient is however directly not comparable to that of Oteng-

Abayie and Frimpong, (2006), who obtained an inelastic consumption term of 0.83830 as they did not differentiate between private consumption and government consumption. They however found that consumption was important in determining changes in import demand in Ghana.

There is also a highly statistically significant positive relationship between LNTRADE (trade liberalization) and import demand in Ghana as depicted by the probability value of [0.000], with the nearly unitary elastic coefficient (1.1012). The statistical significance of trade liberalization implies the relative importance of trade liberalization in exposing the countries competitive sectors (mainly agriculture) to competition both in the short and in the long run, which has the potential of collapsing the traditional agricultural sector given the negative relationship between imports and agricultural shares in Ghana. This relationship is perhaps reinforced by surge in private consumption as well as the deficit in domestic production and the high taste for imports. Thus trade liberalization could be more detrimental to the Ghanaian economy both in the long run and in the short run.

To sum it up, there is a high speed adjustment of the variables in the import demand equation to equilibrium given any distortion in equilibrium, as shown by the coefficient of the error correction model. It is also observable that the statistical importance and relationships between the independent variables and the dependent variable remained virtually the same with the exception LNGDP and LNREER. Again, it is quite glaring from both the long run and short run coefficients of the import model that several factors other than a decline in the tradable sector (agricultural shares) as given by LNYAG (Dutch Disease) are responsible for the surge in imports over the decades.

4.2.0 The Exchange Rate Equation

4.2.1 Bounds Test for Cointegration

The ARDL bounds test for the joint significance of the real effective exchange rate (LNREER) and its determinants is used to establish any evidence of cointegration. The results of the bound test for cointegration are displayed in table 4.2.0, and clearly established the existence of a long run relationship between LNREER and its determinants since the computed F-statistic is greater than the upper critical bounds at both 5% and 10% alpha levels as indicated in the table.

Table 4.2.0: Bound Test Results for Cointegration for the Exchange Rate Model

Number of parameters (k)	Computed f-statistic	Bounds test critical values					
		At 1%		At 5%		At 10%	
6	4.2124[.039]	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
		3.60	4.90	2.87	4.00	2.53	3.59

4.2.2 Stability and Diagnostic Tests

Since there is evidence of cointegration, an unrestricted ARDL error correction model was estimated and diagnostic and stability tests conducted on the coefficients. The diagnostic test results are shown in table 4.2.1. The diagnostic tests indicated that the model is not serially correlated, is homoscedastic, is normally distributed and has the correct functional form since none of the tests is statistically significant. The stability of the model is also confirmed based on the CUSUM and CUSUMSQ graphical tests as shown in appendix II, figures 3 and 4 respectively.

Table 4.2.1: Results of the Diagnostic tests

Test statistic	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.4686[.226]	.85347[.369]
B:Functional Form	CHSQ(1)= 1.86905[.137]	2.90070[.210]
C:Normality	CHSQ(2)= 1.2141[.545]	Not applicable
D:Heteroscedasticity	CHSQ(1)= .63142[.427]	.60096[.445]

Note:

A: Lagrange multiplier test of residual serial correlation

B: Ramsey's RESET test using the square of the fitted values

C: Based on a test of skewness and kurtosis of residuals

D: Based on the regression of squared residuals on squared fitted values

4.2.3 Results and Discussion of the Long Run Coefficients of the Exchange Rate Model

The ARDL approach to cointegration analysis implies the estimation of the long run relationship between the variables. Microfit 4.1 was used to compute the results of the long run coefficients as given in table 4.2.2.

Table 4.2.2: Estimated Long Run Coefficients of the Exchange Rate Model

ARDL(1,1,0,0,0,1,1) selected based on Schwarz Bayesian Criterion
Dependent variable is LNREER

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNCON	1.2791	.16264	7.8650[.000]***
LNTOT	.86869	.19554	4.4426[.000]***
LNRES	-.31060	.048910	-6.3504[.000]***
LNFDI	.026695	.032311	.82619[.420]
LNINFL	1.3683	.18160	7.5343[.000]***
LNTRADE	-1.6055	.10991	-14.6079[.000]***
C	28.3070	2.6708	10.5988[.000]***
T	.10414	.054768	1.9015[.074]*

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis.*

From the table above, it can be seen that, all the coefficients of the real exchange rate equation are statistically crucial in explaining variations in the real effective exchange rate even at the 1% level of significance except that of the foreign exchange inflows variable (LNFDI), which is statistically insignificant even at the 10% level of significance. It is important to note that real effective exchange rate (REER) has been defined in a way that an increase implies depreciation and a fall implies appreciation. The Real Effective Exchange Rate (REER) is defined as

$$NEER\,{}^{Pt}/_{Pn}$$

Where: *NEER* is the effective nominal exchange rate, *Pt* is price of tradables and *Pn* is the price of non-tradables.

The impact of an increase in private consumption (LNCON) on the real exchange rate depends on how such consumption demand is distributed between tradables and non-tradables. If the bulk of private consumption is on non-tradables, the price of non-tradables may rise and this may cause an appreciation of the real exchange rate. In contrast, tax-financed increases in spending on traded goods would put downward pressure on the trade balance, and this would require a depreciation of the real exchange rate to sustain external balance (Edwards, 1989). The coefficient associated with private consumption (LNCON) (1.2791) implies that private consumption has a significant positive impact on the REER, thus indicating increases in this variable will cause the real exchange rate to increase (depreciate). As argued earlier, this scenario could occur if private consumption is dominated by tradable goods. Thus the result clearly tells us that private consumption in Ghana has been concentrated on tradable goods. This could possibly be the reason why increases in private consumption had a positive significant impact on imports in the import demand model. The problem here is that, since the impact of consumption on imports is positive and significant, increases in this variable which cannot be met entirely domestically may create balance of payment problems since the unmet demand has to be filled by imports.

The terms of trade variable (LNTOT) has a positive and significant impact on the real effective exchange rate. Its value (.86869) informs us that, about 0.86869 of the variations in LNREER are due to variations in the terms of trade. The sign and magnitude of the terms of trade can be explained by two factors: the substitution and income effect. Generally, an improvement in the terms of trade means more goods can be bought with improved income. The substitution effect is however due to the fall in the relative price of imported goods which reflects in the depreciation of the real exchange rate. Consequently, an improvement in the real exchange rate causes an appreciation of the real exchange rate if the income effect dominates the substitution effect. From our results, the positive relationship between the LNTOT and LNREER gives the impression of the dominance of the substitution effect over the income effect. Thus a 1% improvement in the terms of trade causes the real effective exchange rate to depreciate approximately by 0.87. This is consistent with the findings of Opuku-Afari et al, (2004) for Ghana.

