The Effect of Foreign Aid on Real Exchange Rate in Ghana

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Abstract

This paper assesses the effect of foreign aid inflows on real exchange rate in Ghana in order to test the hypothesis that large foreign aid inflows might lead to the appreciation of the real exchange rate of the recipient country and thus, impact negatively on its trade position, a case known as **"The Dutch Disease"** effect.

Using the ordinary least squares method of estimation, the paper finds that although foreign aid inflows to Ghana are quite high, foreign aid inflows have positive impact on the real exchange rate. In other words, foreign aid inflows lead to the depreciation of the cedi, implying that "The Dutch Disease" hypothesis of large foreign aid inflows is rejected in the case of Ghana.

In terms of policy recommendation, the results suggest that Ghana can still receive aid without fear of harming its exports competitiveness.

1 Introduction

Foreign aid, more commonly known as official development assistance (ODA) comprises medium and long term concessional and grants from bilateral (e.g. governments) and multilateral (e.g. International Monetary Fund, World Bank) sources (Moreira, 2002). Foreign aid has been transferred to developing countries in the form of project aid, commodity aid (including food aid), technical assistance, and programmed aid (balance of payments support and budget aid) (Cassen, 1994). A fundamental argument for aid, at least on economics, is that it contributes to economic growth in recipient countries. This has been the driving economic objective of aid for decades, formally established in the "two gap" model of Chenery and Strout (1966). In this approach investment is the cornerstone of growth and, at least initially, this requires imported capital goods.

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However, low-income countries typically face fundamental constraints, or financing gaps. First domestic savings rates are insufficient to provide the resources to meet desired levels of investment. Second, export earnings are not adequate to finance the importation of capital goods. Consequently, such countries are constrained in their ability to achieve a target growth rates. In this approach, the contribution of aid is to finance investment, including imports and capital goods.

Early empirical work on the impact of aid on growth was based on the "two-gap" model, often concentrating on the impact of aid on investment or savings rather than on growth per se. Recent studies of aid effectiveness have been based on some variant of neo-classical or endogenous growth models and assess the impact of aid on growth controlling for other variables, especially indicators of economic policy. One prominent view is that the correlation between aid and growth is, at best weak (Burnside and Dollar, 1997). Aid only appears to be effective in countries with appropriate economic policies, that is, "Aid works in a good environment" (World Bank, 1998). From this perspective, good policy is a necessary condition for aid effectiveness.

During the 1980s, several African countries experienced negative economic growth despite a substantial increase of aid inflow to these countries (White, 1992). "A large number of countries became more aid-dependent in the 1990s than they were in the late 1970s" (Tsikata, 1998).

This grim reality has raised many concerns over the effectiveness of aid. Questions such as "What is effective aid?", "What is ineffective aid?", and whether aid works or not have become a substantial source of debate among academic researchers and aid practitioners over the past few decades. These questions raised are directly applicable to Ghana.

1.1 Statement of the Problem

Concerns that large aid inflows will induce an appreciation of the real exchange rate and discourage the expansion of exports, particularly non-traditional exports, thereby damaging growth prospects in the recipient economy are rarely far the center of contemporary debates on the macroeconomics of aid to low-income countries. The Ghanaian economy, with support from the World Bank and International Monetary Fund (IMF), has since September 1980 witnessed the introduction of mechanisms to halt the downturn of the economy and to move on a path of sustained growth and development. This change elicited tremendous donor assistance in the form of grants, concessional loans and technical assistance. Net official development assistance (ODA), which constituted about 4% of GDP in 1980, rose to 10% in 1990 and has been in that neighborhood ever since. The overwhelming dependence on external aid inflows from developed countries for the supply of basic import commodities has made the Ghanaian economy vulnerable to policy conditionality that might accompany such assistance (Sackey, 2001).

Depending on whether these aid inflows have been temporary or permanent, and whether they were spent on imports or domestically produced goods and services, they have had various repercussions. Throughout the economic adjustment agenda, exchange rate and trade reform occupied a core position. The real exchange rate, by virtue of its impact on the international competitiveness of an economy, assumed an overriding importance among the cohorts of policy variables.

Surges in aid inflows are believed to be causing "Dutch disease" problems for the macroeconomic management of the economy. The management of aid has been

characterized by a combination of foreign exchange accumulation (both building reserves and eliminating arrears), credit to the banking system, and increased public spending especially on development projects. Efforts to maintain the real exchange rate in an area of increased aid inflows have kept inflation high (Younger, 1992). Yet, arguably, in the absence of aid inflows Ghana's growth and development efforts would have been stifled.

1.2 Objectives of the Study

In broad terms, the study sought to determine whether foreign aid inflows have generated **"Dutch Disease"** effect in Ghana or not. In order to achieve this broad objective, the following specific objectives were set:
- To find out whether foreign aid inflows have led to the depreciation or appreciation of the real exchange rate in Ghana.
- To determine whether foreign aid inflows have positively or negatively affected exports in Ghana.
- To make recommendations from the findings for macroeconomic management.

1.3 Justification of the Study

Both Ghanaians and donors should ask themselves, has the aid done any good? Thus, a study in this area is justified because it will:
- Let the general public realize the effect of foreign aid on the Ghanaian economy.
- Serve as an effective source to strengthen aid management measures to policy makers.
- Assist both donors and recipient governments to address the policy implications for making foreign aid more effective.
- Serve as basis for further research.

2 Review of Related Literature

2.1 Theoretical Review

Theoretically, there are two principal definitions of real exchange. In internal terms, real exchange rate has been defined as the ratio of the domestic price of tradable (exportable and importable) goods to non-tradable (domestic) goods within a single economy. That is: RER = Price of tradable goods / price of non- tradable goods. Where tradable goods refer to goods which are traded across national boundaries and non-tradable refer to goods which are not traded across national boundaries (Van Wijnbergen, 1985 and 1986).

In internal terms, Lansdsburg and Feinstone (1997) defined real exchange rate as the quantity of domestic goods required to buy one foreign good. This is expressed in terms of the price levels as: Real Exchange Rate (RER) = eP' / P Where e = nominal exchange rate. P = the consumer price index of the domestic country. P' = the consumer price index of a country.

