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The Impact of Oil-Related Income on the Equilibrium Real Exchange Rate in Syria

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Abstract

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This paper examines the impact of oil-related income, among other fundamentals, on the equilibrium real effective exchange rate (ERER) in Syria. After reviewing the evolution of the Syrian multiple exchange rate regime since 1960 and assessing alternative measures for the exchange rate, the paper analyzes the impact of oil-related income on the ERER in the context of a behavioral equilibrium exchange rate model. The analysis concludes that ERER appreciates with higher oil-related income, productivity and net foreign assets, but, at odds with the conventional wisdom, depreciates with higher government expenditures given that an increase in expenditures usually translates into higher imports and weaker current account position. In light of the projected real shocks associated with the depletion of oil and the change in other fundamentals in the context of the ongoing transition to a market economy, a more flexible regime would serve Syria better in the future.

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I. INTRODUCTION

The transition of the Syrian economy from a planned to a market economy is being increasingly tested by the depletion of oil, the main source of external and government revenues. Over the last few years, many activities have been liberalized (e.g., banking, insurance, transportation, and communications) to allow greater role for the private sector, including foreign, participation and investment. The trade regime has been fully liberalized resulting in a significant increase in imports. In addition, the authorities are rethinking the exchange rate regime and have taken important steps toward unifying the exchange market. They have also developed plans to reduce subsidies and liberalize prices. These developments, combined with the declining oil production, are likely to have significant impact on the equilibrium level of the exchange rate and on the choice of an exchange rate regime that is conducive to domestic and external stability.

Previous attempts to estimate the equilibrium real exchange rate (ERER) and to assess the impact of oil have faced serious challenges related to data availability, measuring the exchange rate, and modeling the impact of oil. The availability of a long time series is essential when investigating relationships of a long-run nature such as the ERER. Defining an appropriate measure for the exchange rate is difficult in the context of Syria's multiple exchange rates regime that has been in place since the 1950s. Modeling the impact of oil is complicated by Syria's move from oil importer to exporter, significant changes in the level of oil production since production started in 1968, and other related activities that coincided with oil production.

In an attempt to address the above challenges, this paper provides a new time series for the period 1960–2005[2] covering a number of macroeconomic fundamentals and the Syrian pound free market rate, and constructs a weighted average exchange rate. It also explores alternative ways of assessing the impact of oil and more generally oil-related income on the ERER. The analysis concludes that, in the long run, the ERER appreciates with higher oil-related income, productivity and net foreign assets (NFA), but depreciates with higher government expenditures. While the impact of government expenditures is contrary to some common views in the literature, it is consistent with fact that higher fiscal spending worsens the fiscal balance and consequently the current account leading to currency depreciation to restore internal and external stability. A similar result was obtained by Ravn and others (2007) who investigated the effects of government spending shocks on output, consumption, the real exchange rate and the trade balance in the context of deep-habit model.[3] However, this does

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[2] The data and information were obtained from staff reports, recent economic developments reports (1951–2007), INS database, and the *World Economic Outlook* database.

[3] To explain the depreciation of the real exchange rate, they show that an increase in domestic government spending causes a decline in domestic markups relative to foreign markups. As a result, the domestic economy becomes relatively cheaper than the foreign economy, or equivalently, the real exchange rate depreciates.

not preclude the possibility of a short-term positive impact for government spending on inflation.[4]

The switch in late 2007 to referencing the Syrian pound (SP) to the SDR within wide band (+/- 9 percent) is a move in the right direction, as it introduces some exchange rate flexibility. Greater flexibility is much needed to accommodate the real shocks associated with the depletion of oil and the transition to a market economy. More generally, changes in the exchange rate need to be guided by the objective of aligning the exchange rate with fundamentals to preserve external competitiveness and to avoid the risk of a forced adjustment similar to that experienced in the mid-1980s.

The rest of the paper is organized as follows: Section II provides a brief review of the literature. Section III examines the development of the exchange rate and exchange regime since the 1950s. Section IV analyzes the role of oil-related income. Section V presents the theoretical determinants of the ERER and estimation results, followed by the main conclusions.