There is also a negative and statistically significant impact of the availability and level of international reserves in determining the movement of exchange rate in Ghana. From the results as given in table 4.2.2, a 10% depletion of Ghana’s international reserves depreciated the exchange rate by approximately 3%. This confirms the theoretical relationship between reserves and exchange rate. According to Aruna, (2005) it has been hypothesized that especially in developing countries the volume of imports is largely dependent upon the availability of international reserves to finance imports. The reserves are basically held to achieve a balance between demand for and supply of foreign currencies, for intervention, and to preserve confidence in the country's ability to carry out external transactions. The possible implication of the reserves link to exchange rate in Ghana is that, with windfalls inflows that are expected from the oil and gas sector, Ghana's international reserves are expected to improve which could appreciate the local currency and cause problems for traditional exports. The country must therefore take the opportunity of the expected improvement of its reserves to work towards stable exchange rate.

The only variable that is statistically insignificant in explaining changes in the exchange rate is the proxy value for foreign exchange inflows (LNFDI). It has an unexpected positive sign; indicating that increases in foreign exchange inflows that are normally associated with exploration of natural resources has the potential of depreciating the exchange rate in Ghana as indicated by the positive sign. This depreciation is however insignificant. Though statistically unimportant in determining exchange rate movement in Ghana, its magnitude tells us that exchange rate depreciates by .026695, given a 1% rise in LNFDI. This finding is inconsistent with the theory framework of the Dutch disease model. It is however consistent in sign to that of the findings of Sackey, (2001) and Nyoni, (1998) for Ghana and Tanzania respectively, though not in statistical significance and magnitude. Again, an important observation of the variable LNFDI is that though it has no statistical impact on exchange rate movement, in Ghana, it is however, very critical in explaining import demand. This is probably due to the fact that exchange rate movement has no impact on imports. Thus regardless of the exchange rate, imports are more likely to go up with a given surge in foreign exchange inflows. Another possible explanation of the insignificant depreciating effect of LNFDI on LNREER is that, perhaps these inflows are used to import capital and intermediate goods which have positive externalities that can boost local production of tradables thereby limiting any appreciating effects of the inflows. This relationship and results seem to confirm the researchers' assertion that with the circumstances and structures in place in Ghana, the country is unlikely to surfer a Dutch disease phenomenon with windfalls from its natural resources.

Another important variable that determines exchange rate movement in Ghana is the level of inflation. The underlying theoretical relationship between the level of inflation and exchange rate is that, a rise in inflation should depreciate the local currency all things being equal. Thus economic fundamentals are at work as we established a well laid down economic fundamental relationship between inflation and exchange rate as given by the coefficient of LNINFL (1.3683), indicating that a 10% rise in the level of inflation depreciates the local currency by well over 13%.

Lastly, trade liberalization has a negative and statistically significant impact on the real effective exchange rate in Ghana even at the 1% alpha level. Its coefficient (-1.6055), does not conform to economic theory as it is often expected that liberalization should lead to depreciation. In other words**,** openness seems to have rather appreciation effect on LNREER. This probably might have been the reason why liberalization led to increased import demand in the import demand model. This finding is consistent with the work of Lendjoungou, (2009) for Cameroon where he studied four African countries (Cameroon, Congo, Chad and Gabon). Once trade liberalization has the statistical tendency and potential of appreciating exchange rate and increasing imports in Ghana, government must rethink its trade policies so as to avoid the ensuing danger that is associated with over liberalization.

4.2.4 Results and Discussion of the Error Correction Model

After examining the relationship between the variables in the long run, we follow suit to examine the short run relationships as well. The results of the error correction model are therefore illustrated in table 4.2.3.

Table 4.2.3: Results of the Exchange Rate Error Correction Model

ARDL(1,1,0,0,0,1,1) selected based on Schwarz Bayesian Criterion
Dependent variable is Dlnreer

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNCON	.36073	.25788	1.3988[.177]
dLNTOT	1.1323	.26470	4.2778[.000]***
dLNRES	-.40486	.070586	-5.7357[.000]***
dLNFDI	.034797	.041692	.83461[.414]
dLNINFL	.58245	.31786	1.8324[.082]*
dLNTRADE	-.94485	.16272	-5.8066[.000]***
dC	36.8980	4.6591	7.9196[.000]***
dT	.13575	.071272	1.9047[.071]*
ecm(-1)	-1.3035	.10836	-12.0295[.000]***

ecm = LNREER + 1.2791*LNCON -.86869*LNTOT + .31060*LNRES -.026695*LNFDI -1.3683*LNINFL +1.6055*LNTRADE -28.3070*C -.10414*T

R-Squared	.93909	R-Bar-Squared	.89967
S.E. of Regression	.12448	F-statistic	32.7600[.000]
Mean of Dependent Variable	-.097896	S.D. of Dependent Variable	.39299
Residual Sum of Squares	.26341	Equation Log-likelihood	27.0202
Akaike Info. Criterion	15.0202	Schwarz Bayesian Criterion	6.8164
DW-statistic	2.2689		

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis, d is the difference operator.*

The explanatory power of the exchange rate model is satisfactory as given by the R-square (.93909) which implies that about 93% changes in exchange rate movement in Ghana is explained by changes in the independent variables in the exchange rate model specified for Ghana in this study. Again, the sign of the error correction term is negative (-1.3035) and correct. The coefficient of the error correction model gives us the speed at which the variables adjust to their long run equilibria if there is any shock.

All the variables maintained their respective signs in the short run estimation as compared to the long run estimation. An interesting observation however relates to the statistical importance of the variables in explaining variations in exchange rate. The statistical importance of private

consumption in explaining real effective exchange rate is lost in the short run. This is perhaps because increases in private consumption in the midst of increase trade liberalization as characterized by reduced tariffs on imports in recent years, coupled with the fact that private consumption is tradable goods bias would mean little or no impact on the exchange rate.
Similarly, the statistical impact of inflation on LNREER is misplaced both at the 1% and 5% alpha levels. It is however important in determining LNREER at the 10% alpha level. With regards to the remaining regressors (LNTOT, LNTRADE, LNRES and LNFDI), there is no dramatic change in the error correction results as compared to the long run estimates, in regards to both signs and magnitudes of their coefficients. This implies that the dynamics of these variables short run are similar to the dynamics of the long run.

