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FOREIGN AID FLOWS AND REAL EXCHANGE RATE: EVIDENCE FROM SYRIA

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This paper uses time series data from Syria for the period 1965 to 1997 to test the aid and "Dutch disease" hypothesis. We employ the relatively new approach to cointegration, known as the Auto Regressive Distributed Lag (ARDL) approach. We find no support for this hypothesis neither in the long run nor in the short run. On the contrary, our results indicate that foreign aid flows are associated with depreciation of the real exchange rate. The main policy implication, based on the long run results, is that Syria can continue to receive aid without fears of impairing its export competitiveness.

Keywords: Aid Flows, Dutch Disease, Real Exchange Rate, Cointegration, Error Correction, Syria
JEL classification: F35, C32

1. INTRODUCTION

There have been concerns that foreign aid inflows might lead to an appreciation of the real exchange rate in recipient countries, and thus impact negatively their trade positions, a case known in the literature as "The Dutch Disease". Although the literature on foreign aid is voluminous, much of the attention has been focused on the aid-growth, aid-savings and aid-investment relationships. Studies on the effect of aid on the real exchange rate of the recipient economies are sparse in spite of the crucial role of the real exchange rate in policy discussion and in the economic performance especially in the context of developing countries. The focal point of the theory on aid and "Dutch disease" has been the impact exerted by aid on the relative price of non-tradable goods (see Van Wijnbergen (1985, 1986)) where the main argument is that part of this aid will be channeled to the nontradable sector. This may put upward pressure on domestic prices and lead to a real exchange rate appreciation.[1] In turn, the real appreciation may lead to a reallocation of labor toward the nontradable sector which raises real wages in terms of

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[1] The real exchange rate is generally defined as the relative price of tradable to non-tradable goods.

the price of tradable goods. The ensuing deterioration in competitiveness may lead to a decline in export performance and an adverse effect on growth. However, it has also been argued that if aid has a direct effect on public investment in infrastructure or in the presence of learning by doing and learning spillover, then the response of the real exchange rate to aid flows could be ambiguous (Torvik (2001), Adam and Bevan (2003)).

The empirical evidence on the "Dutch disease" effect of foreign aid appears to be rather mixed. Indeed, in a panel study of 62 developing countries, Elbadawi (1999) found that aid flows caused the real exchange rate to appreciate. An earlier study by White and Wignaraja (1992), in the context of Sri Lanka, found that aid inflows were associated with the appreciation of the real exchange rate. In a recent study, Opoku-Afari *et al*. (2004), also, found support for the "Dutch disease" hypothesis for Ghana. In contrast, Ogun (1995) for Nigeria, Nyoni (1998) for Tanzania found no evidence of "Dutch disease" with respect to aid flows. More recently, Ouattara and Strobl (2003) also rejected the "Dutch disease" hypothesis in the context of CFA countries.

This study is an attempt to contribute to the aid and "Dutch disease" literature by exploring how the real exchange rate of Syria responded to aid flows over the period 1965-1997. The empirical methodology employed in this paper is based on the Auto-Regressive Distributed Lag (ARDL) approach to cointegration proposed by Pesaran *et al*. (2001). Two proxies of the real exchange rate are used. The first of which depends on the ratio of the consumer price index of the United States to that of Syria. The other proxy considers the ratio of the average of the consumer price indices for Syria's main trading partners to that for Syria. The main finding of this paper is that foreign aid flows are not associated with real appreciation in Syria over the period of study. Put differently, "Dutch disease" hypothesis, with respect to aid flows, is rejected in the context of Syria.

The remainder of the paper is organised as follows. Section 2 outlines briefly key economic aspects related to Syria. In Section 3, issues related to the model specification and the data are discussed. Section 4 presents the econometric methodology. The results are discussed in Section 5. Finally, Section 6 concludes the paper.