II. Brief Review of the Literature

There is a considerable body of literature on the estimation of the ERER. There is a wide consensus in the literature that the purchasing power parity (PPP) is not an appropriate model for the determination of the ERER because of the slow mean reversion of the real exchange rate to the long-run equilibrium implied by the PPP (MacDonald and Ricci, 2003). Many adjusted variants of the PPP were examined in the literature to determine the ERER, including the internal-external balance approach and its variants (the Fundamental Equilibrium Exchange Rate—FEER),[5] the Macroeconomic Balance Approach and the Natural Rate of Exchange Rate (NATREX),[6] the Behavioral Equilibrium Exchange Rate (BEER)[7] and the New Open Macro Economy approach (see Égert and others, 2005, for a survey of these models).

While the internal-external balance approach and its variants and the macro balance approach are appealing for advanced economies, the BEER is more suited to developing and low income countries where the quality of current account data are low and concepts such as the

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[4] The analysis of empirical results in Section V indicates that increased government expenditure leads in the short run to an appreciation of the exchange rate. A more elaborate discussion about the impact of government spending can be found in Rogoff (1996).

[5] The FEER is the real effective rate that simultaneously secures the internal and external balance of the economy (Williamson, 1994).

[6] Natural Rate of Exchange Rate was developed by Stein (1994, 1995, and 2002).

[7] Usually referred to as the equilibrium real exchange rate.

potential output growth[8] associated with low inflation and the sustainability of the current account position[9] are imprecisely defined or inapplicable. The BEER is not based on any specific exchange rate model and hence could be viewed as a very general approach for modeling the equilibrium exchange rate. It takes as a starting point that real factors could explain the slow mean reversion of the PPP and directly estimates the structural relationship between these economic fundamentals and the ERER and produces measures for exchange rate misalignment. This allows for explicitly modeling the impact of the terms of trade (TOT), oil, administrative prices, and trade restrictions, which are observed in developing countries.

In resource-based economies, factors such as changes in the TOT or the price of exporting commodities could have a significant impact on the equilibrium exchange rate. For example, Cashin and others (2002); MacDonald and Ricci (2003) on South Africa; and Zalduendo (2006) on Venezuela found that commodity prices play a significant role in determining a time-varying equilibrium exchange rate path in addition to other fundamentals such as trade openness, fiscal balance, NFA and relative productivity (to assess the Balassa-Samuelson effect).

III. EXCHANGE SYSTEM IN SYRIA

A. Exchange System Developments

Since its inception in 1952, the Office of Control of Foreign Exchange (OCFE) has applied exchange controls, with a degree that varies significantly depending on current economic and political conditions. These controls, for current and capital account transactions, include creating different rates for different transactions, imposing quantitative limits on imports, financing only certain imports, and changing surrender requirements. Appendix I discusses in detail the development of the exchange system in Syria.

These controls not only failed to prevent foreign exchange crisis in the 1980s, they magnified the crisis and increased its cost while also creating various distortions in the market. Because private importers were not allowed to finance imports by purchasing or borrowing foreign exchange from the domestic banking system, the segmentation of the public and private pools of foreign currency widened as most private foreign exchange transactions moved to the unofficial market. These restrictions and controls also encouraged corruption, shifted large part of trade financing outside the Syrian banking system, fomented the black market,

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[8] Two main approaches were suggested in the literature to measure potential output, decomposing historical GDP growth to cyclical and trend components, and using economic theory to determine the magnitude of potential growth.

[9] Current account sustainability could be assessed by the sustainability of the debt-to-GDP ratio at a specific level. However, determining the exact level would require a great deal of judgment. In addition, assessing export and import elasticities could be very difficult especially in developing and low-income countries. A second approach involves viewing the current account in terms of savings and investment balances.

and increased the fiscal cost of running a multiple-exchange-rate system. Figure 1 depicts exchange rate developments from 1951–2005.