In conclusion, an examination of the factors responsible for variations in exchange rate in Ghana indicates that, several factors other than inflows especially as these inflows come as a result of windfall from our natural resources such as gold, cocoa and now oil are more important in determining variations in exchange rate and for that matter any possible Dutch disease in Ghana. Though it is possible that Ghana could lose its tradable sector, this lost of competiveness probably may be through different channels rather than through the reasoning behind the Dutch disease. Important ways through which Ghana could be uncompetitive in its tradable sector include, issues related to trade liberalization and issues related to management of reserves.

4.3.0 The Dutch Disease Model

4.3.1 Bounds Test for Cointegration

We first start the ARDL process for the Dutch disease model by testing for cointegration between the variables. We used the variable deletion test for the joint significance of the lag values of the variables' coefficients. Table 4.3.0 shows the results obtained. Microfit 4.1 was used to estimate the coefficients using the ARDL bounds testing procedure and employing a variable deletion test.

Table 4.3.0: Bound Test Results for Cointegration for the Dutch Disease Model

Number of parameters (k)	Computed F-statistic	Bounds test critical values	
		At 5%	
4	4.6457[.011]	Lower bound	Upper bound
		3.47	4.57

Since the F-statistic (4.6457) is higher than the upper bound value (4.57) at the 5% significance level, the null hypothesis of no cointegration cannot be accepted and hence there is evidence for cointegration.

4.3.2 Diagnostic and Stability Tests

Cointegration analysis is a matter of procedure and steps and hence the next step in the ARDL cointegration approach is the estimation of the coefficients of the conditional ARDL UECM of the Dutch disease model in the agriculture sector as well as the diagnostic and stability tests to ensure that the estimation of our coefficients satisfies the classical linear regression assumptions. Using Microfit 4.1, we utilize the cumulative sums (CUSUM) and cumulative sums of squares (CUSUMSQ) graphical methods to test for stability of the estimated coefficients as given in appendix II, figures 5 and 6 respectively. In addition to the test for the stability of our coefficients, tests for serial correlation, heteroscedasticity functional form and normality of our model were carried out. From the tests, the null hypotheses of serial correlation, incorrect functional form, heteroscedasticity and no normal distribution of the model could not be accepted at the 5% alpha level. Thus the model has no problems with regards to serial correlation, correct functional form, normal distribution and heteroscedasticity. The results of the diagnostic tests are displayed in table 4.3.1, while the auto regressive distributed lag model (ARDL) estimated results are given in appendix I, table 3.

Table 4.3.1: Diagnostic Tests Results

Test statistic	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 3.4452[.063]	3.1138[.090]
B:Functional Form	CHSQ(1)= .15536[.693]	.12494[.727]
C:Normality	CHSQ(2)= .75366[.686]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 2.7352[.098]	2.8090[.105]

Note:

A: Lagrange multiplier test of residual serial correlation

B: Ramsey's RESET test using the square of the fitted values

C: Based on a test of skewness and kurtosis of residuals

D: Based on the regression of squared residuals on squared fitted values

4.3.3 Estimation and Discussion of the Long Run Coefficients of the Dutch Disease Model

The results of the long run relationship between the variables in the Dutch disease in agriculture sector are displayed in table 4.3.2.

Table 4.3.2: Estimated Long Run Coefficients of the Dutch Disease Model

ARDL(0,0,0,0,0) selected based on Schwarz Bayesian Criterion
Dependent variable is LNAGRIC

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNREER	.046363	.035669	1.2998[.206]
LNTRADE	-.0033536	.065613	-.051111[.960]
LNPYC	-.14884	.047930	-3.1054[.005]***
C	4.5979	.33573	13.6950[.000]***
T	-.011400	.0036740	-3.1029[.005]***

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis.*

From table 4.3.2., the coefficients can be explained in terms of elasticities since the values of the variables were converted to logarithms before the estimation. All the elasticity coefficients have the expected signs. The coefficient associated with LNPYC (per capita income) is highly statistically significant even at the 1% level of significance. This implies that most of the variations in agricultural share in GDP are due to variations in per capita income. The economic theory underlying economic development and the empirical observation of the now developed countries in their developmental stages experienced a decline in their agricultural sectors and increased manufacturing shares. Thus the economic reasoning underlying agricultural decline is what is referred to as the natural development process. As a country industrializes, we expect a decline in the agricultural contribution to its GDP. We can therefore conclude that economic growth and development is a major determining factor of the contribution of agriculture, a highly tradable sector in developing countries such as Ghana to GDP.

The coefficients of LNREER (the real effective exchange rate), a proxy for the spending effect of the Dutch disease, and LNTRADE (trade liberalization) are however, statistically not different from zero (0), implying that variations in the share of agriculture in GDP are not significantly explained by variations in the real effective exchange rate and trade liberalization. It is expected that increases in spending as a result of the inflows should appreciate the exchange rate and contract traditional tradable agricultural sector. Thus increase spending which causes appreciation (decrease in exchange rate) should contract agricultural shares hence a positive relationship is expected between LNREER and LNAGRIC. Though the implied sign is achieved in this study, this relationship is not statistically significant. This means that the spending effect of the Dutch disease cannot be validated. A conclusion that can be made from this result is that agricultural decline in Ghana may be attributed to factors such as the natural growth process other than a Dutch disease phenomenon, since the variable that measure the spending effect of the Dutch disease (LNREER) is not statistically significant.

4.3.4: Results and Discussion of the Error Correction Model

The existence of cointegration among the variables in the Dutch disease equation implies the construction and estimation of an error correction model that captures the short run behavior of the variables. The results obtained therein from the estimated error correction model are given in table 4.3.3 below.