2. SYRIA: SOME FACTS

2.1. Background of the Country

Syrian Arab Republic "SURIYAH" is located in the northern corner of the continent of Asia on the eastern coast of the Mediterranean Sea. Since a long time ago following its independence, Syria has adopted the central planning system that followed a wide nationalisation process in the 1950s and 1960s. The Syrian economy is divided into three main sectors namely (public, private and joint venture) with an explicit dominance

of the first one over the national economy. However, since the mid 1980s continuous attempts have been made to encourage the other two sectors to play more active role in the economy. The most important attempt has been The Investment Act number 10 that was passed in 1991. The key economic indicators for Syria show an increase in the GDP from 6800 million Syrian Pound to 569.262 million S.P. in 1970 and 1995 respectively (Syrian Statistical Abstract 1997). The main industries are petroleum, food processing, textile, cement, tobacco, beverage, phosphate rock mining and electrical power. The main agricultural products are wheat, barley, cotton, olives and citrus fruits. Total external debt has increased from 3.552 million US$ in 1980 to 21.420 million US$ in 1996 equal to 106% and 321% of goods and services export and 27% and 130% of GNP in 1980 and 1996 respectively. Syrian population has grown rapidly from 6.305 million inhabitants to 13.782 million inhabitants in 1970 and 1994 respectively (Syrian Statistical Abstract 1997) with annual population growth rate of about 3.1%. Life expectancy rate at birth increased from 53 year in 1970 to 68 year in 1994 (World Bank 1991). Total fertility rate decreased from 7.5 in 1978 to 4.22 in 1993 (Syrian Statistical Abstract 1997).

2.2. Aid and the Real Exchange Rate Trends in Syria 1965-1997

The real effective exchange rate (*RER*) is commonly defined as the price of traded goods relative to the price of nontraded (domestic) goods. In the absence of readily available indices of tradable and nontradable prices, the real exchange rate has to be proxied by available domestic and world price indices and nominal exchange rates. There is no unique way of constructing a proxy measure, but all commonly used measures compute the ratio

$$RER = \frac{NER \times P^f}{P^d}, \tag{1}$$

where *NER* denotes the nominal exchange rate (measured as domestic currency per foreign currency), P^f is an index of foreign prices and P^d is an index of domestic prices.

Different measures of P^f and P^d are used in the literature depending on data availability. In the present paper, we construct two measures of the RER. In the first measure (RER1), foreign prices (P^f) are proxied by the US consumer price index (CPI-US). This is based on the argument that most international transactions are quoted in US dollars. For the domestic price, we used the Syrian consumer price index. With respect to the second measure (RER2), we replaced the CPI-US with the average of the

consumer price indices of Syria's main trading partners.[2] These definitions of the RER imply that an increase in the value of RER corresponds to a real depreciation. All relevant data are obtained from the World Development Indicators (2002) and the IMF Database. Figure 1 shows a plot of the RERs.