Figure 1. Syrian Arab Republic: Developments of the Official and Free Market Exchange Rates, 1951–2005

Exchange Rate of the Syrian Pound Versus the U.S. Dollar, 1951–80

Exchange Rate of the Syrian Pound Versus the U.S. Dollar, 1981–95

Exchange Rate of the Syrian Pound Versus the U.S. Dollar, 1996–2005
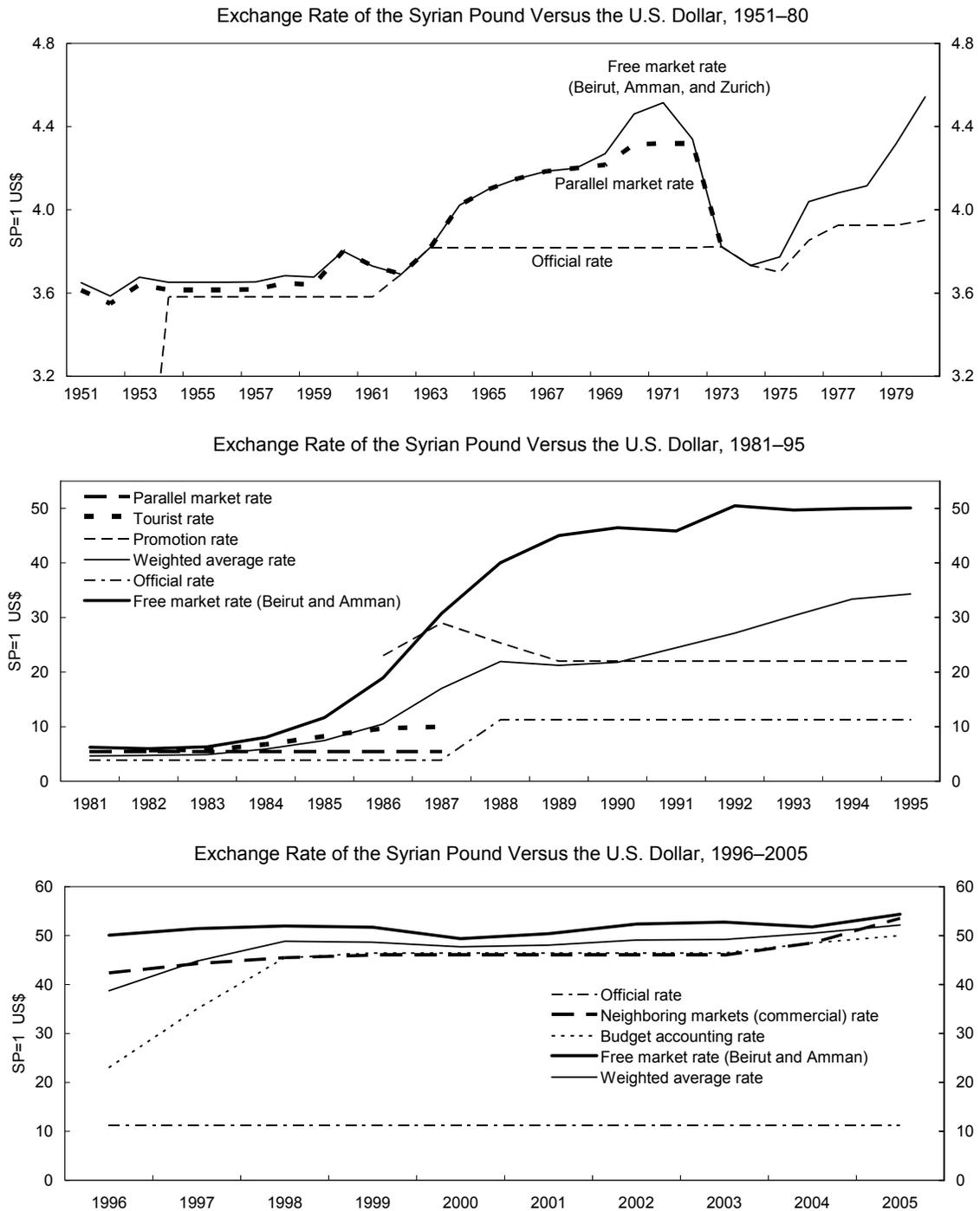
Sources: Central Bank of Syria; and Fund staff estimates.

Encouraged by improvements in the balance of payments (BOP) in the early 1990s, the authorities started to simplify the exchange system, with a series of moves toward fewer, more depreciated official exchange rates. These measures were followed by a further gradual liberalization of the exchange and trade systems in the latter part of the 1990s and early 2000s. These measures, taken in the context of a step-by-step approach to unification, have contributed to a deepening of the foreign exchange market and brought the official and unofficial rates closer, paving the way to a more unified exchange system.

