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RESULTS & DISCUSSION
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IMPORT DEMAND, CAPITAL INFLOWS AND DUTCH DISEASE IN GHANA: THE CASE OF FOREIGN DIRECT INVESTMENTS (FDIS)

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ABSTRACT

This paper examined the relationship between import demand, capital inflows and Dutch disease in Ghana. In examining this relationship, two models were constructed and the Autoregressive Distributed Lag (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 gross domestic product (tradable sector contribution to output) on imports and second, to show the extent to which windfall inflows affect import demand. 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. 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 gross domestic product is as a result of economic development theory.

KEYWORDS

import demand, dutch disease, capital inflows, exchange rate.

1.0 INTRODUCTION

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). The importance of transparency and accountability, solid macroeconomic policies, economic diversification, prudent financial management, strong and effective institutions and laws to maximize the natural resources for economic development are highlighted in these studies. To this end, the parliament of Ghana enacted the Petroleum Revenue Management Act (PRMA) which was assented to in April 2011 by the President of Ghana. The framework for a transparent accountable and sustainable management of the revenue inflows from the oil for the benefit of all Ghanaians is provided in this act.

Dutch Disease is the process by which natural resource exports cause a steep contraction of a country's non-resource tradable sector such as manufacturing sector for developed countries or agricultural sector for developing economies. Alternatively, the Dutch disease phenomenon can be explained as a situation where revenue inflows from natural resource exports cause a decline in a nations productive sectors through an appreciation of the nation's real exchange rate coupled with rising wages. As a result of the real exchange rate appreciation together with the wage hikes, the country's productive sector in international markets becomes less competitive. (Bank of Ghana, 2007).

The Experiences of most African countries such as, Angola, Equatorial Guinea and Zambia informs us that efficient management of resource windfalls for the benefit of the citizenry is an enormous challenge for most developing economies.The works of Sachs and Warner, (1995), and Gylfason, (2001) established that natural resource endowed countries tend to grow at a slower pace than countries that are less endowed with natural resources.For most resource endowed countries, high poverty rates, corruption and weak institutions and conflicts have been the order of the day in the midst of all these wealth from the resources (Sala-i-Martin and Subramanian, 2003). Thus, natural resource discoveries and for that matter positive commodity price shocks in Africa have been described as the ''resource curse syndrome'' (Bategeka and Matovu, 2011).

According to Oteng-Abayie and Frimpong, (2006), the important items on Ghana's import bill constitute capital goods, energy and crude oil. This is clearly the case as the Bank of Ghana Annual Report for 2010 indicates that77.1 percent of total non-oil imports in Ghana were capital and intermediate goods, compared to 73.7 percent in 2009. They however contended also that a great deal of primary raw materials and consumables are imported. 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.

The approach of the Dutch disease studies has traditionally been through the exchange rate appreciation approach ignoring the nature of the import and export 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 a supply response induced inflows that offsets demand response creates no Dutch disease effects. 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.

This paper has five (5) sections. After the introductory section, section two covers both theoretical and empirical literature. Section three considers the methodology and models specifications. Section four contains the results and discussions. The study is concluded with the fifth section which includes summary of findings, recommendations and conclusion.

2.0 REVIEW OF LITERATURE

The discovery of oil in Ghana presents a great opportunity for the country to chat a new growth path that will bring about improvement in living conditions of all its citizens. However, the Dutch disease literature cautions us that, the expected structural change in the economy might deprive people in the traded goods sector some benefits (Christine, 2003).

The Dutch disease is often associated with discovery of a natural resource, but it can also result from a large increase in foreign currency inflows, including foreign aid, foreign direct investments (FDIs) or substantial natural resource price increases. Corden and Neary, (1982) are the cornerstones of a large Dutch disease literature which is built around how a natural resource boom initiate a process of "deindustrialization." The name "Dutch disease" perhaps arose from the effect of the discoveries of the North Sea gas on the manufacturing sector of the Dutch economy. The new found wealth caused an appreciation of the Dutch Guilder which consequently made all non-oil products of their economy non-competitive in international markets thereby leading to a decline in the manufacturing sector.

Corden and Neary, (1982) in their analysis of the Dutch disease posited that the economy can be divided into three main sectors. These include the natural resource sector, the non-resource tradable sector (agriculture or manufacturing sector) and the non-tradables sector (non-tradables services and construction). The real exchange rate can be 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 resource movement effect and the spending effect.