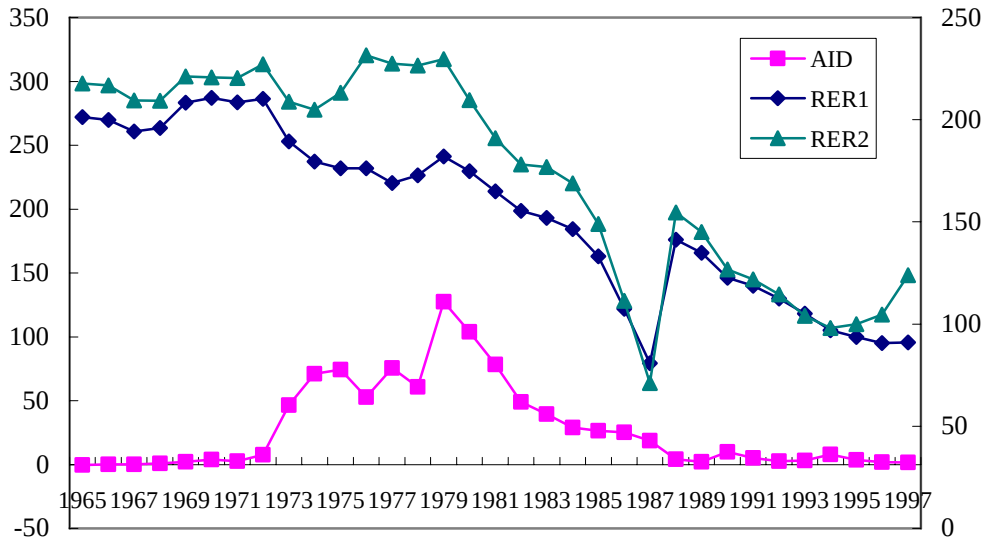


Figure 1. Real Exchange Rate and Aid Trends in Syria: 1965-1997

From Figure 1, three phases can be observed in the trends of the real exchange rate. The first phase, which covers the period of 1965-1987, shows that the real exchange rate has appreciated over that period dropping from above 200 percentage points in 1965 to below 80 percentage points in 1987. In the second phase, the period from 1987 to 1988, the Syrian currency witnessed a real depreciation (above 175 percentage point in 1988). Finally in the third phase the real exchange rate started to appreciate again falling to 95.5 percentage points in 1997 for RER1 and 123 percentage points for RER2.

In terms of aid flows to Syria Figure 1 shows that they were relatively low until 1972 (around 8 millions of USD, in real term). In 1973, the year of the first oil shock, Syria received 46 millions in aid and by 1975 this amount rose to almost 75 millions before skyrocketing to 127 millions in 1979 at the time of the second oil shock. Thereafter, aid flows to Syria started to drop gradually falling to as low as 1.66 millions in real term in 1997. From first look at the trends for aid and the real exchange rate, one could not

[2] France, Germany, Japan, Turkey, Spain, Italy and Saudia Arabia.

detect potential "Dutch disease" effects. For example, between 1965 and 1979 aid flows increased steadily while the real exchange rate appreciated; however, the real exchange rate continued to appreciate thereafter and thus until 1987 when aid flows experienced a sharp decline.

3. MODEL SPECIFICATION AND DATA ISSUE

The model used in this paper is based on the framework developed by Edwards (1989). The baseline regression equation is assumed to take the following functional form:

$$RER_t = \alpha_0 + \alpha_1 Aid_t + \alpha_2 G_t + \alpha_3 GDP_t + \alpha_4 Open_t + \alpha_5 TOT_t + \alpha_6 GM2 + \varepsilon_t, \qquad (2)$$

where *RER* is the real effective exchange rate, *Aid* is official development assistant (ODA), *G* is real government consumption, *GDP* is real per capita income, *Open* is openness, *TOT* is terms of trade, *GM2* is the growth of money, which captures expansionary monetary policies, ε is the error term, and *t* as time subscript. The description of the data is given below.

•Aid: Net foreign aid namely official development assistant ODA obtained from the OECD-DAC online statistics.

•G: Government consumption obtained from the World Development Indicators (2002).

•GDP: GDP per capita obtained from the World Development Indicators (2002).

•Open: Openness of the economy (1995=100), calculated as 100*(imports+exports)/GDP. Imports and exports data come from the World Development Indicators (2002).

The time series for Aid, GDP and G were deflated by GDP deflator (1995=100), obtained from the World Development Indicators (2002), to obtain their real values.

•TOT: Terms of trade has been constructed by dividing export unit value by import unit value, both obtained from the IMF international financial statistics (online version 2003). It is worth pointing out that export and import unit values for Syria are available from 1965 to 1997. Given that the terms of trade is an important determinant of the real exchange rate our study will focus on the period 1965-1997. Summary statistic of the above variables is given in Table 1.

The expected theoretical impacts of the respective variables included in our model are as follows:[3]

•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.

•GDP (-) The expected effect of this variable on RER is to be negative. According to the Balassa-Samulson hypothesis as development takes place the productivity

[3] (-) means that the variable exerts a negative effect on the RER and (?) means that the impact is ambiguous.

improvement in the tradable goods sector exceeds that of non-tradable goods sector. This implies that the decrease in the price of the former is relatively bigger than that in the later, thus, causes appreciation of the RER.

•G (?) The effect depends on the composition of government consumption. Consumption of non-tradable tends to appreciate the RER, while that of tradable leads to real depreciation.

•OPEN (?) Openness of the economy would cause real depreciation (appreciation) if it reduces (increases) the demand for non tradable.

•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).

•GM2 (-) Changes in the money supply (expansionary monetary policies) would tend to raise the general price level (CPI_{Syria}) and thus leading to an appreciation of the RER.