Building on previous achievements, several measures were undertaken in the last two years that led to the effective unification of exchange rates in January 2007.[10] These include the replacement of the positive import lists with a negative list, further liberalizing current account transactions, starting the process of trading foreign currency with private banks, allowing private banks to finance trade, enacting a foreign exchange bureaus law and licensing foreign exchange bureaus. Furthermore, in August 2007, the authorities moved from the de facto peg to the U.S. dollar regime to referencing the SP to an SDR basket within relatively wide margin. As a result, between December 2006 and March 2008, the SP appreciated against the U.S. dollar by about 9 percent and the REER appreciated by 3.7 percent.

B. Which Exchange Rate Should be Used to Measure the Real Effective Exchange Rate?

The existence of a multiple-exchange-rate system poses the question of which exchange rate to use when measuring the REER. Given that none of the previously discussed rates, except the official and free market rates, existed during the entire period under review, they cannot be relied upon to measure the REER. In addition, the size of transactions conducted on the official exchange rate decreased significantly since the mid-1980s, rendering it inappropriate as well. Two alternatives are available for compiling the REER.

The first is a weighted exchange rate, with the weights determined by the size of transactions. While this rate covers most foreign exchange transactions, it suffers from several measurement problems. Detailed data on the amount of transactions concluded at different exchange rates is not available for many years and hence the assumed size of transactions, based on historical data or qualitative information, may not be accurate. The inaccuracy problem becomes more severe during the 1980s and 1990s when too many exchange rates that differed significantly existed (Figure 1). Furthermore, many of the official rates reflected the authorities' accounting decisions or were used to provide subsidies[11] and did not reflect the market's demand and supply equilibrium conditions. For example, using a more appreciated or depreciated exchange rate for oil exports and imports would have a significant

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[10] The central bank issues a single rate that governs almost all transactions instead of the previous budget and commercial rates.

[11] Such as the budget rate.

impact on the weighted rate but no impact on the BOP since all oil exports and imports are done by the government. Thus, even if one were to assume the absence of measurement errors for the size of transactions at different rates, the weighted rate does not reflect market equilibrium conditions.

The free market rate offers a better alternative. Although it is deemed not to be a comprehensive rate, it does not suffer from the previous measurement problems. Moreover, the transactions in the free market were legal for most of the period of 1960–75 and enforcement forbearance was observed by the authorities for most of the period since then.[12] This confers to the rate quoted in this market the characteristics of an equilibrium rate, and not a black market one, that reflects the different real and nominal shocks. Since the mid-1990s the free market, budget, and neighboring countries rates moved very closely. The authorities' intervention in the foreign exchange market during the period of interest was guided by the developments in the free market, and they targeted stabilizing it because the free market rate (i) was the common denominator for an important share of transactions; (ii) has a significant impact on inflation expectations and; (iii) was the only free price that could be monitored.[13]

C. Developments of the Free Market and Weighted Rates

In general, there is a clear similarity between the behaviors of the bilateral, nominal and real effective exchange rates compiled using the free market (F) and the weighted average (W) rates (Figure 2). The developments of the free market rates (NEERF and REERF) were mainly driven by BOP developments and their impact on the bilateral Syrian pound/U.S. dollar exchange rate from 1960–90. However, due to the authorities' policy in the early 1990s of targeting a free market rate around SP 50 per U.S. dollar, the developments of the NEERF reflected the U.S. dollar exchange rate developments against other major currencies, especially the Euro. The difference between the weighted and free market rate developments during the 1992–98 period, where the REERW depreciated while the REERF appreciated, reflects the authorities' policy of pricing foreign exchange more realistically by adjusting the commercial and budget accounting rates to levels close to the free market rate level.

The strong correlation between the nominal and real exchange rates for both the free and weighted rates implies that overall exchange rate developments were dominated by changes in the exchange rate of the open (tradables) sector. The heavy use of tariff and nontariff trade barriers in Syria, the authorities' policy of using multiple exchange rates, the large non-profit nontradable sector (such as education and health services), and the heavy use of administrative prices could explain why the price of tradables played an important role in the

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[12] Before licensing them, money changers, who were known to the authorities, conducted large transactions to finance private sector operations. In 2005, the authorities intervened in the market through them.