THE SPENDING EFFECT

This relates to a higher domestic income brought about by the resource boom culminating into extra-spending on both traded and non-traded goods.

THE RESOURCE MOVEMENT EFFECT

This results if in addition, the booming resource sector share domestic production factors with other sectors of the economy such that expansion in the resource booming sector bids up prices in these factors. The improved prices in the booming natural resource sector and non-traded resources sector attracts capital and labour away from the traded manufacturing or agricultural sectors thereby damaging these sectors. The ensuing consequence of both spending and resource movement effects is a fall in the output share of tradables relative to non-tradables.

It must be noted that, some views about the Dutch disease phenomenon point to some 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 is that the beneficiary economies are operating on their production possibilities frontiers, yet it is an undeniable fact that most developing economies do have excess capacity capable of absorbing the more spending from the resource boom without any Dutch disease (Mckinley, 2005).The phenomenon also assumes that all inflows are not entirely used to finance imports.There is also the assumption of a perfectly elastic demand for tradable goods. What is conspicuously clear here is that the Dutch disease effect 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 theeffects of the Dutch disease could be eliminated if the foreign currency inflows are used to induce a rapid supply response which more than offsets a demand response.

The empirical 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 investments (FDIs) on the tradable sectors of resource rich economies, as well as the effects of remittances on the tradable sector of recipient economies. More recent studies like Sosunov and Zamulin, (2007), Lartey, (2008) and Acosta et al, (2009) have explored the use of dynamic sectorial general equilibrium (DSGE) models to assess the impact of a positive external shock in a small open economy. These articles discussed the impact of a positive external shock as an increase in capital inflows (Lartery, (2008)), remittances (Acosta et al, (2009)) or a commodity price boom (Sosunov and Zamlin, (2007).

Gelb, (1998) provides an extensive cross-country empirical study of the Dutch disease where the effects of windfall on oil exporting countries were examined following large spending by such countries as a result of the oil price boom in 1973. Virtually no Dutch disease effects were found in this study. According to the author, a possible explanation for the missing Dutch disease was that these sectors were initially too small and that subsidies combined with price controls and active promotion of the traded sectors enable these countries to escape the Dutch disease.

Also, the empirical evidence concerning the interaction between additional capital inflows and Dutch disease effects has been inconclusive. The IMF, (2005) studied five African countries (Ghana, Ethiopia, Mozambique, Tanzania and Uganda) and found that inflows through aid surges do not have Dutch disease effects in these countries. In fact, they found that years in which aid inflows surged were associated with exchange rate depreciation. This is confirmed by Li and Rowe, (2006) who found a strong negative and significant relationship between aid surges in Tanzania and real effective exchange rate (REER). Earlier, Nyoni, (1998) for the period 1967-1993 found similar results where aid surges were associated with exchange rate depreciation. All these contrast the Dutch disease theory.

A more related study pertaining specifically to Ghana is the one by Sackey, (2001), who estimated an empirical model for Ghana's real exchange rate with focus on foreign aid. His results showed that though aid dependence in Ghana is quite high, this dependence led to real exchange rate depreciation and had a positive significant impact on exports. Again, the World Bank, (2009) using dynamic comparative general equilibrium (DCGE) model to run simulations over the period 2009-2029, showed a long downward shift in the long-term growth trajectory of the country with oil production compared to a non-oil scenario. They projected that by 2029, per capita income may be 14 percent lower indicating that Ghana may not benefit that much from its oil.

Rajan and Subramanian, (2009) in their study of 33 countries over the 1980s and 15 countries in the 1990s showed evidence of systematic adverse effect of foreign aid on competitiveness of exports. Fayad, (2010) using a sample of 73 aid receiving countries for the period 1981-2000 showed that aid surges had a strong negative impact on manufactured exports which is consistent with the Dutch disease phenomenon. Doubling of aid according to Prati et al, (2003) appreciates the real exchange rate by 4 percent in the short-term and up to over 30 percent in the long-term. Using DCGE model simulations, Bategeka and Matovu, (2011) studied how different spending options of the oil revenue in Uganda affect the competitiveness of the traded goods sector and concluded that in all scenarios, oil revenues inflows would lead to a significant exchange rate appreciation in Uganda. All these findings are consistent with the theory of the Dutch disease.