4. ESTIMATION TECHNIQUES

To estimate Equation 2, we employ the ARDL approach to cointegration proposed by Pesaran *et al*. (2001). The unrestricted error correction representation of the ARDL model for Equation 2 is given by:

$$\begin{aligned}\Delta RER_t = {} & \varphi_0 + \sum_{i=1}^{2} \beta_i \Delta Aid_{t-1} + \sum_{i=1}^{2} \delta_i \Delta G_{t-i} + \sum_{i=1}^{2} \gamma_i \Delta GDP_{t-i} + \sum_{i=1}^{2} \mu_i \Delta Open_{t-i} \\ & + \sum_{i=1}^{2} \theta_i TOT_{t-i} + \sum_{i=1}^{2} \omega_i GM2_{t-i} + \varphi_1 RER_{t-1} + \varphi_2 Aid_{t-1} + \varphi_3 G_{t-1} \\ & + \varphi_4 GDP_{t-1} + \varphi_5 Open_{t-1} + \varphi_6 TOT_{t-1} + \varphi_7 GM2_{t-1} + \nu_t .\end{aligned} \tag{3}$$

The null hypothesis of no cointegration ($H_0 : \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = 0$) is tested against the alternative by means of the F-test. This test statistic has a non-standard distribution irrespective of whether the variables are I(0) or I(1). Pesaran *et al*. (2001) provide two sets of asymptotic critical values. One set assumes that all variables are I(0) and the other assumes they are I(1). If the computed F-statistic exceeds the upper bound of the critical value band, the null hypothesis of no long run relationship (or no cointegration) can be rejected. If it is below the lower bound, then the null hypothesis cannot be rejected. If the computed statistics falls within the critical value band, the result of the inference is inconclusive. After confirming the existence of cointegration among the variables, the second stage of the analysis is to estimate the coefficients of the long run relation of the savings equation and the associated error

correction models, and make inferences about their values.

This approach assumes that one set of variables are I(0) and the other are I(1). However, as noted by Ouattara (2004), if the order of integration of a variable is greater than one then the underlying assumptions of the ARDL is violated. Put in different words, testing the order of integration of the variables included in the model is important to ensure that we satisfy these underlying assumptions. For this reason, we begin by checking for the order of integration of the variables, prior to proceeding to the ARDL estimation itself.

4.1. Unit Root Test

Unit root tests are carried using the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) (Dickey and Fuller (1979, 1981)) stationarity tests, which are widely used in the literature. This test involves estimating the following equation:

$$\begin{aligned} y_t &= a + (1-\phi)\delta t + \phi y_{t-1} + \sum_{i=1}^{k} \gamma_i y_{t-i} + \varepsilon_t, \\ &\qquad \text{where} \quad t = 1,2,...,n, \\ \Delta y_t &= a + \rho \delta t + \rho y_{t-1} + \sum_{i=1}^{k} \gamma_i y_{t-i} + \varepsilon_t, \end{aligned} \tag{4}$$

where the null hypothesis is $H_0 : \rho = 1 - \phi = 0$ (the unit root), k is the number of lags of the dependant variable and n is the number of observations. The results of the unit root test are contained in Table 2.

The unit root results presented in Table 2 show that the order of integration of all variables in our model is less or equal to one implying that the underlying assumption for applying the ARDL methodology is satisfied. Thus, we can proceed ahead to check for the existence of the long run relationship.

Table 1. Summary Statistics

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
Real Effective Exchange Rate	28.93	37.12	4.01	105.17
Aid	4.79	4.45	-0.11	17.91
Real GDP per Capita	3651.76	946.64	1803	4772
Government Consumption	17.73	3.71	11.40	24.49
Openness	150.87	45.36	79.70	230.47
Terms of Trade	157.34	46.38	79.70	241.12
Growth of Money	19.47	8.58	7.97	45.79

5. ESTIMATION RESULTS

The computed F-statistics of the joint null hypothesis that there is no long-run relationship among the variables is 3.926 for the RER1 model and 6.734 for RER2. These two values are greater than the higher bound of the 95 per cent critical value interval[4] (2.476-3.646) thus implying a rejection of the null of no long-run relationship. Both models pass the standard diagnostic tests (serial correlation, normality and heteroscedasticity). The estimates of the long-run coefficients, based on the Schwarz Bayesian Criteria, are summarised in Table 3.