[13] This was confirmed by the authorities during the 2007 Article IV consultation.

developments of the real exchange rate in Syria. This finding is not unique to Syria. For example, a strong correlation between nominal and real exchange rates was established by Mussa (1986) for industrial countries during the post-1973 floating period, Engel (1993 and 1999) for the U.S. and Monacelli (2004) for a group of industrial countries.

Figure 2. Syrian Arab Republic: Nominal and Real Effective Exchange Rates, 1960–2005
(Index 1960=100)
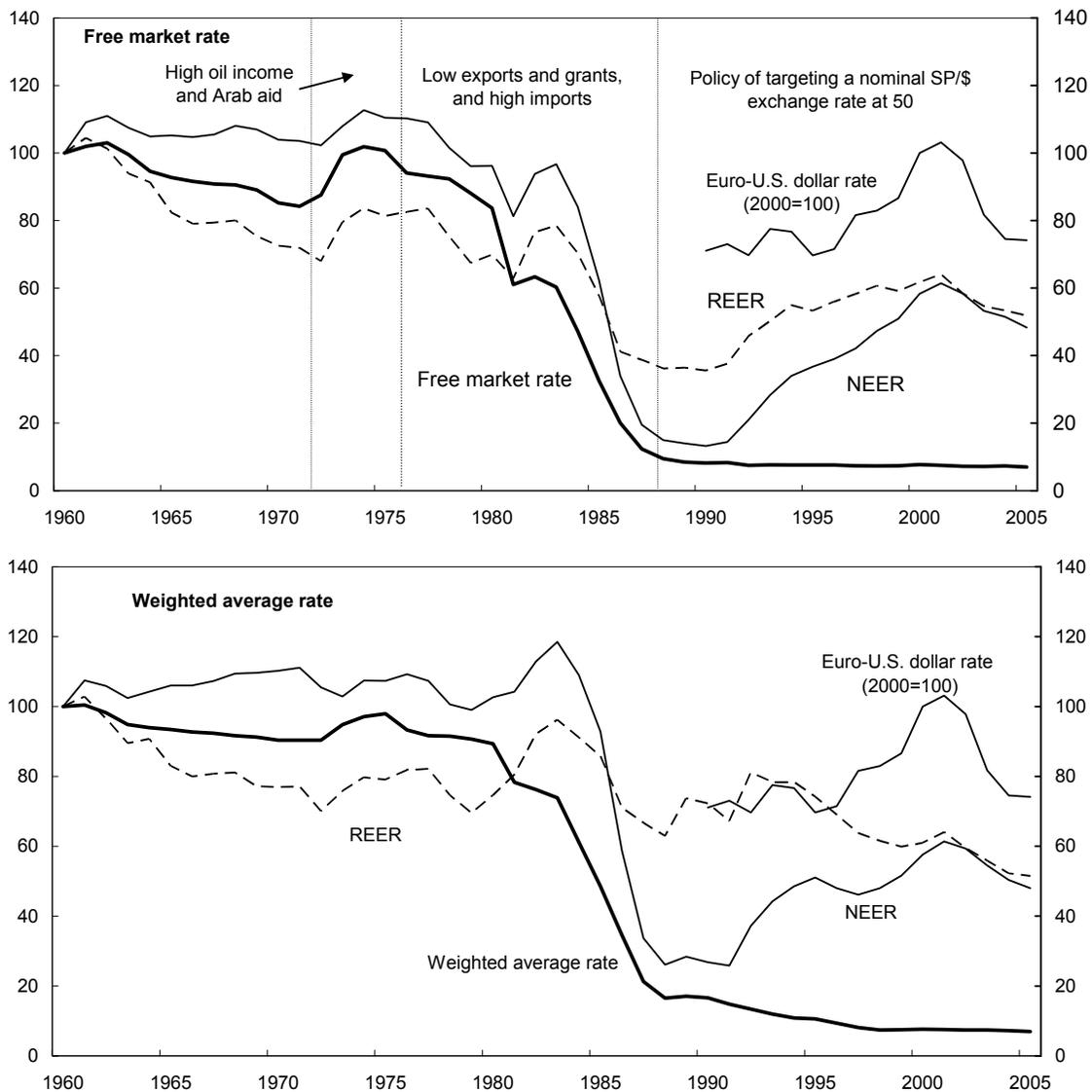
Sources: Central Bank of Syria; IMF *World Economic Outlook*; IMF INS database; and Fund staff estimates.