Lartey, (2011) in his studies of financial openness and the Dutch disease revealed that increased financial openness leads to exchange rate appreciation in more financially opened countries only. Studying the impact of exchange rate on non-oil exports in Azerbaijan, Hasanov and Samadova, (2010) concluded that real exchange rate has a strong negative impact on non-oil exports performance which they contended was the Dutch disease effects of oil production.

It is important to note that 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 investments (FDI). The empirical results that have been obtained in these studies have largely been mixed.

3.0 PROBLEM STATEMENT

Since authors such as (Ismail, 2010), (Arezki and Ismail, 2010), (Gylfason, 2001), (Adenauer and Vagasky, 1998) (Fayad, 2010) and others, contend that the exchange rate appreciation approach to studying the Dutch disease phenomenon, ignores 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, this paper seeks to fill this gap. Thus the paper adopts a new approach to studying the Dutch disease phenomenon by incorporating the import demand function which hitherto has not gained attention in the Dutch disease literature.

Moreover, the study sought to directly test for any Dutch disease effects in the traded agricultural sector using the share of agriculture in GDP as the dependent variable to verify whether agriculture which is the traded goods sector in Ghana shows any symptoms of Dutch disease. This approach is quite different from the one that has been used in most literature of the Dutch disease where the Dutch disease dependent variable is proxied by real exchange rate. This study is largely motivated by the recent discussions concerning the Dutch disease in Ghana and the knowledge gap in studying the phenomenon by incorporating the import demand function.

To fill this knowledge gap, an import demand function that captures the effects of both inflows and Dutch disease is estimated. Finally, a Dutch disease model is constructed to examine the Dutch disease effects on the competitive traded agricultural sector.

4.0 IMPORTANCE OF THE STUDY

As stated already, this study is largely motivated by the recent discussions concerning the Dutch disease in Ghana. To the best of the authors' knowledge, even though there is a vast knowledge on the subject matter, such studies often fail to go beyond the effects of inflows on the exchange rate which has often been referred to as the Dutch disease. This paper adopts a new approach to studying the Dutch disease phenomenon by filling a knowledge gap of incorporating the import demand function which hitherto has not gained attention in the Dutch disease literature. This contributes immensely to the existing literature on the Dutch disease phenomenon, particularly in a developing country context. Thus people from academia and policy makers in general will benefit immensely from this research work by knowing the exact link between the import demand function and Dutch disease, in a typical developing country context and hence inform policy prescriptions.

5.0 OBJECTIVES OF THE STUDY

The major objective of this study is to examine the Dutch disease phenomenon of capital inflows in Ghana taking into consideration the import demand structure of the country. Specific objectives of the study include:

1. To examine whether natural resource revenue inflows have Dutch disease effects in Ghana.
2. To examine the effects of inflows on imports.
3. To examine the Dutch disease effects on the traded competitive agricultural sector.
4. To outline other factors responsible for non-competitiveness of traded sector (agriculture).

6.0 RESEARCH METHODOLOGY

In this paper, we have incorporated the import demand function as crucial in determining whether or not Dutch disease effects will arise in Ghana as a result of capital inflows proxied by foreign direct investments (FDIs).

Data for this 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 (2011). 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.

The standard specification of the import demand model is similar to the specification of any other demand model. It treats imports as dependent on import prices and income. In modeling the import demand function for Ghana, we follow the imperfect substitutes model where neither imports nor exports are perfect substitutes to domestic goods (Goldstein and Khan, 1985). Since Ghana imports only a small fraction of world's import supply, it is realistic to assume perfectly elastic supply of world import supply to Ghana. This assumption reduces our model to a single equation import demand model. Relative prices can include price indices for both tradable and non-tradable sectors as these types of goods form the consumption basket of most consumers (Holder and Williams, 1995). The real exchange rate is included in this model to allow for the transmission of terms of trade shocks to import demand behaviour.

MODELING THE IMPORT DEMAND FUNCTION

The theoretical framework of the Dutch disease is that, as a result of the revenue inflows following discovery of a natural resource, there is an eventual decline in the local tradable goods sector (agricultural for developing countries or manufacturing sector, for most 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 increased imports. Thus a priori expectation of this variable is negative. The import model is therefore stated as:

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

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 capital inflows, TRADE is the openness index (trade liberalization index), REER is the real effective exchange rate and 't' time.