Table 4.3.3: Estimated Short Run Coefficients of the Dutch Disease Model

ARDL(0,0,0,0) selected based on Schwarz Bayesian Criterion
Dependent variable is dLNAGRIC

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLNREER	.046363	.035669	1.2998[.206]
dLNTRADE	-.0033536	.065613	-.051111[.960]
dLNPYC	-.14884	.047930	-3.1054[.005]**
Dc	4.5979	.33573	13.6950[.000]***
dT	-.011400	.0036740	-3.1029[.005]**
ecm(-1)	-1.0000	0.00	*NONE*

ecm = LNAGRIC -.046363*LNREER +.0033536*LNTRADE + .14884*LNPYC -4.5979*C + .011400*T

R-Squared	.49741	R-Bar-Squared	.41699
S.E. of Regression	.054741	F-statistic	4.9485[.003]
Mean of Dependent Variable	-.022899	S.D. of Dependent Variable	.071693
Residual Sum of Squares	.074914	Equation Log-likelihood	47.3210
Akaike Info. Criterion	42.3210	Schwarz Bayesian Criterion	38.8180
DW-statistic	1.3111		

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance level respectively. P-values are in parenthesis, d is the difference operator.*

In the error correction model, a relatively low R-squared value of .49741 is obtained; implying that approximately 50% variations in the share of agric in GDP is explained by the independent variables in the model. The low R-squared value is probably due to the use of few independent variables in the model. This does not however affect the results much as the interest of this paper is not really to identify the determinants of agriculture share in GDP, but rather to establish whether or not decline in agriculture shares in GDP is as a result of the ongoing debate of the Dutch disease. All the variables in the model obtained the appropriate signs. The coefficient of the error term also has the appropriate sign and is statistically significant. It captures the speed at which the independent variables adjust in the short run when there is a shock, to their long run equilibrium positions.

From the short run results, the proxy variable that captures the spending effect of the Dutch disease LNREER is of the correct sign and statistically insignificant in explaining any decline in the tradable agricultural sector (Dutch disease) as was the case in the long run. It can therefore be concluded on the basis of this result that agricultural decline in Ghana cannot be attributed to the spending effect of the Dutch disease. Again, it is found that, trade liberalization has no statistical impact on the contribution of agriculture to GDP even though the expected sign is obtained in the estimation. The expectation was that, increased openness of the economy exposes the tradable sector (agriculture) to competition, which has the tendency of collapsing the sector. This expectation though achieved in the estimation, lacks strong influence in the model as shown by the probability value of [.960].

The natural development process variable (LNPYC) seems to be the single most influential variable in explaining the decline in agriculture shares in the Dutch disease model. The theory that underlines the natural development process is that, as a country develops and industrializes, the contribution of agricultural sector must decline. This was the transitional phenomenon that was observed in the now developed countries when they began to industrialize. Specifically, its value (-.14884) tells us that, the share of agriculture in GDP is expected to decline by roughly 1.5% given a 10% increase in the per capita income of Ghana ceteris paribus. This result suggests that the typical development pattern of contraction in the agricultural sector as the country modernizes is an important factor in explaining the contraction of Ghana's agricultural sector.

4.4 Conclusion

In sum, we do not obtain any evidence of Dutch disease effects in Ghana at least from the estimation of Dutch disease equation. Other factors such as the natural development process are more important explanations of declined tradable sector (agriculture shares) than Dutch disease in Ghana. We can therefore refute the phenomenon of the Dutch disease in Ghana. This finding is confirmed by the results obtained in the exchange rate equation. Since the basic channel of the Dutch disease is through exchange rate appreciation, the expectation was for increased inflows especially windfall flows from the natural resources to appreciate the exchange rate significantly, thereby causing a Dutch disease. The results obtained however showed that, increased inflows as given by the coefficient of LNFDI did not impact significantly on exchange rate and for that matter Dutch disease.

Even though foreign exchange inflows significantly explains import demand in Ghana, there is the possibility of these imports being capital and intermediate goods which have the potential of further raising output and competitiveness of the tradable sector, thereby mitigating and muting any Dutch disease effects in the economy. Again, a decline in the agricultural sector which is undoubtedly the tradable sector in Ghana did not increase the demand for imports in Ghana. The Dutch disease theory is that, imports will increase tremendously to fill the increased demand in the collapsed tradable sector. Thus the study established that, the relationship between the Dutch disease (decline in agricultural output as a result of windfalls from natural resources) and import demand is insignificant and inconsequential in Ghana since a decline in agricultural output (Dutch disease) had no significant impact on import demand.

Also, the study did not find any evidence of a significant impact of windfall inflows on the real effective exchange rate which is the major channel of the Dutch disease phenomenon. In fact, the study showed that, other variables like increased openness of the economy as well as the availability of reserves were more important causes of exchange rate appreciation rather than foreign inflows. Considering all these results and evidences, we can conclude that Ghana is unlikely to surfer from any Dutch disease phenomenon with the inflow of natural resource windfalls, especially the inflows from the new oil and gas industry. We therefore do not reject the null hypotheses of no spending effect of the Dutch disease and no appreciation effect of inflows in Ghana.

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS, POLICY IMPLICATIONS AND CONCLUSIONS

5.0 Introduction

This chapter summarizes the major findings of the research, outlines the policy implications of the findings and concludes the study.

5.1 Summary of Findings

- Firstly, loss of competitiveness of tradable sector (decline in agriculture) (LNYAG) is associated with increased imports as indicated by the negative sign. This relationship is however of no statistical significance. This finding is further supported by the fact that agricultural decline in Ghana (evidence of Dutch disease) only follows a natural growth process and not as a result of any Dutch disease effect as the spending effect of the Dutch disease proxied by LNREER could not be validated in the Dutch disease equation.

- The study also found that, the size of the economy (LNGDP) has no significant impact on imports in the long run but significantly explains the level of imports in the short run. This finding seem to learn credence to the first finding that the increased imports in Ghana as the economy expands, is just the Balasa-Samuelson effect and does not have any Dutch disease effect as these increases are adjusted in the long run in such a way that the tradable sector is not hurt.

- Real exchange rate movement does not determine the demand for imports in Ghana as its impact on imports is not statistically different from zero (0). Better still, exchange rate depreciation (appreciation) does not reduce (increase) imports in Ghana. Demand for imports is thus relatively inelastic. This can be explained by the fact that the Ghanaian economy is import dependent as the essential items such as food, energy and machinery are largely imported.

- The terms of trade moderately determines the level of import demand in Ghana. This finding to some extent suggests that the country's exports earnings are only moderately correlated with its import demand. The results obtained suggests that the impact of terms of trade on import demand is only moderate, such that as the country earns more revenue from its oil and other natural resource exports, its import demand moderately goes up, so that, the expected appreciation of the local currency that must occur to cause a Dutch disease is only moderate. Investment of the remaining revenue (that is not spent on imports) in the productive tradable sector (agriculture) enhances the productivity and competitiveness of this sectors thereby avoiding the occurrence of Dutch disease.