IV. THE ROLE OF OIL-RELATED INCOME

A. The Concept of Oil-Related Income

In Syria, the impact of oil on the real exchange rate cannot be separated from other related activities. The oil-related activities take three main forms. First, the production of crude oil; second, the petroleum dues (transit fees) on the Iraqi pipeline in the 1960s and 1970s; and

third, the official grants (in the form oil and cash) mainly from Arab oil-producing countries to Syria (Box 1). In addition to the production of oil, oil petroleum dues from transit fees of the Iraqi oil pipeline played an important role as a foreign exchange earner and contributor to the budget between 1960 and 1975. Until oil prices surged in the early 1970s, Syria earned more from the international pipelines that crossed its territory than from domestic oil production. While grants might seem different from the first two in nature, they have a similar impact on the ERER in terms of sign and channels of effect.[14] While these grants in general were related to political and security conditions in the region, mainly the Arab-Israeli conflict, they were also significantly impacted by the developments in the oil market given that they came mainly from oil-exporting countries with their magnitude increasing with the increase in oil revenues. In addition, some of these grants were in the form of oil on concessionary terms and as outright gifts (see Box 1).

B. The Impact of Oil-Related Income on the Balance of Payments and the Budget

During the 1960s, oil-related income played a relatively limited role in financing the BOP with transit fees representing the main source of income and smaller income from oil production and exports, and from official grants (Figure 3).[15] With the production of oil and the significant increase in official grants, this role increased significantly with oil-related income representing more than 50 percent of Syria's foreign exchange income for most of the period since then. The authorities' responses to the improvement in the oil-related income consisted of relaxing imports and foreign currency restrictions, maintaining relatively appreciated exchange rate and/or appreciating the exchange rate. This was evidenced in the years leading to the currency crises in the 1980s. The increase in oil-related income encouraged a correspondent relaxation of import restrictions and the maintenance of significantly appreciated official rates compared with the free market rate, discouraging non-oil exports, and resulting in large current account deficits and a deterioration of the NFA position.[16] Since 1988, the current account was in surplus owing to higher oil exports along with the authorities' policy of depreciating the official rates to the free market rate level and imposing import controls (see Appendix I for details). This switched the large BOP deficits in the 1980s to large surpluses in the 1990s and early 2000s and helped in the accumulation of large NFA, which stood at the equivalent of 21 months of imports in 2005.

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[14] Because the aid accrues initially to the government, it is similar to a resource windfall in state-owned natural resource sectors. It is for this reason that parallels are often drawn between issues of aid management and the so-called resource curse.

[15] Syrian exports of oil before 1968 represent refined oil products exports using imported crude oil from Iraq.

[16] NFA decreased from $274 million in 1979 to-$3.5 billion in 1987 and it returned to the 1979 level only in 1991.

Box 1. Oil-Related Income in Syria

Oil production

Over the last forty years, oil has played a very important role as a foreign exchange earner and contributor to the budget. Oil was discovered in Syria in the early 1950s but the sector developed slowly and sizable production did not begin until 1968 (albeit with the relatively small amount of 1 million tons). However, oil production increased rapidly in the following years to peak at 10 million tons in 1976. Oil production stabilized in the range of 8–9 million tons until 1985. Because of the stagnation in production, the sector was reopened to foreign investment under

Syrian Arab Republic: Oil Production and International Oil Prices, 1968–2005

Oil prices
(RHS; in $ per barrel)

Oil production
(LHS; in millions of tons)

Sources: Syrian authorities; and IMF *World Economic Outlook*.