A priori expectation of GDP, CON, TOT and FDI is positive since both the substitution and income effects reinforce each other. 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 hence a priori positive relationship is expected for TRADE.However, a priori negative is sign is expected for YAG.

The import demand function can be appropriately put into logarithmic form as:

$$LNMt= \beta0 + \beta1LNGDPt+ \beta2LNTOTt+ \beta3LNYAGt+ \beta4LNCONt+ \beta5LNFDIt+ \beta6LNTRADEt+ \beta7LNREERt+ \mu t \quad (2)$$

The autoregressive distributed lag model (ARDL) bounds testing procedure developed by Pesaran et al, (2001) is used in this model to examine the cointegration relationship between the variables in the model. Per Pesaran et al, (2001), we specify a conditional unrestricted error correction model (UECM) of import demand as:

$$\Delta LNMt= \beta0 + \beta1LNMt-1 + \beta2LNGDPt-1 + \beta3LNTOTt-1 + \beta4LNYAGt-1 + \beta5LNCONt-1 + \beta6LNFDIt-1 + \beta7LNTRADEt-1 + \beta8LNREERt-1 + \sum_{i=0}^{p} \Phi1i\Delta LNMt-i + \sum_{j=0}^{p} \Phi2j\Delta LNGDPt-j + \sum_{k=0}^{p} \Phi3k\, \Delta LNTOT_{t-k} + \sum_{l=0}^{p} \beta4l\, \Delta LNYAG_{t-l} + \sum_{m=0}^{p} \beta5m\Delta LNCON_{t-m} + \sum_{n=0}^{p} \beta6n\Delta LNFDI_{t-n} + \sum_{p=0}^{p} 7p\Delta LNTRADE_{t-p} + \sum_{r=0}^{p} \beta8r\Delta LNREER_{t-r} + \mu t \quad (3)$$

Where all variables are as previously defined and Δis the first difference operator. Testing for cointegration relationship between the variables in the above conditional UECM involves three steps. The first step is to estimate the conditional UECM equation above by OLS, and conduct 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

The second step in 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 import demand (LNMt) based on the UECM equation (3) once cointegration is established.

$$LNMt= \alpha0+\sum_{i=1}^{p} \alpha1\Delta LNMt-i+ \sum_{i=1}^{q1} \alpha2\Delta LNGDPt-i+ \sum_{i=1}^{q2} \alpha3\, \Delta LNTOT_{t-i} + \sum_{i=1}^{q3} \alpha4\, \Delta LNYAG_{t-i} + \sum_{i=1}^{q4} \alpha5\Delta LNCON_{t-i} + \sum_{i=1}^{q5} \alpha6\Delta LNFDI_{t-i} + \sum_{i=1}^{q6} \alpha7\Delta LNTRADE_{t-i} + \sum_{i=1}^{q7} \alpha8\Delta LNREER_{t-i} + \mu t \quad (4)$$

The final step consists of the construction of an error correction model that captures the short-run and long-run dynamics of the variables as:

$$\Delta LNMt= \gamma0 + \sum_{i=0}^{p} \alpha1i\Delta LNMt-i+ \sum_{j=0}^{q1} \alpha2j\Delta LNGDPt-j + \sum_{k=0}^{q2} \alpha3k\, \Delta LNTOT_{t-k} + \sum_{l=0}^{q3} \alpha4l\, \Delta LNYAG_{t-l} + \sum_{m=0}^{q4} \alpha5m\Delta LNCON_{t-m} + \sum_{n=0}^{q5} \alpha6\, n\Delta LNFDI_{t-n} + \sum_{p=0}^{q6} \alpha7\, p\Delta LNTRADE_{t-p} + \sum_{r=0}^{q7} \alpha8r\Delta LNREER_{t-r} + \lambda ecmt-1 + \mu t \quad (5)$$

Where γsare the short-run coefficients, $ecmt-1$ is the error correction model and λ is the speed of adjustment to long-run equilibrium of the variables.

MODELING THE DUTCH DISEASE

A standard model of the Dutch disease should take into account the declining effect of the traded goods sector of the economy. A traded goods sector decline (agriculture or manufacturing) is hypothesised to be a function of the spending effect and resource movement effect.