The term **"Dutch Disease"** refers to the deindustrialization of a nation's economy that occurs when the discovery of a natural resource raises the value of that nation's currency, making manufactured goods less competitive with other nations, increasing imports and decreasing exports. The term was devised to describe the adverse impact on Dutch manufacturing of the increase in income associated with the discovery of natural gas in

the Netherlands in the 1960s, essentially through the appreciation of the Dutch real exchange rate (RER).

The focal point of the theory on aid inflows and Dutch Disease has been the impact exerted by aid on the relative prices of non-tradable goods (Van Wijnbergen 1985 and 1986). This theory holds that part of foreign aid will be channeled to the non-tradable sector of the economy causing a possible increase in the demand for non-tradable goods, thereby raising their price. Given that the real exchange (RER) is defined as the relative price of tradable goods to that of non-tradable goods (i.e., RER = Price of tradable goods / price of non- tradable goods), a rise in the price of the latter would result in a decline in the real exchange rate.

2.2 Empirical Review

Analysis of countries' experiences with sectoral booms has revealed varied results. The windfall gains from diamond exports in Botswana have not been associated with the Dutch disease (Harvey, 1992). Benjamin, Devarajan, and Weiner (1989) conduct a simulation with a computable general equilibrium (CGE) model of Cameroon and find that as an result of a boom in the oil sector, the agricultural sector is most likely to be hurt, whereas some components of the manufacturing sector will benefit. On balance, the non-oil tradable sector may not necessarily shrink.

In their analysis of the macroeconomic impact of aid in Nicaragua, Vos and Johanasson (1994) find that aid is weakly but negatively correlated with export volumes. They indicate that the simple negative correlation, which they find to be stronger during years of small aid inflows (the 1970s) than during the period of large aid inflows (the 1980s and 1900s), does not seem to make the case of a typical aid-associated Dutch disease.

Ogun (1995) also carried out a research on the relation between foreign aid and real exchange rate in Nigeria and found that aid inflows led to depreciation of the currency.

Using the newly developed technique to cointegration, the autoregressive distributed lag approach, Outtara and Issah (2003), used time series data from Syria to test the hypothesis that foreign aid inflows generate "Dutch disease" in the recipient country. They found that foreign aid inflows are associated with depreciation of real exchange rate.

In a model of the RER for Tanzania during 1967-93, Nyoni (1998) finds that aid was associated with RER depreciation. He presents figures indicating that the RER depreciated more sharply over the period 1985-93 than in the earlier nine-year period, despite a significant increase in ODA flows. This contrasts with the predications of the Dutch disease model since RER appreciation, the main channel through which aid is conjectured to affect the tradable sector adversely, did not materialize.

However, Falck (1997) also undertakes an assessment of aid-induced real exchange rate appreciation in Tanzania. The model for the determination of the real exchange rate specifies among other variables the real exchange rate lagged one period, rate of change of the nominal exchange rate, foreign aid, macroeconomic policy proxied by the growth of excess domestic credit, international terms of trade and investment. He computes twelve different real exchange rates indexes for Tanzania, applies a three-stage selection procedure to each one of them and estimates the model by the use of ordinary lest squares. Falck finds that foreign aid inflows cause the real exchange rate to appreciate which in sharp contrast to the findings of Nyoni (1998).

Van Wijnbergen (1986) applies a single regression equation to estimate the aid-real exchange rate nexus model for Africa countries. He finds a significantly negative

relationship between aid and the real exchange rate in four out of six African countries. He also demonstrates that the effect of the "aid boom" permanently lowers the total productivity in the export sector. Despite the real exchange rate being allowed to depreciate after the effect of the "aid boom", productivity does not return to the level before the "aid boom". Nevertheless, he argues that if capital markets were perfect, there should have been no problem after the effect of the "aid boom" as the private sector can re-borrow and re-invest after the economic recovery from this effect.

Analyzing the link between aid and "Dutch disease", Edwards (1989) estimate an empirical model specifying explanatory variable like international terms of trade, government consumption of non-tradable, measure of extent of controls over external aid inflows, index of severity of trade restrictions and exchange controls, measure of technological progress and ratio of investment to GDP. Ordinary least squares and instrumental variables techniques were used. He found that excessive aid inflows put pressure on the real exchange rate and causes it appreciate in the short run.

Using the CGE model, Weisman (1990) investigates the impact of aid inflows to Papua New Guinea. He finds that aid inflows increased government spending, which in turn increased the prices of non-traded goods and services. Producers responded to the increase in prices of non-traded goods by increasing supply in this sector and shifting resource from the production of traded goods. Therefore, aid inflows brought about the "Dutch disease" effect that threatened the export earning of Papua New Guinea.

Collier and Gunning (1992) also apply the CGE model to examine "Dutch disease" effects in African economies. They find that aid supported government spending that raised aggregate demand and exerted upward pressure on the prices of non-tradable sectors. As a result of the booming of non-tradable sectors, labour and capital were drawn away from the tradable sector. They illustrated that devaluation does reduces this inverse effect on tradable sectors.

White (1992a) points out that aid will lead to real exchange rate appreciation so long as part of the aid inflows is spent on non-tradable goods. The upward pressure on the real exchange rate is greater, the higher is the marginal propensity to spend on traded goods, the lower is the responsiveness of supply of non-traded goods, and the higher is the responsiveness of demand to price changes. The impact of previous aid inflows is that the real exchange rate has to depreciate when aid flows cease (White, 1992c).

On his part, Vos (1993) indicates that if the aid boom is temporary, there may be an inclination to consume the additional wealth or accumulate reserves to safeguard the economy against future losses. Where aid is of a permanent nature, the rational choice would seem to be to invest the "windfall gain" in order to maximize future consumption.

Analyzing the macroeconomic aspects of the effectiveness of foreign aid, Van Wijbergen (1986) points out that temporary aid flows will lead to temporary appreciation of the real exchange rate and will lead to a decline in the production of traded goods as well as exports. Collier and Gunning (1992), on the other hand, writing on aid and exchange rate adjustment in African trade liberalization is export promotion. In a simple exchange rate model, a higher export price is the only effect of liberalization. Aid-only liberalizations, although technically feasible, produce perverse resource shifts and require massive rapid nominal wage flexibility to avoid unemployment.