- Again, an attempt was made to examine the impact of windfall inflows proxied by LNFDI, on imports and it was found that windfall inflows had significant impact on imports in Ghana. Given the positive impact of inflows on imports, coupled with the fact that Dutch disease could not explain rising imports in Ghana, we interpreted this relationship to mean that the increased imports are perhaps of capital and intermediate goods (investment goods) which generates positive externalities to the tradable sectors thereby neutralizing any Dutch disease effects. As indicated by Oteng-Abayie and Frimpong, (2006), "*In the long-run, investment and exports expenditures are the major determinants of movements in imports in Ghana.*" This finding is further supported by the fact that inflows have insignificant impact on the real exchange rate.

- Also, it was found that increased trade openness (liberalization of trade) and growing private consumption were largely responsible for the increases in import demand in Ghana. Again, where as openness had appreciating effect on the real exchange rate, private consumption had depreciation effect on the real exchange rate, implying growing private consumption in Ghana is tradable goods bias. The problem however is that, the increase in private consumption is met significantly from imports probably because of the effects of trade liberalization on the real exchange rate.

- It was also found that several factors that include; reserves, inflation, terms of trade and private consumption (in the short run), other than windfall inflows affect the real exchange rate, and as a result, there is no evidence of any appreciation of the exchange rate as a result of the inflows and for that matter any Dutch disease in Ghana following windfall inflows.

- Last but not the least, the spending effect of the Dutch disease is not supported in the study as the proxy for the spending effect of the Dutch disease has no significant impact on the tradable sector (agriculture). Rather, decline in the tradable sector (Dutch disease) is only a consequence of economic growth theory.

5.2 Recommendations and Policy Implications

The policy implication of the insignificant relationship between LNYAG and imports is that, increased imports cannot be attributed to any Dutch disease effects in Ghana. Therefore, measures to curtail increased imports of goods and services in Ghana must be directed at appropriate policies rather than those policies that sought to deal with the Dutch disease phenomenon. Again, the irresponsiveness of REER to imports seems to learn credence to the finding that LNYAG does not impact significantly on imports. The implication here is that, though improvement in the tradable sector can be pursued, targeting exchange rate as a means of influencing (reducing) imports so as to improve the tradable sector may not be an appropriate policy measure since the response of exchange rate to imports is virtually inconsequential.

Furthermore, it was found that, the factors that are most likely to affect import demand in Ghana are private consumption and trade liberalization and to a little extent terms of trade. The policy implication of these findings is that, import demand in Ghana can be controlled appropriately by adjusting any of these variables. Specifically, it was found that private consumption had depreciating impact on the exchange rate which implies that private consumption in Ghana is tradable goods bias. This at first may seem to be good for the domestic tradable sector, but on a second thought not all good for the domestic tradable sector as prices of these goods are internationally determined and so the increased demand for traded goods as a result of increase in private consumption can either be met from imports or domestically based on prevailing prices. The problem is further worsened by the fact that trade liberalization had appreciation effect on the exchange rate; meaning domestic tradable goods cannot actually compete with their foreign traded counterparts. Considering the effect of these two variables (LNCON and

LNTRADE) on the real exchange rate and imports, it is prudent for government to rethink its trade liberalization policy, as this unduly make the domestic traded sector uncompetitive in international markets. The government must be selective in deciding which areas of the economy to liberalize and which areas to put controls so as to reduce, if not eliminate entirely the adverse effects of increased openness of the economy.

Finally, the study did not find any evidence of harmful effects of foreign capital inflows from the country's natural resources as the Dutch disease will often predict. Perhaps the increased imports that follows the inflows are of capital and intermediate goods in nature and therefore may tend to enhance productivity in the tradable sector in particular and improvement in economic conditions in the country in general. At this point it may therefore be unwise to think of adjusting imports artificially in Ghana, since this variable adjusts naturally to bring about improved economic conditions in the country. As the terms of trade variables shows in the import demand equation as well as the exchange rate equation, imports and export are only moderately positively correlated and as such improvement in the terms of trade results in some moderate increased imports. Therefore, there is some level of moderate adjustment even at this point, then some adjustment from the point of view of investing the inflows in productive traded sectors of the economy that generate positive spillovers to the economy. Thus there is complete adjustment of economic fundamentals in the long run.

5.3 Conclusions

The major objective of the study was to examine the relationship between import demand and the Dutch disease in Ghana with the specific case on foreign capital inflows that come as a result of the natural resources such as gold, cocoa and oil. The ARDL Bounds Testing procedure to cointegration was used to carry out the study.

Based on the results obtained in the study, though the implied negative relationship between the Dutch disease and import demand is achieved, this relationship was insignificant and therefore there was no evidence to support the proposition that increased imports in Ghana are as a result of Dutch disease (decline in tradable sector) effects, at least over the period of study of this research.

Interestingly, there is evidence of a positive significant impact of foreign capital inflows on import demand in Ghana. The implication is that, as capital flows into the country, it leaves in the form of imports and therefore may not cause any exchange rate appreciation and for that matter Dutch disease in Ghana. Given that rising import demand in Ghana was not attributable to falling traded sector (Dutch disease) as given by LNYAG, the interpretation of the significant impact of inflows on import was that, the rising imports are perhaps of capital and intermediate goods in nature. These kinds of imports are mainly imported for investment and further production purposes and therefore generate positive externalities in the tradable sectors of the economy. The study draws on the empirical work of Oteng-Abeyie and Frimpong (2006) on Ghana as well as the insignificant impact of inflows on the real effective exchange rate (LNREER) to come to this conclusion. There is therefore no reason to fear that inflows from natural resources have Dutch disease effects in Ghana.

There are other important variables such as increase liberalization of the economy as well as the level of reserves that could have adverse effects on the economy; as these variables basically tend to appreciate the real exchange rate as well as reduce tradable sector (agriculture) shares in GDP in Ghana. The adverse effect of these variables (degree of openness of the economy and reserves) is clearly indicated in the exchange rate model as these variables have appreciating effects on the exchange rate and therefore the tendency to cause a collapse of the tradable agricultural sector in Ghana.

Finally, the study did not find any evidence to support the existence of any Dutch disease in Ghana. At least the spending effect of the Dutch disease could not be validated. Though the study does not build a prediction model, the research is of the firm conviction based on the results obtained; that economic, social, institutional, environmental and political conditions in Ghana are well developed and grounded and therefore isolates Ghana from a host of its African counterparts such as Nigeria, Angola and many others. Therefore, Ghana is most unlikely to surfer from any Dutch disease as a result of its new found oil as has been argued by many people since the announcement of the oil find in 2007.