Decline in Agric or Manufacturing = f (spending effect + resource movement effect) (6)

Authors like (Rudd, 1995), (Saleh-Isfahani, 1989) and (Holder and Williams, 1995) 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. 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 Agriculture share in GDP.The spending effect of the Dutch disease is captured by real exchange rate since increased spending by government feeds through domestic price level which eventually affects exchange rate thereby affecting the competitiveness of the tradable agricultural sector. This is particularly a better measure of spending effect since most African countries finance deficits by resorting to the printing of money. A measure of the resource movement cannot be captured in this paper due to lack of data but this is not expected to affect the results of the study in any way.

One explanation of declining agricultural share of GDP is what Rudd, (1995) referred to as "the natural development process." 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. We include a variable of openness (LNTRADE) to capture the effects of trade liberalization on the tradable sector. The Dutch disease model is therefore specified as:

AGRICt = f(REERt, PYCt, TRADEt) (7)

The log linear form of equation (7) is specified as:

$$LNAGRICt = \pi 0 + \pi 1 LNREERt + \pi 2 LNPYCt + \pi 3 LNTRADEt + ut \quad (8)$$

The Dutch disease equation also follows the bound testing procedure for cointegration as outlined in the import demand model. Therefore, the conditional unrestricted error correction model (UECM) is specified in equation (9).

$$\Delta LNAGRICt = \pi 0 + \Omega 1 LNAGRICt{-}1 + \Omega 2 LNREERt{-}1 + \Omega 3 LNPYCt{-}1 + \Omega 4 LNTRADEt{-}1 + \sum_{i=1}^{p} \pi 1i \Delta LNAGRICt{-}i + \sum_{j=1}^{u} \pi 2j \Delta LNREERt{-}j + \sum_{k=1}^{u} \pi 3k \Delta LNPYCt{-}k + \sum_{l=1}^{u} \pi 4l \Delta LNTRADEt{-}l + et \quad (9)$$

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

$$LNAGRICt = \rho 0 + \sum_{i=1}^{p} \rho 1 \Delta LNAGRICt{-}i + \sum_{i=0}^{u1} \rho 2 \Delta LNREERt{-}i + \sum_{i=0}^{u2} \rho 3 \Delta LNPYCt{-}i + \sum_{i=0}^{u3} \rho 4 \Delta LNTRADEt{-}i + vt \quad (10)$$

The lag length of the ARDL model is selected based on the Schwarz Bayesian Criterion (SBC). We specify the error correction model of the Dutch disease model as:

$$\Delta LNAGRICt = \Psi 0 + \sum_{i=0}^{p} \Psi 1i \Delta LNAGRICt{-}i + \sum_{i=j}^{u} \Psi 2j \Delta LNREERt{-}j + \sum_{i=k}^{u} \Psi 3k \Delta LNPYCt{-}k + \sum_{i=l}^{u} \Psi 4l \Delta LNTRADEt{-}l + \sigma ecmt{-}1 + et \quad (11)$$

Again, $\Psi 1,2$, $\Psi 3$ and $\Psi 4$ are the short-run dynamics elasticities and $\sigma$is the speed of adjustment.

The Augmented Dickey-Fuller (ADF) test is used to test the stationarity or otherwise of the variables.

7.0 RESULTS AND DISCUSSION

This section presents a thorough analysis and discussion of the regression estimates of the models discussed in the previous section.

7.1 TIME SERIES PROPERTIES OF THE DATA

A test for statioarityof the data involving the two models was done to ensure that the variables were integrated of at most order one I(1) to avoid spurious results since the ARDL breaks down with I(2) according toPesaran et al, (2001). The Augmented Dicker-Fuller test was used to check for unit root and order of integration of the variables. The test indicates that all the series were either I(0) or I(1) and hence the ARDL applied. The unit root test and cointegraion test results for both the import demand and the Dutch disease models are presented in tables 7.0, 7.1 and 7.2 respectively.