In an empirical analysis of the impact of aid on the RER in four CFA countries – Burkina Faso, Cote d'Ivoire, Senegal, and Togo during 1980 -1993, Adenauer and Vagassky (1998) find evidence of a direct relationship between aid flows and RER appreciation. They suggest that, during the period when the four countries received large aid flows,

their government deficits increased through high wage bills and para-public spending and their trade balances widened. The developments appear to lead support to the idea of Dutch disease, Nevertheless, as economic performance in the four countries was affected by adverse developments in the world prices of their primary exports and the appreciation of the French franc against the dollar during the latter part of the 1980s, it would have been useful to ascertain the role played by the CFA frances per U.S. dollar or French francs per U.S dollar exchange rates in the development of RER. Also, real export figures could help ascertain whether the deteriorating trade balances were driven by declining world prices, declining trade volumes, or both.

In an econometric model of RER behavior for Sri Lanka during 1974-88, White and Wignaraja (1992) find a direct relationship between total aid and remittances and RER appreciation. They suggest that increased aid flows, among other factors, played an important role in the failure of the RER to depreciate, despite depreciations of the nominal rate. Also, they associate the RER behavior with a disappointing performance of the manufacturing sector, lending support to the Dutch disease theory. In contrast, Bandara (1995) does not find support for the Dutch disease theory in an analysis of the impact. He indicates that despite the RER appreciation associated with foreign capital inflows, some tradable sectors may expand a result inline that of Benjamin, Devarajan, and Weiner (1989).

2.3 Review of Studies on Ghana

Assessing the impact of aid on macroeconomic management in Ghana, Younger (1992) finds that the increase in foreign aid to Ghana from an annual average of 3 percent of GDP during 1981-83 to 6 percent of GDP during 1984-87 gave rise to macroeconomic management problems that were associated with high inflation, an appreciating RER, and tight credit to the non-bank private sector. First, the increased availability of foreign exchange in the economy did not come from aid alone. The rise in aid flows was accompanied by a significant increase in private transfer and capital, consistent with the idea of pro-cyclicality between private capital, such a foreign direct investment (FDI) and foreign aid associated with policy reforms, while Younger suggests that the private sector was crowed out; the evidence to support such a claim is, best, very weak. He indicates that the Ghana government's response to aid inflows was a combination of foreign exchange accumulation, provision of credit to the banking sector, and increased public spending, especially on development projects. At the same times although private investment remained low, as the author indicates, the figures the presents indicates that the private investment-to-GDP ratio doubled to 5 percent during 1984-89, compared with 2.5 percent during 1980-83. Third, not only did Ghana's overall economic performance improve as compared with the period preceding the aid increase, but it also compared favorably with the average for low income countries in the sub-Saharan African region on many indicators, including growth of total and sectoral GDP, exports, and goes domestic investment.

Sackey (2001) a adopts a cointegration technique to examine the aid-real exchange rate relationship using annual time series data for the period 1962-1996 and found that although aid inflows are quite high, aid inflows have led to depreciations in the real exchange rate. He also estimated an export performance model for Ghana and found that aid inflows have also had a positive impact on export performance. He concluded his paper by emphasizing that for external aid to be an effective investment, policy

management needs to focus on ensuring the prevalence of sound macroeconomic fundamentals, among others.

The results of their estimations appear to be conflicting. Whilst some of the like Falck (1997) for Tanzania, White and Wignaraja (1992) for Sri Lanka and Younger (1992) for Ghana found that aid inflows caused the real exchange rate to appreciate, other such as Ogun (1995) for Nigeria, Nyoni (1998) for Tanzania and Sackey (2001) for Ghana found no evidence of "Dutch Disease". Thus, this study attempts to contribute to the aid –real exchange rate nexus by using a more targeted approach. In the next chapter, we outline the detailed methodology for the study.

3 Methodology

3.1 Model Specification

In order to estimate the effect of foreign aid inflows on the real exchange rate in Ghana, we establish a model in which real exchange rate is a function of foreign aid. However, since foreign aid is not the only determinant of real exchange rate, we include some other de like government consumption, GDP per capital, openness, terms of trade, growth of money supply as other explanatory variables. Thus, based on the works of Ouatarra and Strobl (1989), the baseline regression equation is assumed to take the form:

$RER_t = a_0 + a_1 Aid_t + a_2 G_t + a_3 GDPPC_t + a_4 Open_t + a_5 TOT_t + a_6 GM_t + \varepsilon_t$
where:

RER	=	Real exchange rate
Aid	=	Official development assistant
G	=	Real government consumption
GDPPC	=	Real per capita income
Open	=	Openness of the economy
TOT	=	Terms of trade
GM	=	Growth of money
ε	=	Error term

Real exchange rate is defined as the quantity of domestic goods required to buy one foreign good. This is expressed in terms of the price levels as: Real Exchange Rate $(RER) = eP^1 / P$

where e = nominal exchange rate. P = the consumer price index of a good in a foreign country. P = the consumer price index of a good in the domestic country.

Foreign aid specifically refers to official development assistance (ODA) such as loans and grants. Ratios are computed using values in U.S. dollars converted at official exchange rates.

Real government consumption includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but exclude government military expenditure that are part of government capital formation.

Real income per capita (Gross Domestic Product per capita) is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in

the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars.

Openness of the economy is given by the sum of exports and imports of goods and services measured as a share of gross domestic product.

The terms of trade refer to the ratio of the export price to the ratio of the import price.

That is $TOT = P^x / P^{m.}$

The growth of money refers to the average annual growth rate in money and quasi money. Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition is frequently called M2; it corresponds to lines 34 and 35 in the International Monetary Fund's (IMF) International Financial Statistics (IFS). The change in the money supply is measured as the difference in end-of-year totals relative to the level of M2 in the preceding year.