The alternative hypotheses testing the spending effect of the Dutch disease and appreciating effects of inflows could not be rejected in the study as we could not establish any evidence of a significant impact of the spending effect of the Dutch disease, as well as any appreciating effect of inflows (LNFDI) on agricultural shares of GDP and exchange rate respectively. However, the null hypothesis testing the use of inflows to finance imports could not be rejected as inflows was highly significant in influencing import demand. This probably is the reason for the rejection of the impact of inflows on exchange rate.

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APPENDIX I

RESULTS OF THE ARDL ESTIMATES FOR THE VARIOUS EQUATIONS

Table 1: Autoregressive Distributed Lag Estimates (Import Model)

ARDL(0,1,0,0,0,1,1,1) selected based on Schwarz Bayesian Criterion			
Dependent variable is LNMT			
Regressor	Coefficient	Standard error	T-Ratio [Prob]
LNGDP	2.7448	.79954	3.4329[.003]
LNGDP (-1)	-2.1108	.75771	-2.7858[.013]
LNTOT	-.14712	.084061	-1.7501[.098]
LNYAG	-.0031121	.074769	-.041622[.967]
LNFDI	.031703	.013129	2.4147[.027]
LNREER	.057420	.050481	1.1375[.271]
LNREER (-1)	-.094247	.035540	-2.6518[.017]
LNCON	1.0046	.068792	14.6030[.000]
LNCON (-1)	.11171	.067925	1.6446[.118]
LNTRADE	1.1012	.069820	15.7716[.000]
LNTRADE (-1)	-.16169	.065209	-2.4796[.024]
C	-11.3856	10.5693	-1.0772[.296]
T	-.024938	.032761	-.76123[.457]
R-Squared	.99949	R-Bar-Squared	.99912
S.E. of Regression	.034952	F-stat. F(12, 17)	2756.8[.000]
Mean of Dependent Variable	21.5181	S.D. of Dependent Variable	1.1808
Residual Sum of Squares	.020768	Equation Log-likelihood	66.5652
Akaike Info. Criterion	53.5652	Schwarz Bayesian Criterion	44.4574
DW-statistic	1.6206		

Table 2: Autoregressive Distributed Lag Estimates (Exchange Rate Model)

ARDL(1,1,0,0,0,1,1) selected based on Schwarz Bayesian Criterion			
Dependent variable is LNREER			
Regressor	Coefficient	Standard error	T-Ratio [Prob]
LNREER(-1)	-.30350	.10836	-2.8009[.012]
LNCON	.36073	.25788	1.3988[.180]
LNCON(-1)	1.3066	.28467	4.5899[.000]
LNTOT	1.1323	.26470	4.2778[.001]
LNRES	-.40486	.070586	-5.7357[.000]
LNFDI	.034797	.041692	.83461[.416]
LNINFL	.58245	.31786	1.8324[.084]
LNINFL(-1)	1.2011	.39699	3.0254[.008]
LNTRADE	-.94485	.16272	-5.8066[.000]
LNTRADE(-1)	-1.1480	.23097	-4.9702[.000]
C	36.8980	4.6591	7.9196[.000]
T	.13575	.071272	1.9047[.074]
R-Squared	.98813	R-Bar-Squared	.98045
S.E. of Regression	.12448	F-stat. F(11, 17)	128.6466[.000]
Mean of Dependent Variable	5.1113	S.D. of Dependent Variable	.89023
Residual Sum of Squares	.26341	Equation Log-likelihood	27.0202
Akaike Info. Criterion	15.0202	Schwarz Bayesian Criterion	6.8164
DW-statistic	2.2689	Durbin's h-statistic	-.89152[.373]

Table 3: Autoregressive Distributed Lag estimates (Dutch Disease Model)

ARDL(0,0,0,0,0) selected based on Schwarz Bayesian Criterion			
Dependent variable is LNAGRIC			
Regressor	Coefficient	Standard error	T-Ratio [Prob]
LNREER	.046363	.035669	1.2998[.206]
LNTRADE	-.0033536	.065613	-.051111[.960]
LNPYC	-.14884	.047930	-3.1054[.005]
C	4.5979	.33573	13.6950[.000]
T	-.011400	.0036740	-3.1029[.005]
R-Squared	.92888	R-Bar-Squared	.91750
S.E. of Regression	.054741	F-stat. F(4, 17)	81.6323[.000]
Mean of Dependent Variable	3.7449	S.D. of Dependent Variable	.19059
Residual Sum of Squares	.074914	Equation Log-likelihood	47.3210
Akaike Info. Criterion	42.3210	Schwarz Bayesian Criterion	38.8180
DW-statistic	1.3111		

Table 4: Variable Deletion Test (OLS case) Import Demand Model

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Dependent variable is DLNMT
List of the variables deleted from the regression:
LNMT(-1) LNRGDP(-1) LNTOT(-1) LNYAG(-1) LNFDI(-1)
LNREER(-1) LNCON(-1) LNTRADE(-1)
29 observations used for estimation from 1982 to 2010

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Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLNMT(-1)	-.14600	.21862	-.66782[.516]
C	-.073189	.054876	-1.3337[.205]
T	.0017366	.0016009	1.0848[.298]
DLNRGDP	1.0931	.61086	1.7894[.097]
DLNRGDP(-1)	-.89957	.60264	-1.4927[.159]
DLNTOT	.073355	.094362	.77737[.451]
DLNTOT(-1)	-.18984	.10383	-1.8285[.091]
DLNYAG	-.072651	.076447	-.95034[.359]
DLNYAG(-1)	.17216	.096041	1.7926[.096]
DLNFDI	.053965	.018436	2.9271[.012]
DLNFDI(-1)	.0017743	.014944	.11873[.907]
DLNREER(-1)	-.019058	.034113	-.55867[.586]
DLNCON	1.0116	.053080	19.0587[.000]
DLNCON(-1)	.049955	.23927	.20878[.838]
DLNTRADE	1.1610	.061717	18.8116[.000]
DLNTRADE(-1)	.093401	.26487	.35263[.730]

****

Joint test of zero restrictions on the coefficients of deleted variables:
Lagrange Multiplier Statistic CHSQ(8)= 26.8067[.001]
Likelihood Ratio Statistic CHSQ(8)= 74.8747[.000]
F Statistic F(8, 5)= 7.6388[.019]