production sharing agreements with the Syrian Petroleum Company (SPC). This helped the development of new discoveries and contributed to a significant increase in oil production, which reached 31.6 million tons in 1995. However, oil production has been on a downward trend since then (declining by 4 percent annually) despite a further opening of the sector and large investments.
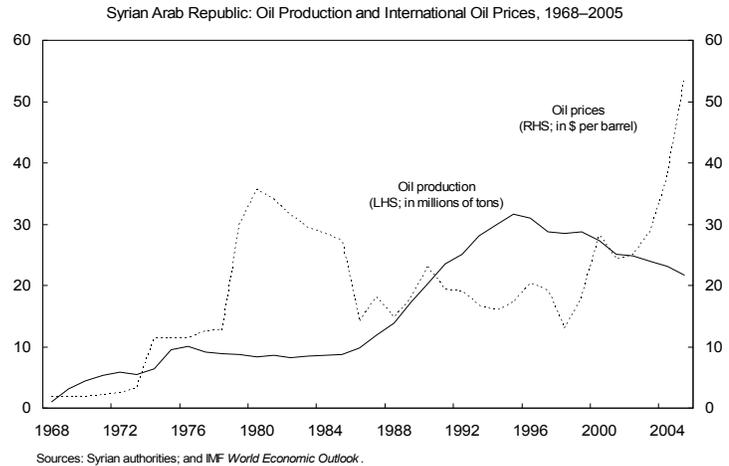
Petroleum dues

The Iraqi oil pipeline began operations in the early 1950s, providing transit fees as well as the crude oil that was refined at the Homs refinery into products for Syrian consumption. In April 1976, however, Iraq cancelled the transit agreement over price disputes and cut off oil supplies to Syria. Saudi Arabia supplied oil for the Homs refinery until February 1979, when Iraq and Syria negotiated a new agreement, setting transit fees at $0.35 per barrel compared to $0.45 per barrel when the pumping stopped. The outbreak of the Iran-Iraq War in September 1980 interrupted pumping and in April 1982, after negotiating an agreement to purchase oil from Iran, Syria closed the pipeline to Iraqi petroleum exports.

Official grants

Grants played a very important role in the 1970s and the early 1980s in financing the current account and budget deficits. As a result of the 1973 war, the political support given to Syria and other Arab countries, namely Egypt and Jordan, translated into financial support in the form of official grants. Since 1979, the grants under the Baghdad Agreement of 1978[1] have been the principal means of financing the large deficits in the current account. These grants rose sharply after 1978, to the equivalent of 11 percent of GDP in 1981. However, they declined substantially in the following two years to about 6 percent of GDP in 1983. The decrease in grants continued since then to reach $91 million in 1990. This put further pressure on the BOP in addition to the pressure resulting from the decline of non-oil exports. The grants increased temporarily in 1991 and 1992 and then almost faded away therafter.[2] While most of the official grants were in the form of direct transfers, some of these grants in the mid-1980s and 2000s were in the form of imported oil from Iran and Iraq on concessionary terms, which was reflected in higher net oil exports.[3]

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[1] At the 1978 Baghdad summit conference, the Arab oil-producing states pledged $1.8 billion a year in financial support to Syria. However, most observers agreed that actual cash transfers amounted to far less than official allocation levels.
[2] The political developments in 1991 (when Iraq invaded Kuwait, and Syria decided to send troops to support the liberation of Kuwait) helped in the resumption of grants from GCC countries.
[3] Iran has supplied large quantities of oil to Syria on concessionary terms and as outright gifts. In 1984, Iran provided Syria with 6.4 million tons of oil, discounted by $2.50 per barrel, and 1.6 million tons free. In 1985, Iran supplied Syria with 6 million tons of oil, including a 1-million-ton gift. (Source: *Syria: Energy and Natural Resources*, 1987—available via website: http://memory.loc.gov/cgi-bin/query/r?frd/cstdy:@field(DOCID+sy0073.)