The expected theoretical impacts of the respective variables included in our model are as follows:

Aid	(-)	Tends to cause real appreciation by changing the composition of the demand for traded and non-traded goods, according to the "Dutch disease" theory of foreign aid.
GDPPC	(-)	The expected effect of this variable on RER is to be negative. This is because as development takes place, the productivity improvement in the tradable goods sector exceeds that of non-tradable goods sector. This implies that the decreased in the price of the former is relatively bigger than that in the later, thus, causes appreciation of the RER.
	(?)	The effect depends on the composition of government of consumption. Consumption of non-tradable tends to appreciate the RER, while that tradable leads to real depreciation.
OPEN	(?)	Openness of the economy would cause real depreciation (appreciation) if it reduces (increases) the demand for non tradables.
TOT	(?)	The effect of the terms of trade on the real exchange rate depends on whether the substitution or the income effect dominates. If the income (substitution) effect dominates then a deterioration of the TOT tends to cause real depreciation (appreciation).

GM　　　　　　　　(-)　　　　　　Changes in the money supply (expansionary monetary policies) would tend to raise the general price level and thus lead to an appreciation of the RER.

NB: Following our definition for the real exchange rate, a negative sign represents an appreciation of the real exchange rate whilst a positive sign represents a deprecation of the real exchange rate.

3.2 The Exports Equation

In order to estimate the relationship between export performance and real exchange rate, a simple export performance model abstracted from Vos (1998) is used. In this model, growth of real exports (Exp) is assumed to be a function of real exchange rate (RER, foreign aid inflows (Aid) and price of exports. That is:

$$EXP = \beta_0 + \beta_1\ RER + \beta_2 Aid + \beta_3 P^x + \varepsilon_t$$

Exports of goods and services represent the value of all goods and other market services to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government, services. They exclude labor and property income (formerly called factor services) as well as transfer payments. Data are in constant 1995 U.S. Dollars. The price of exports is a weighted average of the prices in U.S. dollars of goods and services exported with their respective share in the total exports of goods service as weights. It can be recalled that real exchange rate and foreign aid have been defined already under section 3.2.1.
The expected theoretical impacts are as follows:

RER　　　　　　　　(+)　　　　　　Increase in the real exchange rate are expected to result in exports expansion.

AID　　　　　　　　(?)　　　　　　A good policy environment (proxied by real net ODA toGhana)　tends to elicit positive response from the export sector. Aid inflows, by providing some sort of assistance to the export sector tend to encourage export competitiveness and output enhancement.

P^x　　　　　　　　(+)　　　　　　A rise in the price of exports, all other things being equal,　will lead to an increase in the supply of exports.

3.3 Sources of Data

The study employs annual time series data from Ghana over the period of 1970-2002. The data used to estimate the models are obtained from a number of the sources. The real exchange rates are obtained from the IMF International Financial Statistics Yearbook 1995. All the other variables were obtained from the World Bank World Development Indicators (WDI), 2004, CD Rom version except the series on price of exports that were extracted from the African Development Indicators, (2004).

3.4 Estimation Techniques

In order to estimate equations (1) and (2), we employ the ordinary least squares (OLS) methods of estimation. Thus, based on the classical assumptions, some relevant residual and specification tests are rigorously carried out. Since the presence of serial correlation in the residuals reduces the efficiency and forecasting powers of the estimators based on OLS estimates, the Durbin-Watson test for first order serial correlation in the residuals is conducted to ensure that there is no autocorrelation in the residuals.

The variance inflation factors test for checking the extent of collinearity between the explanatory variables will also conducted to ensure that the extent of collinearity between the explanatory variable is not severe. For, if the inter correlation between the explanatory variables is high, the estimates are indeterminate and the standard errors of these estimates become infinitely large (Koutsoyiansnis, 1973).

The White's test for heteroscedasticity will also be performed. This test is motivated by the observation that in many economic time series, the magnitude of the residuals appears to be related to the magnitude of the recent residuals. The presence of heteroscedasitcity itself does not invalidate standards least squares. However, ignoring it may result in loss of efficiency in the estimated parameters. The null hypothesis is that hetorscedasticity is not present.

The Ramsey RESET test is a general test for model specification errors resulting from omitted variable, incorrect functional from and correlation between the independent variable and the residuals, which may be due to errors in measurements, simultaneity and serially correlated disturbances. Under such specification errors, least square estimates will be biased and inconsistent and for that matter conventional inference procedures will be invalidated. The model is correctly specified if the F-statistic is insignificant at the given error level (mostly 5%).

The Jarque-Bera statistic is for testing whether the residuals are normally distributed. If the residuals normally distributed, the Jarque-Bera statistic, which has a chi-square distribution under the null hypothesis of normally distributed errors, should be insignificant.

4 Ordinary Least Squares Estimation

4.1 Results of the Real Exchange Rate Equation

The result of the real exchange rate equation (equation 1) estimated with OLS are presented in Table 4.2. The results of all the diagnostic tests performed are very satisfactory. The results of the F-test show that the F-statistic ($F_{(6,26)} = 45.0279$) is statistically significant at 1 present error level. This implies that we can reject the null hypothesis that all the parameters are zero at one percent error level this further implies that the overall regression is statistically significant.

The R^2 of 0.912212 (Adjusted R^{21} = 0.891953) shows that approximately, 91 percent of the variations in real exchange rate can be explained by foreign aid, real government consumption, real per capita income, the degree openness of the economy, terms of trade and growth of money. This high value of the R^2 shows that the overall model is statistically significant.

The results also show that there is absence of autocorrelation in the residuals. The Durbin-Watson statistic of 1.75 is closer to 2 (no autocorrelation) than to zero (perfect autocorrelation). Also, the first order autocorrelation coefficient which is 01131 is closer to zero (no autocorrelation) than 1 (perfect autocorrelation). This is therefore a confirmation that serial correlation between the error terms is not a serious problem in our model.

The Ramsey RESET test for the regression specification revealed that the model is correctly specified. The null hypothesis HO: specification is adequate is tested against the alternative hypothesis H1: specification is not adequate. The F-statistic $F_{(2, 24)} = 3.02827$ has a probability value of 0.067184. This implies that the null hypothesis cannot be rejected at 5 percent error level. This confirms that the model is correctly specified.