TABLE 7.0: UNIT ROOT TEST

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

Source: Author's Estimation

*Note: ** and *** denotes the rejection of the null hypothesis of non-stationarity at the 5% and 1% significance level respectively, I(0) indicates stationarity of the variable and I(1) indicates non-stationarity.*

7.2: COINTEGRATION TEST

TABLE 7.1: ARDL BOUND TEST FOR COINTEGRATION OF THE IMPORT DEMAND MODEL

Number of parameters (k)	Computed F-statistic	Bounds test critical values At 5%	
6	7.6388 [.019]**	Lower bound	Upper bound
		2.22	3.39

Source: Author's Estimation

*Note: ** denotes the rejection of the null hypothesis of no cointegration at the 5% significance level.*

TABLE 7.2: ARDL BOUND TEST FOR COINTEGRATION OF 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

Source: Author's Estimation

*Note: ** denotes the rejection of the null hypothesis of no cointegration at the 5% significance level.*

7.3 IMPORT DEMAND MODEL

TABLE 7.3: ESTIMATED LONG RUN COEFFICIENTS OF THE IMPORTS DEMAND MODEL

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]

Source: Author's Estimation

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

TABLE 7.4: RESULTS OF THE IMPORT DEMAND ERROR CORRECTION MODEL

ARDL (0,1,0,0,0,1,1,1) selected based on Schwarz Bayesian Criterion (SBC)

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 Squares	.020768	Equation Log-likelihood	66.5652
Akaike Info. Criterion	53.5652	Schwarz Bayesian Criterion	44.4574
DW-statistic		1.6206	

Source: Author's Estimation

*Note: *, ** and *** denotes the rejection of the null hypothesis at the 10%, 5% and 1% significance levels 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 7.3 that all the coefficients of the import model are inelastic since they are all less than one. Again we can see that all coefficients both in the long run and the error correction models are identical in terms of significance except in the case of GDP which is alternating in significancein the long-run and short-run.

From the results, LNRGDP has the expected sign and is insignificant in explaining import demand in Ghana in the long-run. It is however significant in determining import demand in the short-run. 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 significant in explainingboth the long and short-run behavior of import in Ghana at the 10% significance level. Its magnitude indicates thatGhanaians are less responsive to import prices. This is consistent with the Cochrane-Orcutt estimates of Abayie and Frimpong, (2006).

The share of non-resource agriculture shares in output (LNYAG) which is of particular interest in this study is what is called cyclical income and is measured by non-major natural resource share of 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 agricultural shares), the study's proposition that, Ghana is unlikely to suffer from the Dutch disease effect following its natural resource windfall inflows, can be upheld. William and Holder, (1995) who studied the Trinidad and Tobago's economy however, found that increased imports were partly attributable to Dutch disease effects.

Furthermore, the elasticity of foreign inflows (LNFDI) is statistically significant at the 5% level. 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 exchange rate appreciation that would causeDutch 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 in the long run only. This is particularly true since the empirical results indicated that the elasticity of imports with respect to relative prices (TOT) is inelastic and significant only at the 10% level. 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 through to the 2000s, as economic theory would have predicted.

The elasticity coefficients associated with private consumption (LNCON) and the openness index (LNTRADE) are highly significant even at the 1% level, and have the expected signs. Since a great deal of the inflows from the natural resources ordinarily accrues to government in the form of taxes and royalties, any government policy that is geared towards 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.

Evidence from table 7.4 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. Other diagnostic tests are presented in appendix 1.

7.4 THE DUTCH DISEASE MODEL

An issue of interest to this paper is to find out whether capital inflows in Ghana have Dutch disease effects which was done through the import demand model. This paper is also interested in establishing whether declining agricultural share of output could be as a result of Dutch disease or just some other factors such as the natural growth path that the now developed countries have followed. To this end, a Dutch disease model is specified with agricultural share as the dependent variable.

TABLE 7.5: EMPIRICAL RESULTS OF THE LONG RUN DUTCH DISEASE MODEL

ARDL (0,0,0,0,0) seclected based on the Schwarz Bayesian Criterion (SBC)

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]***

Source: Author's Estimation

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

TABLE 7.6: ESTIMATED SHORT RUN COEFFICIENTS OF THE DUTCH DISEASE MODEL

ARDL (0,0,0,0) selected based on the Schwarz Bayesian Criterion (SBC)

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 DW-statistic	42.3210 1.3111	Schwarz Bayesian Criterion	38.8180

Source: Author's Estimation

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

The results indicate that all the elasticity coefficients have their priori signs and are similar in both the short-run and long-run and the error correction model shows a 100% adjustment level. The coefficient associated with LNPYC (per capita income) is highly statistically significanteven 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. We can therefore conclude that declining share of agriculture in GDP is as a result of a natural development process in Ghana.

The coefficients of LNREER, a proxy for the spending effect of the Dutch disease, and LNTRADE, openness index, are however, statistically not different from zero; 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, though the implied signs are achieved in this study. 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.