Table 2. ADF Unit Root Tests

Variable	Level		First Difference		Conclusion
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
RER1	-0.6548	-3.517	-6.12**	-6.1**	I(1)
RER2	-1	-2.73	-5.88**	-5.81**	I(1)
Aid	-1.52	-1.58	-5.78**	-5.85**	I(1)
RG	-1.3	-1.51	-3.65**	-3.91*	I(1)
GDP	-1.357	-1.88	-3.8**	-3.76*	I(1)
Open	-1.354	-1.92	-7.1**	-6.97**	I(1)
TOT	-1.453	-2.454	-5.843**	-7.157**	I(1)
GM2	-7.45**	-7.98**			I(0)

Note: ** and * indicate stationarity at the 1 and 5 percent level, respectively.

It can be seen from Table 3 that our two measures of the real exchange rate give approximately similar results, in terms of magnitude, sign and statistical significance of the estimated coefficients. One exception is the coefficient of the openness variable with respect to the magnitude and the statistical significance.

Turning to the interpretation of the results, it is clear from Table 3 that contrary to the prediction of the "Dutch disease" hypothesis of foreign aid, the estimated coefficients for the aid variable are positive (0.404 and 0.392, for RER1 and RER2 respectively,) and significant at the 10 percent level (marginally significant at the 5 percent level). This implies that foreign aid flows are not associated with the appreciation of the real exchange rate of Syria. Put differently, the potential "Dutch disease" effect associated with foreign aid flows is not supported by the empirical evidence in Syria. The impact of per capita GDP on the real exchange rate of Syria is negative (-0.006 and -0.005) and statistically significant, thus implying that higher income levels tend to appreciate the

[4] The critical value intervals are computed by Pesaran *et al.* (1996) where they are reported in Table (F).

exchange rate as predicted by the Balassa-Samuelson hypothesis (Balassa (1973)). Higher government consumption tends to affect positively the real exchange rate. However, the estimated coefficient for this variable is statistically insignificant. This could mean that the Syrian Government spend equally on tradable and non-tradable goods. The coefficients of openness are negative (-1.625 and -0.781) and highly significant. This result suggests that openness leads to an appreciation of the real exchange rate in the context of Syria. This might have resulted from the lifting of tariffs and other trade barriers by the Syrian government and its trade partners to encourage trade with each other, which would tend to decrease the price of tradable goods, thus, leading to the appreciation of the real effective exchange rate. The terms of trade variable affects positively (0.104 and 0.101) the real effective exchange rate, however, the estimated coefficients are insignificant. One may interpret this result as that the income effect and the substitution effect associated with changes in the terms of trade appear to cancel each other. Finally, the variable that captures the effect of expansionary monetary policies, i.e., GM2, does not appear to have a significant effect on the real exchange rate of Syria.

The final stage in the ARDL approach is to estimate the error correction model associated with the long run estimates reported in Table 3. The results are reported in Table 4. The error correction coefficients (-1.000) each are statistically highly significant, have the correct sign, and their magnitudes suggest a high speed of adjustment. The fact that the coefficient of the error correction term is highly significant, further confirms our finding of the existence of a long run relationship among the variables in our model. The R^2s (0.58 and 0.50) suggest that the error correction models fit the data reasonably well. Furthermore, the F-statistic for the null hypothesis that "all regressors have zero coefficient" is rejected. It is also important to point out that the underlying error correction model passes the standard diagnostic tests.

Table 3. Long Run Estimates of the Real Effective Exchange Rate

Schwarz Bayesian Criterion		
Regressors	RER1 ARDL (0,2,2,0,0,0,2)	RER2 ARDL (0,2,2,0,0,0,2)
Aid	0.404*	0.392*
GDP	-0.006***	-0.005***
G	0.024	0.134
Open	-1.625***	-0.781**
TOT	0.104	0.101
GM2	6.293	3.749
Constant	344.847***	235.935***

Note: ***, ** and * represent significance at the 1, 5 and 10 percent level, respectively.