****

Table 5: Variable Deletion Test (OLS case) Exchange Rate Model

****

Dependent variable is DLNREER

List of the variables deleted from the regression:

LNREER(-1) LNCON(-1) LNTOT(-1) LNRES(-1) LNFDI(-1)

LNINFL(-1) LNTRADE(-1)

29 observations used for estimation from 1982 to 2010

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
C	.036081	.27358	.13188[.897]
T	.0031364	.0074984	.41827[.682]
DLNREER(-1)	-.38454	.15498	-2.4812[.026]
DLNCON	-.39578	.35563	-1.1129[.284]
DLNCON(-1)	-1.0206	.36689	-2.7818[.015]
DLNTOT	1.0251	.41820	2.4511[.028]
DLNTOT(-1)	.024996	.44489	.056186[.956]
DLNRES	-.25514	.10290	-2.4795[.026]
DLNRES(-1)	-.13212	.11105	-1.1898[.254]
DLNFDI	.044874	.076390	.58744[.566]
DLNFDI(-1)	.021521	.069647	.30900[.762]
DLNINFL	.74078	.50675	1.4618[.166]
DLNINFL(-1)	.70072	.53761	1.3034[.213]
DLNTRADE	-.63865	.24021	-2.6588[.019]
DLNTRADE(-1)	-1.1367	.25952	-4.3799[.001]

****

Joint test of zero restrictions on the coefficients of deleted variables:

Lagrange Multiplier Statistic CHSQ(7) = 23.4363[.001]

Likelihood Ratio Statistic CHSQ(7) = 47.8801[.000]

F Statistic F(7, 7) = 4.2124[.039]

Table 6: Variable Deletion Test (OLS case) Dutch Disease Model

****

Dependent variable is DLNAGRIC
List of the variables deleted from the regression:
LNAGRIC(-1)   LNPYC(-1)   LNREER(-1)   LNTRADE(-1)
29 observations used for estimation from 1982 to 2010

****

Regressor	Coefficient Error	Standard	T-Ratio[Prob]
C	-.0067133	.035733	-.18787[.853]
T	.3861E-4	.0018531	.020838[.984]
DLNAGRIC(-1)	-.093211	.23001	-.40525[.690]
DLNREER	.079839	.062447	1.2785[.216]
DLNREER(-1)	.022880	.049476	.46244[.649]
DLNTRADE	.0094739	.075613	.12529[.902]
DLNTRADE(-1)	.024370	.11131	.21894[.829]
DLNPYC	-.22419	.083594	-2.6820[.014]
DLNPYC(-1)	.010879	.099977	.10882[.914]

****

Joint test of zero restrictions on the coefficients of deleted variables:

Lagrange Multiplier Statistic	CHSQ(4)	=	15.5830[.004]
Likelihood Ratio Statistic	CHSQ(4)	=	22.3523[.000]
F Statistic	F(4, 16)	=	4.6457[.011]

****

APPENDIX II

CUSUM AND CUSUMQ TESTS FOR COEFFICIENTS STABILITY

Figure 1: CUSUM Test (Import Demand Model)

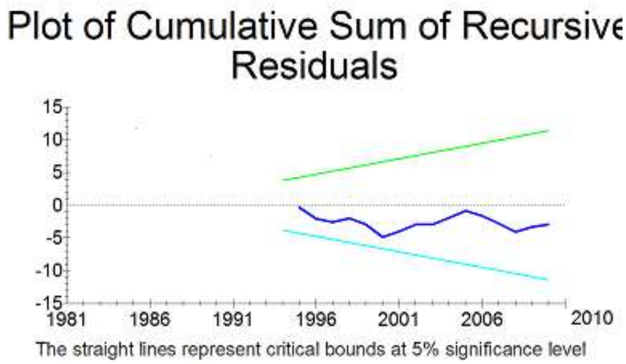


Figure 2: CUSUMQ Test (Import Demand Model)

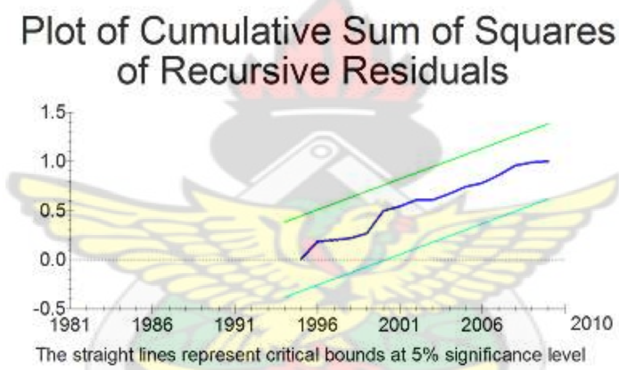


Figure 3: CUSUM Test (Exchange Rate Model)

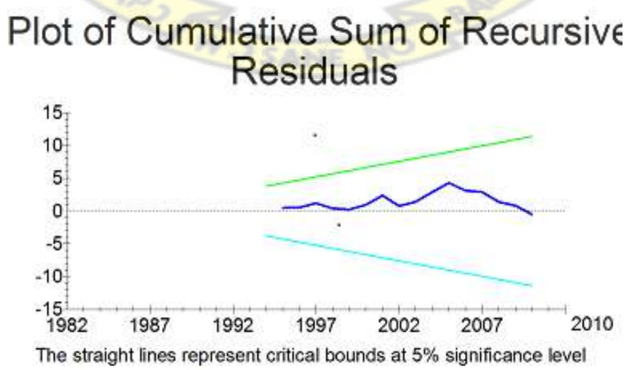


Figure 4: CUSUMSQ Test (Exchange Rate Model)

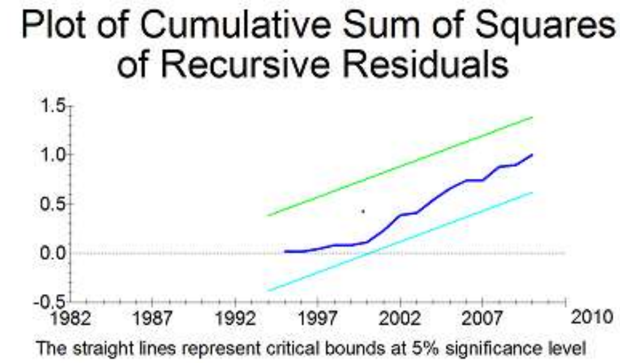


Figure 5: CUSUM Test (Dutch Disease Model)