In the error correction model, a relatively low R-squared value of .49741 is obtained; implying that approximately 50% variations in the share of agriculture 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. The model passed all the diagnostic tests as presented in table 7.6 and appendix 1.

In sum, we do not obtain any evidence of Dutch disease effects in Ghana at least from the estimation of Dutch disease equations. 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.

8.0 SUMMARY OF FINDINGS

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

- Even 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 also draws on the empirical work of Oteng-Abeyie and Frimpong, (2006) on Ghana to support this finding and conclusion. There is therefore no reason to fear that inflows from natural resources have Dutch disease effects 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.

9.0 RECOMMENDATIONS

Firstly, 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. In fact, the contrary is evidenced in this study even though insignificant. Perhaps the increased inflows are used to finance private consumption, especially of traded non-capital and intermediate goods. At this point it may therefore be unwise to think of Dutch disease effects from revenue inflows in Ghana, rather such inflows must be redirected towards capital and intermediate goods that will in the long run improve the domestic traded sector so as to make it internationally competitive.

Secondly, the policy implication of the significance of private consumption in Ghana is that increased private consumption has depreciating effects on the local currency. This means that private consumption is traded goods bias in Ghana. This has been an observable fact since a substantial percentage of Ghana's consumption is imported; ranging from food staples such as rice, sugar, to other items such as fabrics and even toothpicks. Since prices of traded goods are internationally determined, if Ghana is to benefit from this private consumption, it must initiate policies that would increase the production of traded goods domestically at very competitive prices so as to reduce imports of such products internationally.

Finally, the study does not support the hypothesis that declining agricultural share (the tradable sector) in GDP is as a result of Dutch disease effects; rather, the study established that declining share of tradable sector is due to the so called 'natural development process'. The implication here is that there is no fear of Dutch disease symptoms in Ghana following the revenue inflows from her natural resources. Therefore, an attempt to redirect investments to the sector must not be based on the premise of a Dutch disease.

10.0 CONCLUSIONS

Since the Dutch disease effects are absent in both the import demand model and the Dutch disease model, and that per capita income has a significant negative impact on agricultural decline, we conclude that tradable sector decline is only as a result of economic growth process and not a Dutch disease effect in Ghana.

11.0 LIMITATIONS

A major limitation of this study is that of appropriate measurement of variables. In order to decouple the Dutch disease effects in the import demand model, we employ what Holders and William (1995), called cyclical income. This variable measures the contribution of the traded goods sector to output. It was concluded that a good measure of cyclical income therefore would be non-resource agricultural share of GDP since most of Ghana's resource is agricultural in natures such as that of cocoa and timber. This might not be an accurate measure of cyclical income though and further research is needed in this area to establish a good measure of cyclical income.

Secondly, the Dutch disease model suffers from limited explanatory variables. This situation is attributable to non-availability of data on key explanatory variables such as the resource movement effect of the Dutch disease. The lack of adequate explanatory variables might be the cause of the low R-square in the Dutch disease model.

Lastly, the study might be susceptible to problems related to time series data and proxy variables since some proxy variables were used.

12.0 SCOPE FOR FUTURE RESEARCH

This study is of the view that a Dutch disease will not occur following inflows arising from discovery of natural resources if the inflows are used to finance imports. The study therefore departs from the traditional approach to the Dutch disease literature using the import demand function and incorporating a Dutch disease variable called LNYAG which Holders and William (1995), referred to as cyclical income. The study therefore sets the path for a new crop of studies of the Dutch disease taking into account the behavior of the import demand function of the country. A correlation analysis of the import and export functions of a country is also a good area of research to establish what the inflows are used for.

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APPENDIX

APPENDIX 1

TABLE 1.0: RESULTS OF THE IMPORT DEMAND 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

TABLE 1.1: DIAGNOSTIC TESTS RESULTS OF THE DUTCH DISEASE MODEL

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

APPENDIX 2

TABLE 2.0: 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 2.1: 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	

APPENDIX 3

TABLE 3.0: VARIABLE DELETION TEST (OLS CASE) IMPORT DEMAND MODEL

****

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

****

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 (6) = 26.8067[.001]
Likelihood Ratio Statistic CHSQ (6) = 74.8747[.000]
F Statistic F (6, 5) = 7.6388[.019]

****

TABLE 3.1: 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	Standard Error	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]

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