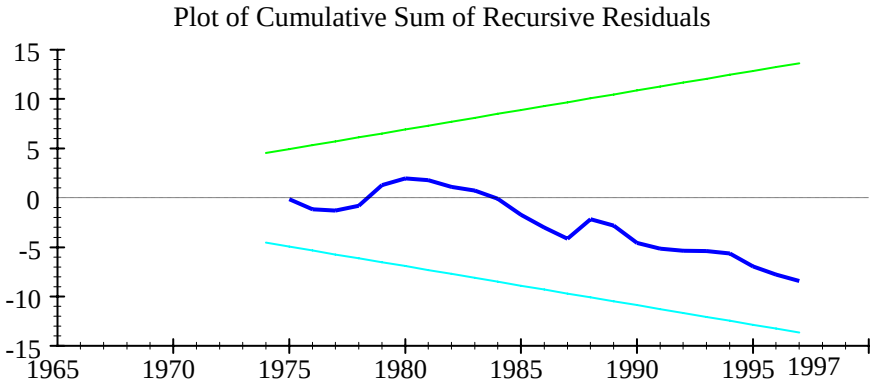
Table 4. Error Correction Model for the RER

Regressors	RER1	RER2
DAid	0.404*	0.391*
DGDP	-0.006***	-0.005***
DG	0.655**	0.549**
DG (-1)	0.756***	0.550***
DOpen	-1.625***	-0.782**
DTOT	0.104	0.101
DGM2	6.293	3.748
Constant	344.847***	235.934***
ECM (-1)	-1.000***	-1.000***

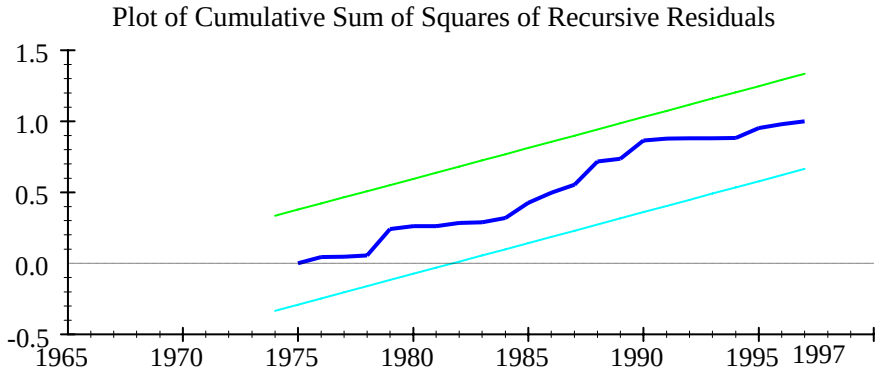
Note: ***, ** and * represent significance at the 1, 5 and 10 percent level, respectively.

The short run results show that aid flows do not generate "Dutch disease" effect. Government consumption and GDP appear to be associated with a depreciation and appreciation of the real exchange rate of Syria respectively. Terms of trade and expansionary monetary policies do not seem to be significantly influential on the real exchange rate.

To check the robustness of our results we carried out stability tests on the parameters of the long run results. For this purpose the plot of the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) are shown in Figures 2 and 3. The plots show that none of the straight lines (drawn at the 5 percent level) is crossed, thus indicating no evidence of any significant structural instability.

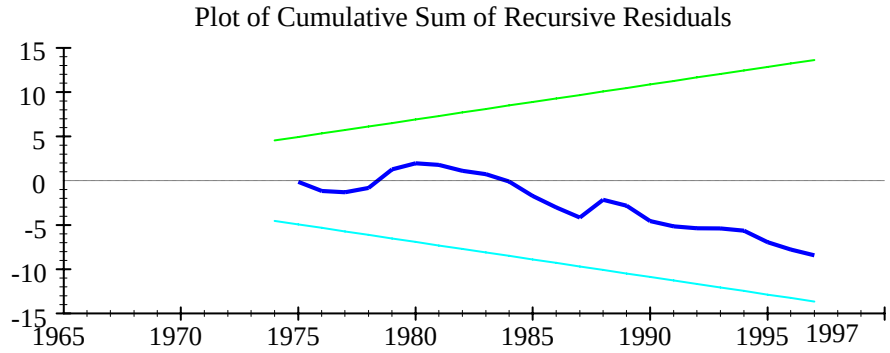


Note: The straight lines represent critical bounds at 5% significance level.