The White test for hetorosecedasticity is employed to test the presence or otherwise of hetoeroscedasitctiy. The null hypothesis "Heteroscedasticity is not present" is tested against the alternaive hypothesis "Heteroscedasticity is present". The Chi-square value of 30.913 is significant only at 27.5 percent error level. This means that we accept the null hypothesis of no heteroscedasticity implying that the model is free from heteroscedasticity.

By employing the variance inflation factors (VIF) technique of determining the presence of or absence of multitcollinearity among the variables, we found that there is a less problem of collinearity between the variables in the model.

The VIF $(j) = 1 / (1-R (j)^2)$, where R (j) is the multiple correlation coefficient between variable j and the other independent variables. Minimum posisbel value = 1.0 Values greater than 10.0 may indicates a collinearity problem. The results of the VIF test is shown in table 1

Table 1: Results of the Variance Inflation Factors Test

Variable	VIF
Aid	3.413
G	1.628
GDPPC	4.540
Open	3.756
TOT	2.988
GM2	1.457

From the table above, since all the values are far less than 10, it can categorically be concluded that multicollinearity is not a serious problem in the model.

Thus, the model passes all assumption of the OLS estimates. Table 2 presents the results of the parameters.

Table 2: Results of the Real Exchange Rate Equation

Variable	Coefficient	Stand. Error	T-statistic	P-value
Constant	-1351.91	440.964	-3.0658	0.005014
Aid	3172.91	1694.43	1.8726	0.072418
G	-800.624	2353.14	-0.3402	0.736412
GDPPC	5.99041	1.52254	3.9345	0.000554
Open	1127.63	251.699	4.4801	0.000133
TOT	-704.172	191.271	-3.6815	0.001067
GM2	521.944	265.745	1.9641	0.060296

R^2	**=**	**0.912212**	**Adjusted R**^{2}	**=**	**0.891953**
F-Statistic	**=**	**45.0279**	**DW**	**=**	**1.74873**

The estimated coefficient of the aid variable is positive (3,172.91) and is statistically significant at 10 percent error level. This means that aid is statistically important determination of real exchange rate. The coefficient implies that an increase in aid by one million U.S. dollars will cause the real exchange rate (measured as cedis per dollar) to increase by 3172.91. In other words, an increase in aid causes the price of the dollar in terms of the cedis to rise; implying a deprecation of the cedi. This result is contrary to the "Dutch disease" theory of foreign aid which states that an increase in foreign aid tends to cause real appreciation of the local currency. Thus, as far as Ghana is concerned, surges in foreign aid inflows causes depreciation of the cedi instead of appreciation. However, this result confirms that of Isaa and Quattara (2004) who found that increases in aid to Syria causes depreciation of the local of Syeria. His result was also significant at 10 percent. This same result corroborates the findings by Ogun (1995) for Nigeria, Nyoni (1998) for Tanzania, Sackey (2001) for Ghana and Quattara and Strobol (2003) for panel of CFA franc counties. Therefore, the potential "Dutch disease" effect associated with foreign aid inflows is not supported by this study. That is; aid does not generate "Dutch disease" in Ghana.

The coefficient of real government consumption is negative. This implies that increases in real government consumption cause the cedi to appreciate. The coefficient implies that an increase in government spending by one million US dollars causes the cedi to appreciate by 800.64 cedis all other things being equal. As argued earlier, this scenario could occur if government consumption is dominated by non-tradable goods. However, the coefficient is not statistically significant. In other words, the coefficient of real government of Ghana spends equally on tradable and non tradable goods.

The coefficient of real per capita income is positive (5.99041) and is statistically significant at 1 percent error level. This implies that higher income levels tend to increase the real exchange rate and hence depreciate the cedi. This is contrary to the prediction made in chapter three that, higher levels of income causes an appreciation of real exchange rate in a sense that, increases in GDP per capita will lead to a productivity improvement in the tradable goods sector and hence cause the prices of the tradable goods to fall and thus appreciation of the currency. On the other hand, in a country where the marginal propensity is high, an increase in income will lead to an increase in imports and thus create demand for foreign currency. This will increase the supply of the domestic currency at the foreign exchange market. The combined effect will therefore be the depreciation of the currency. Hence, the contradictory result could be explained that the marginal propensity to import for most Ghanaian is directory related to level of income.

The coefficient of degree of openness of the economy, measured as the sum of exports and imports as a ratio of GDP is positive (1127.63) and is significant at 1 percent error level. This result suggests that openness leads to a depreciation of the cedi in Ghana. This could mean that the degree of openness tend to reduce the demand for non tradable goods in Ghana and increase that of tradable goods. The positive relationship between the degrees of openness of the economy variable might have resulted from the lifting of tariffs and other barriers by the Ghanaian government and its trading partners to encourage trade with each other.

The terms of trade variable is negative (-704.172) and is statistically significant at 1 percent level of significance. This means that terms of trade negatively affects real

exchange rate. This may be due to the fact that the substitution effect associated with changes in the terms of trade appears to be greater than the income effect.

Finally, the coefficient of growth of money variable is positive (521.944) and is significant at 10 percent error level. Implying that, increases money supply lead to the depreciation of the cedi. The direct relationship between money supply and the real exchange rate could still be explained by the fact that the marginal propensity to import in Ghana is very high. Therefore an increase in money supply without a corresponding increase in output causes people to import more and hence put pressure on the foreign currency leading to a depreciation of the local currency.