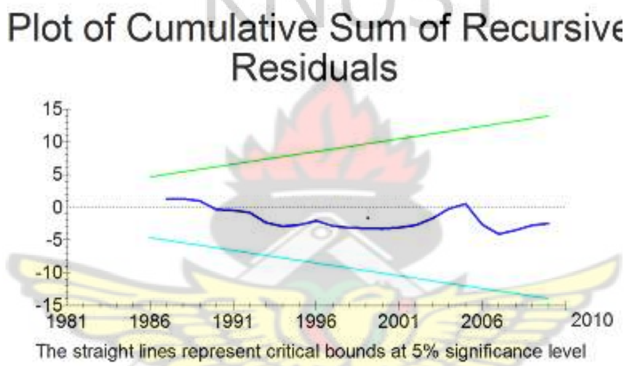
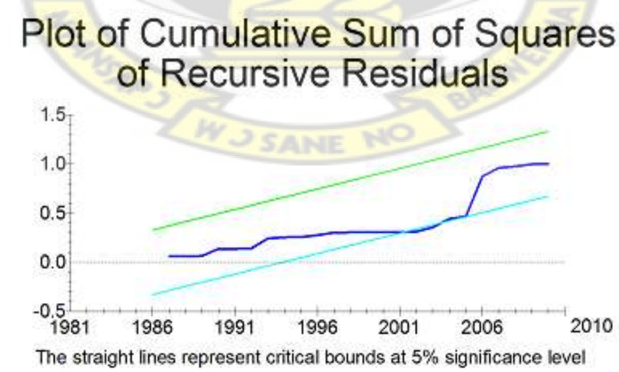


Figure 6: CUSUMQ Test (Dutch Disease Model)



APPENDIX III
DATA USED FOR THE STUDY
Table 7: Data Used for the Study

Year	LNMT	LNGDP	LNTOT	LNYAG	LNFDI	LNREER	LNCON	LNTRADE	LNAGRIC	LNPYC	LNRES	LNINFL
1980	19.82	21.69	5.34	-0.28	16.56	6.62	22.03	-1.73	-0.51	6.00	5.29	-1.25
1981	19.23	21.65	5.22	-0.42	16.60	7.42	22.02	-2.29	-0.59	5.92	5.26	-0.47
1982	18.60	21.58	4.82	-0.40	16.60	7.64	22.01	-2.76	-0.52	5.84	5.33	-0.27
1983	19.30	21.53	5.13	-0.39	14.69	8.18	22.02	-2.15	-0.52	5.82	5.38	0.52
1984	19.97	21.62	4.88	-0.54	14.50	6.30	22.08	-1.67	-0.66	5.86	5.97	0.85
1985	20.23	21.67	4.814	-0.60	15.53	5.98	22.05	-1.41	-0.73	5.85	6.26	0.95
1986	20.86	21.72	4.90	-0.63	15.27	5.52	22.28	-1.00	-0.73	6.06	6.37	1.17
1987	21.00	21.76	4.88	-0.57	15.36	5.23	22.19	-0.77	-0.68	5.91	5.622	1.51
1988	20.94	21.82	4.83	-0.59	15.42	5.13	22.20	-0.86	-0.70	5.91	5.69	1.78
1989	20.96	21.87	4.66	-0.60	16.52	5.06	22.21	-0.88	-0.70	5.89	6.05	2.00
1990	21.14	21.90	4.60	-0.69	16.51	5.05	22.33	-0.85	-0.80	5.98	5.64	2.32
1991	21.24	21.95	4.62	-0.69	16.81	5.08	22.42	-0.85	-0.79	6.07	6.43	2.49
1992	21.33	21.99	4.55	-0.69	16.92	4.95	22.43	-0.77	-0.80	6.01	5.98	2.58
1993	21.49	22.04	4.49	-0.75	18.64	4.81	22.27	-0.56	-0.88	5.91	6.18	2.81
1994	21.41	22.07	4.54	-0.68	19.26	4.60	22.11	-0.47	-0.87	5.79	6.49	3.03
1995	21.47	22.11	4.66	-0.64	18.48	4.75	22.31	-0.55	-0.85	5.93	6.65	3.49
1996	21.74	22.16	4.68	-0.63	18.60	4.83	22.36	-0.32	-0.82	5.98	6.80	3.86
1997	22.01	22.20	4.73	-0.74	18.21	4.89	22.47	-0.15	-0.91	5.95	6.42	4.08
1998	21.97	22.24	4.82	-0.71	18.93	4.95	22.50	-0.21	-0.91	6.01	6.12	4.26
1999	22.06	22.29	4.69	-0.75	19.31	4.94	22.61	-0.20	-0.92	6.02	6.27	4.38
2000	21.93	22.32	4.60	-0.68	18.92	4.52	22.15	0.14	-0.93	5.55	5.74	4.60
2001	21.95	22.36	4.66	-0.72	18.30	4.53	22.20	0.09	-0.93	5.60	5.93	4.88
2002	21.94	22.41	4.90	-0.70	17.89	4.52	22.35	-0.02	-0.94	5.72	6.45	5.03
2003	22.18	22.46	4.90	-0.66	18.73	4.53	22.54	-0.02	-0.91	5.91	7.29	5.26
2004	22.40	22.51	4.82	-0.63	18.75	4.51	22.68	-0.01	-0.88	6.04	7.46	5.38
2005	22.61	22.57	4.82	-0.68	18.79	4.60	22.88	-0.01	-0.89	6.20	7.54	5.52
2006	22.84	22.63	4.85	-1.06	20.27	4.65	23.54	-0.41	-1.19	6.82	7.72	5.62
2007	23.03	22.69	4.91	-1.11	20.56	4.64	23.76	-0.42	-1.24	6.98	7.95	5.72
2008	23.26	22.77	5.04	-1.02	20.92	4.60	23.93	-0.36	-1.17	7.11	7.61	5.87
2009	23.10	22.82	5.13	-0.95	21.24	4.51	23.78	-0.33	-1.15	7.00	8.05	6.05
2010	23.21	22.88	5.16	-0.99	21.65	4.58	23.93	-0.45	-1.20	7.15	8.46	6.15

Source: Authors Calculation Using Annual Data from the World Bank WDI 2011, IMF's IFS 2011, United Nations Conference on Trade and Development (UNCTAD) Hand Book of Statistics 2011 and Bank of Ghana (BoG) 2011.