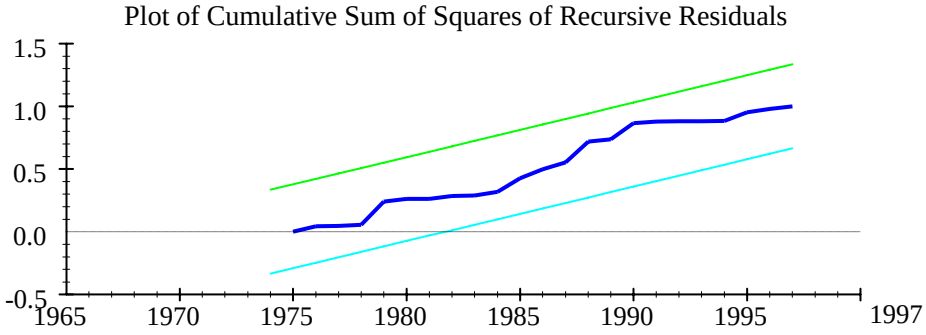


Note: The straight lines represent critical bounds at 5% significance level.

Figure 2. CUSUM and CUSUMSQ for RER1



Note: The straight lines represent critical bounds at 5% significance level.



Note: The straight lines represent critical bounds at 5% significance level.

Figure 3. CUSUM and CUSUMSQ for RER2

In the above construction of the real exchange rate we used the US consumer price index as a proxy of foreign prices. However, in the literature the wholesale price index is also used to proxy foreign prices.[5] As a robustness check we construct a new real exchange rate index where we replace the US consumer price index with the wholesale price index. A plot of the real exchange using the CPI and wholesale price indicates a strong correlation between the two indexes. In Tables 5 and 6 we perform the same regressions as above this time calculating the real exchange rate using the wholesale price index.[6][7] It is clear from the results that aid does not lead "Dutch disease" in Syria. In other words, our findings remain robust irrespective of the measure of the real exchange rate.

Table 5. Long Run Estimates of the Real Effective Exchange Rate

Regressors	RER (wholesale price index) ARDL (0,2,2,0,0,0,2)
Aid	1.047***
GDP	-0.010***
G	-0.117
Open	-2.115***
TOT	0.253
GM2	7.972
Constant	425.643***

Note: *** represents significance at 1 percent level.

Table 6. Error Correction Model for the RER

Regressors	RER (wholesale price index)
DAid	0.425
DAid(-1)	-0.629**
DGDP	-0.010***
DG	0.784**
DG (-1)	0.918***
DOpen	-2.115***
DTOT	0.253
DGM2	7,972
Constant	425.643***
ECM (-1)	-1.000***

Note: *** and ** represent significance at the 1 and 5 percent level, respectively.

[5] We thank an anonymous referee for pointing out this.

[6] The data for the wholesale price index are obtained from the International Financial Statistics (IMF).

[7] Unit root tests on this variable shows its order of integration to be I(1).

6. CONCLUDING REMARKS

This paper aimed at examining whether or not foreign aid inflows generate "Dutch disease" effects in Syria for the period of 1965-1997. For this purpose we constructed two proxies for the Real exchange rate-one based on the relative price of the US consumer price index to Syrian consumer price index and the other on the relative price of the country's trading partners and its consumer price index. Using the ARDL approach to cointegration we found that both models of the RER lead to similar outcomes. Indeed, our results suggest that foreign aid flows are not associated with "Dutch disease" in Syria, both in the short and long run. With regard to the other variables, the results show that per capita GDP and openness lead to real appreciation in the long run as well as the short run. Government consumption seems to lead to real appreciation in the short run but in the long run its impact is insignificant. Finally, terms of trade and monetary expansion do not appear to have any significant effect on the real exchange rate of Syria. Moreover, CUSUM and CUSUMSQ tests for stability confirm that our parameters were stable over the period of study.

The main policy recommendation to be drawn from this study is that because aid flows are associated with the depreciation of the real exchange rate, Syria may continue to receive aid without worrying about a loss in export competitiveness. Indeed, aid can be used to finance supply sides improvements which would sustain higher exports volumes (and quality).

A limitation of this paper, however, is that it does not address the issue of heterogeneity of aid flows. Recent literature on aid effectiveness has tried to distinguish the effects of different types of aid, for example it has been argued that if project aid is accompanied by an equivalent value of imports then it will not have "Dutch disease" effects. This issue could be a topic for further research subject to data availability.

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