4.2 Results of the Export Equation

The exports equation stated in chapter three was also estimated with OLS method and the results are presented in Table 4.3. The model passes all the diagnostic tests except autocorrelation. The results of the F-tests show that the F-statistic at (F (3,29) = 18.6658) is statistically significant at one percent error level. The Durbin Watson Statistic of 1.00881 and the first order autocorrelation coefficient of .494206 indicate that there is a serious problem of autocorrelation. The results are shown on the table below:

Table 3: Results of the Exports Equation

Variable	Coefficient	Stand. Error	T-statistic	P-value
Const	974854	193241	5.0448	0.000022***
PX	-2739.07	4624.37	-0.5923	0.558232
RER	1056.74	153.032	6.9053	<0.00001***
Aid	-4.55664e+06	3.36467e+06	-1.3543	0.186112

R^2	=	0.658813
Adjusted R^2	=	0.62353518
F-statistic	=	18.6658
DW	=	1.00881

The estimated coefficient of real exchange rate is positive (1056.74) and is statistically significant at 10 percent error level. The coefficient implies that an increase in real exchange rate will lead to an increase in exports. This is consistent with the predication made earlier on in chapter three. The positive relationship between exports and real exchange rate is also a confirmation that the "Dutch disease" hypothesis of aid is not validated in Ghana, owing to the fact increases in real exchange rate or depreciations of the cedi, positively affect export performance.

The coefficient of aid is negative (-4.55664e+06). This implies that aid inflows are negatively related to exports performance. However, the estimated coefficient is not statically significant implying that there is no direct meaningful relationship between foreign aid and export performance in Ghana.

Finally, the price of exports variable is negative implying that the price of exports is negatively related to the volume of exports. This is consistent with a prior theoretical expectation that a rise in the price of exports, all things being equal will lead to a reduction in the demand for exports.

However, due to the problem of autocorrelation, the results are not good for analysis, inferences and forecasting. Thus, we change the estimation technique by using the

Cochrane-Orcutt Interactive procedure in order to overcome the problem of autocorrelation to ensure efficiency in our predictions. The results of the Cochrane-Orcutt Interactive estimation are presented on the table 4:

Table 4: Results of the Cochrane-Orcutt Iterative Estimation

Variable	Coefficient	Stand. Error	T-statistic	P-value
Const	6.82969e+06	4.45864e+06	1.5318	0.136796
PX	-7001.07	3156.75	-2.2178	0.034854
RER	-64.1907	119.604	-0.5367	0.595719
Aid	1.42396e+06	1.78517e+06	0.7977	0.431781

R^2	=	0.919036	F-statistic	=	1.77315
Adjusted R^2	=	0.910361	DW	=	1.42374

It can be seen clearly from the table the Durban-Watson statistic and the R square have significantly improved. This is an indication of the null hypothesis of no autocorrelation in the residuals. All the other diagnostic tests with regard to heteroscedasticity, normality of residuals, parameter stability and correct functional form are all satisfiactory. The results from the Cochrane-Orcutt estimation are therefore very good and reliable for analysis, inferences and forecasting.

The estimated coefficient of real exchange rate is negative (-64.1907). This implies that an appreciation or a full in the real exchange rate will lead to an increase in the volume of exports, and vice versa.

The estimated coefficient of aid is now positive (1.42396e+06) implying the foreign aid has a direct relationship with exports. This supports our finding that foreign aid has caused the depreciation of the cedi rather than appreciation since in general, a depreciation of a currency leads to an increase in the volume of exports.

Finally, the price of exports variable is negative implying that the price of exports is negatively related to the volume of exports. This is consistent with the prediction made in chapter three that a rise in the price of exports, all things being equal will lead to a reduction in the demand for exports.

4.3 Two-Stage Least Square Estimation

The estimation of these two equations, that is, equation (1) and (2), without any consideration of possible simultaneity bias can generate misleading results. Thus, estimation was performed by using the two-stage least square (2SLS) method to determine whether the results would be consistent with the OLS results or not. The two-stage least squares (2SLS), like other simultaneous-equation techniques, aims at the elimination as far as possible of the simultaneous-equation bias (Koutsoyiannis, 1973).

The two-stage least squares (2SLS) method of estimation boils down to the application of two-stage least squares (2SLS) method of estimation in two stages. In the first stage we apply OLS to the reduced-form equation in order to obtain an estimate of the exact and random components of the endogenous variables. In the second stage, we replace the endogenous variables appearing in the right-hand side of the equation with their estimated value, and we apply OLS to the transformed original equation to obtain estimates of the structural parameters. The formulae for the two-stage least squares (2SLS) method of estimation are the same as those of the ordinary least squares (OLS) method of estimation

(Koutsoyiannis, 1973). Hence the assumptions underlying the two-stage least squares (2SLS) method of estimation are almost the same as those of the ordinary least squares (OLS) method of estimation.

The results of both the real exchange rate equation (equation 1) and the exports equation (equation 2), estimated with 2SLS are presented in Table 4.5 and Table 4.6 respectively.

Table 5: 2SLS Results of the Real Exchange Rate Equation

Variable	Coefficient	Stand. Error	T-statistic	P-value
Constant	-1603.059	984.7429	-1.627896	0.1161
Aid	23770.560	3545.512	0.668609	0.5099
G	-3950.057	4015.817	-0.983625	0.3347
GDPPC	8.022621	3.033296	2.644853	0.1039
Open	1019.871	458.2757	2.225453	0.0353
TOT	-907.9635	303.7557	-2.989125	0.0062
GM2	952.4069	775.2282	1.228550	0.2307

R^2 = **0.900344**   **F-statistic** = **34.07998**
Adjusted R^2 = **0.876426**   **DW** = **1.72**

Table 6: 2SLS Results of the Real Exchange Rate Equation

Variable	Coefficient	Stand. Error	T-statistic	P-value
Const	724.4808	317.4628	2.282097	0.0303
RER	1.483757	0.223991	6.624168	0.0000
Aid	-13339.64	7898.561	-1.688870	0.1024
PX	3.683078	10.96604	0.335862	0.7395

R^2 = **0.521831**   **F-statistic** = **18.6658**
Adjusted R^2 = **0.470599**   **DW** = **1.23747**

4.4 Comparative Analysis of OLS and 2SLS Results

The results obtained from the 2SLS method of estimation are almost the same as those of the OLS method of estimation. With regard to the signs, all the variables (parameters) as well as the constant term had the same signs in both estimations. Real Government Consumption (G) was not statistically significant in both cases whilst Real per capita income (GDPPC), Openness (Open) and Terms of Trade (TOT) were all highly statistically significant in both cases.

Perhaps, the only difference observed is that in the first estimation, both Aid and Growth of money (GM2) were significant only at 10 percent error level but in the second estimation, both variable were not significant at all, even at 10 percent error level; meaning that both Aid and Growth of money have no significant impact on real exchange rate in Ghana.

In terms of the various diagnostic tests conducted, the R^2 for the OLS estimation 0.912212 whilst that of the 2SLS estimation was 0.9000344. Also, the Adjusted R^2 for the OLS estimation 0.891953 whilst that of a 2SLS estimation was 0.876426. The F-statistic obtained in the case of the OLS estimation was 45.0279 whilst that of the 2SLS estimation was 18.6658. It should be noted that both F-values are highly statistically significant. Again, the DW statistic obtained in the case of the OLS estimation was 1.74873 whilst that of the 2SLS estimation was 1.72. It can clearly be seen that the two

values are almost the same and can be concluded that autocorrelation was absent in both approaches.

With regard to the export equation, it was also observed that the results obtained from the 2SLS method of estimation are almost the same as the results obtained from the OLS same signs in both estimations. Just as it was in the first case, it was only the real exchange rate variable that was highly statistically significant in 2SLS estimations.

From the above discussions, it can be seen that the results of the two estimations performed, that is, the OLS estimation and the 2SLS estimation are similar. We see that the coefficients differ only in terms of magnitudes but not in terms of signs. This implies that the OLS results obtained earlier are without simultaneity bias and can therefore be used for analysis, inferences and forecasting, as far as the Ghanaian economy is concerned.

5 Summary of Major Findings

- The study found that foreign aid inflows lead to real depreciation of the cedi rather than appreciation of the cedi. Hence, the hypothesis that foreign aid inflows generate "Dutch disease" is rejected in the context of Ghana. The coefficient of foreign aid was positive and statistically significant at 10 percent error level.
- The coefficient of real government consumption is negative implying that increase in real government consumption causes the exchange rate to fall. However, the coefficient is not statistically significant. That is government spending has no significant impact on real exchange rate in Ghana.
- The impact of real per capita income is positive and is statistically significant at 1 percent error level, thus implying that higher income levels tend to increase the real exchange rate and hence depreciate the cedi.
- The coefficient of degree of openness of the economy is positive and is highly significant at 1 percent error level. This result suggests that openness leads to a depreciation of the cedi in Ghana.
- The coefficient of the terms of trade variable in negative and is statistically significant at 1 percent error level. This means that terms of trade negatively affects real exchange rate in Ghana.
- Finally, the coefficient of growth of money variable is positive and is significant at 10 percent error level. This implies that increases in the growth of money causes the real exchange rate to increase.
  With regard to the export equation, using the Cochrane-Orcutt Iterative procedure; the following findings were made:
- The estimated coefficient of real exchange rate is negative implying that real exchange rate and exports are negatively related in Ghana. However, this variable was no found to be significant even at 10 percent error level. This means that the real exchange rate is not a major determinant of exports in Ghana.
- The study also found that foreign aid inflows are positively related to exports performance. However, the estimated coefficient is not statistically significant implying that there is no direct meaningful relationship between foreign aid and export performance in Ghana. In other words there are more relevant factors than these. Further researches can therefore these factors.

- Finally, the price of exports variable is negative implying that the price of exports is negatively related to the volume of exports. This is consistent with the prediction made in chapter three that a rise in the price of exports, all things being equal will lead to a reduction in the demand for exports.

5.1 Recommendations

- The main policy recommendation to be drawn from this study is that because aid inflows are associated with the depreciation of the real exchange rate, the Ghana government can continue to receive aid without fear of harming its export competitiveness. Aid can be used to finance supply sides improvement which would sustain higher exporter values and quality too.
- Based on the results related to the openness of the economy, we suggest that the government of Ghana should reexamine the concept of over-liberalization of the economy. There is the need to check the volume of imposts so that it will not lead to over-depreciation of the cedi.
- Finally, the fact that government consumption appreciates the real exchange rate implies the public sector has to introduce some fiscal discipline by curtailing its consumption or composition of tradable goods.

References

[1] Adenauer, I. and Vagassky, L, (1992), Aid versus the Real Exchange Rate: Dutch Disease Effects in African Economies, Intereconomics, Vol.33 African Economic Research Consortium Research Paper 110.

[2] Aryeetey, E; J. Harrigan, J. and Nissanke (2000), Economics Reforms in Ghana: The Miracle and The Mirage, Woeli Publishing Services, Accra.

[3] Benjamin N.C. Shantayanan D. and Weiner, R.J. (1989), Dutch Disease in a Developing Country: Oil Reserves in Cameroon, Journal of Development Economics, Vol. 30.

[4] Beynon, J. (1999), "A Critique of The World Bank Research", mimeo. Available on line http://www.dfid.gov.uk/public/what/advisory/group/beynon-annex2.html.

[5] Beynon, J. (2001), "Policy Implications for Aid Allocations of Recent Research on Aid Effectiveness and Selectivity", Paris, Avaiable online at: http://www.ercdfid.org.uk/knowledgecentre/JB-DAC2.pdf.

[6] Boone, P. (1996), Politics and the Effectiveness of Foreign Aid, European Economic Review, Vol/ 40.

[7] Bowen, J. (1998), Foreign Aid and Economic Growth: A Theoretical and Empirical Investigation, Sydney, Ashgate Press.

[8] Burnside, C. and Dollar, D. (1997), Aid, Policies, and Growth, Policy Research Working Paper 1777, World Bank, Development Research Group, Washington, DC.

[9] Cassen, R. (1994), Does Aid Work, (2nd edition), Oxford: Carendon Press.

[10] Chenery, H. and Strout, A. (1996), Foreign Assistance and Economic Development, American Economic Review, Vol. 66.

[11] Collier, P. and Gunning, W. (1992), Aid and Exchange Rate Adjustment in African Trade Liberalization, Economic Journal 102.

[12] Corden, W. and Nearly, J. (1982) "Booming Sector and Deindustrialization in a Small Open Economy", The Economic Journal, Vol. 92.

[13] Dalgaard, C. and Hansen, H. (2000), On Aid, growth, and Good Policies, CREDIT Research Paper 00/7, Centre for Research in Economic Development and International Trade, University of Nottingham.

[14] Dowling, J. and Hiemenz, V. (1982), Aid, Savings and Growth in The Asian Region, quoted in White, H. (1992a) "The Macroeconomic Impact of Development Aid: A Critical Surveys", Journal of Development Studies, Vol. 28.

[15] Durbarry, R., Gemmell, N. and Greenway, D. (1998), New Evidence on The Impact of Foreign Aid on Economic Growth, CREDIT Research Paper 98/8, University of Nottingham.

[16] Easterly, W. (2000), The Lost Decades: Explaining Development Countries' Stagnation 1980-1998, Available online at: http/www.worldbank.org/research.

[17] Edwards, S. (1989), Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries, Cambridge MA, MIT Press.

[18] Falck, H. (1997), Aid and Economic Performance; The case of Tanzania, Lunds offset AB, Lunds.

[19] Gillis, M, Perkins, D.H., Roemer, M, and Sondgrass, D.R. (1987), Economics of Development, W.W. Norton And Company, New York.

[20] Griffin, K. and Enos J. (1970), Foreign Assistance: Objectives and Consequences, Economic Development and Cultural Change, Vol. 18.

[21] Gupta, K. (1975), Foreign Capital Inflows, Dependency Burden and Savings Rates in Developing Countries: A Simultaneous Equation Model, Kyklos. Vol, 28.

[22] Hadjimichael, M., Ghura, D., Muhleisen, M., Nord, R. and Ucer, E. (1995), Sub-Saharan African: Growth, Saving, and Investment, 1986-63, IMF Occasional Paper No. 118, IMF, Washington D.C.

[23] Hasnsen, H. and Tarp, F. (2000), Aid and Growth Regressions, CREDIT Research Paper No 00/7, University of Nottingham.

[24] Harvey, C. (1992), Botswana: Is the Economic Miracle Over? Journal of African Economies, Vol. 1.

[25] Koutsoyiannis, A. (1973) Theory of Econometrics, (2nd edition), Replika Press Limited, Kundli.

[26] Lansburg, E.S. and Lauren, E.F. (1997), Macroeconomics, Mcgraw-Hill Company, New York.

[27] Lensink, R. and White, H. (2000), Assessing Aid: A Manifesto for Aid in The 21st Century, Oxford Development Studies, Vol. 28, No 1,

[28] Moreira, S. (2002), Evaluating the impact of Aid on Growth. Available online at google.com.

[29] Mosley, P. (1980), Aid, Savings and Growth Revisited, Oxford Bulletin of Economies and Statistics, Vol. 42.

[30] Mosley, P., Hudson, J. and Horrell, S. (1987), Aid, The Public Sector and The Market in Less Developed Counties, Economic Journal, Vol. 97.

[31] Murshed, S. (2000), Globalization, Marginalization and Development, Working Paper No 175, United Nation University, world Institute for Development Economic Research, Helsinki, Finland.

[32] Nayyar, D. (1997), Globalization: The Game, The Players and The Rulers in SD Gupta (ed), The Political Economy of Globalization, London: Kluwer.

[33] Nyoni, T.S. (1998) Foreign Aid and Economic Performance in Tanzania, World Development, 26.

[34] OECD (1997), Geographical Distribution of Financial Flows to Developing Countries, Data on CD –ROM, Organization for Economic Co-operation and Development, Paris.

[35] Osei, R. Morrissey, O. and Tim L (2001), Aid, Exports and Growth in Ghana, CREDIT Research Paper, Nottinggham.

[36] Ogun, O. (1995), Real Exchange Rate Movements and Export Growth: Nigeria, 1960-1990, African Economic Research Consortium Research Paper.

[37] Ouattara, B. (2004), The Impact of Project Aid and Programme Aid on Domestic Savings: A Case Study of Cote d'Ivoire, Centre for the study of African Economics.

[38] Ouattara, B. and Issah, H. (2003), Foreign Aid Inflows And Real Exchange Rate: Evidence From Syria, Manchester School Discussion Paper 00331.

[39] Papanek, G. (1973), Aid, Foreign Private Investment, Saving and Growth in Less Developed Countries, Journal of Political Economy.

[40] Sackey, H.A. (2001), External Aid Inflows and the Real Exchange Rate in Ghana. Nairobi, The Regal Press.

[41] Stoneman, C. (1975), Foreign Capital and Economic Growth, Applied Economies, Vol. 25.

[42] Tsikata, T. (1998), Aid Effectiveness: A Survey of The Recent Empirical Literature, Paper on Policy Analysis and Assessment, IMF, Washington, D.C.

[43] Van Wijnbergen, S. (1986), Aid Export Promotion and The Real Exchange Rate: An African Dilemma, Macroeconomic division, Development Research Department, world Bank, and Centre for Economic Policy Research, London.

[44] Voivodas, C. (1973), Exports, Foreign Capital Inflow and Economic Growth, Journal of International Economics, Vol. 3.

[45] Vos, R. (1998), Aid Flows and Dutch Diseases in a General Equilibrium Framework for Pakistan, Journal of Policy Modeling, Vol. 20.

[46] Vos R. and Johansson, S. (1994), Macroeconomic Impact of Aid in Nicaragua, Department of Economics Reprint Series No. 134 (Stockholm: Handelshogskoland I Stockholm).

[47] Weisman, E. (1990), Aid as A Booming Sector: Evidence From a Computable General Equilibrium Model of Papua New Guinea, Islands Australia Working Paper No. 90/13, Canberra: National Centre for Development Studies, The Australian National University.

[48] White, H. & Wignaraja, G. (1992), Exchange Rates, Trade Liberalization and Aid: The Sri Lankan Experience, World Development, 20.

[49] White, H. (1992), The Macroeconomic Impact of Development Aid: A Critical Survey, Journal of Development Studies, Vol. 28.

[50] World Bank (1998), Assessing Aid, Washington D.C.: Oxford University Press.Younger, S. (1992), Aid and the Dutch Diseases: Macroeconomic Management When Everybody Loves You. World Development, Vol. 20.