Figure 3. Syrian Arab Republic: Share of Oil-Related Revenues in Total Foreign Exchange Earnings,
and Balance of Payments Developments, 1960–2005 1/
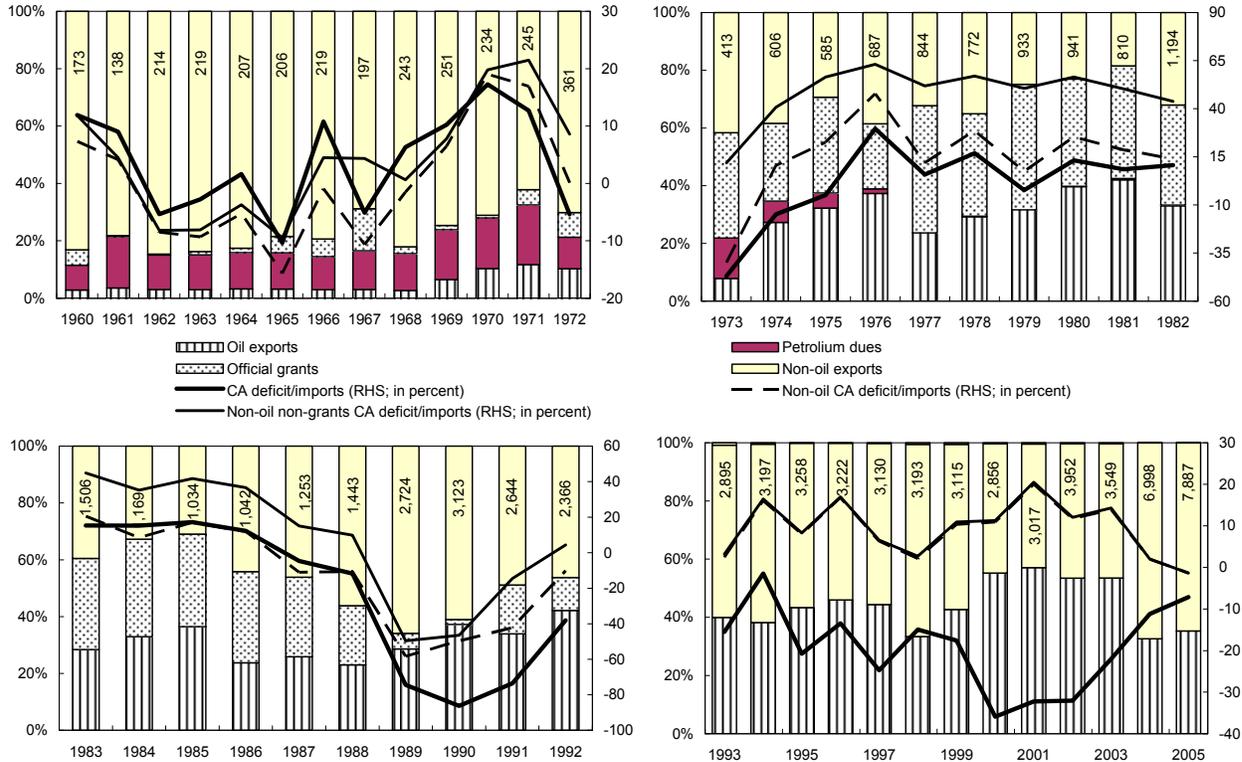
Sources: Central Bank of Syria; and Fund staff estimates.
1/ Non-oil exports are in millions of U.S. dollars.

The fiscal impact of the oil-related income (Figure 4) was parallel[17] to the BOP impact as the oil-related income is captured by the government with government expenditure adjusted to reflect available resources. While the fiscal impact was important in the 1960s, it became more significant in the 1970s and early 1980s with the increase in production of oil and official grants. However, as was the case for the BOP, the increase in oil-related revenues encouraged higher government expenditures and hence an unsustainable fiscal stance, with budget deficits hovering around 10 percent of GDP in the early 1980s, and leading to the financial crisis of the mid-1980s. Since then, the authorities have adopted a policy of rationalizing development expenditures to maintain the overall budget deficit within 5 percent of GDP. This policy helped achieve relatively low public debt-to-GDP ratios (about 42 percent as of 2005).

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[17] Although it is parallel, it is not exact since an important part of oil revenues comes from the domestic sale of petroleum products.

Figure 4. Syrian Arab Republic: Share of Oil-Related Revenues in Total Foreign Exchange Earnings, and Fiscal Developments, 1960–2005 1/


Sources: Ministry of Finance; and Fund staff estimates.
1/ Non-oil revenues in millions of Syrian pounds.
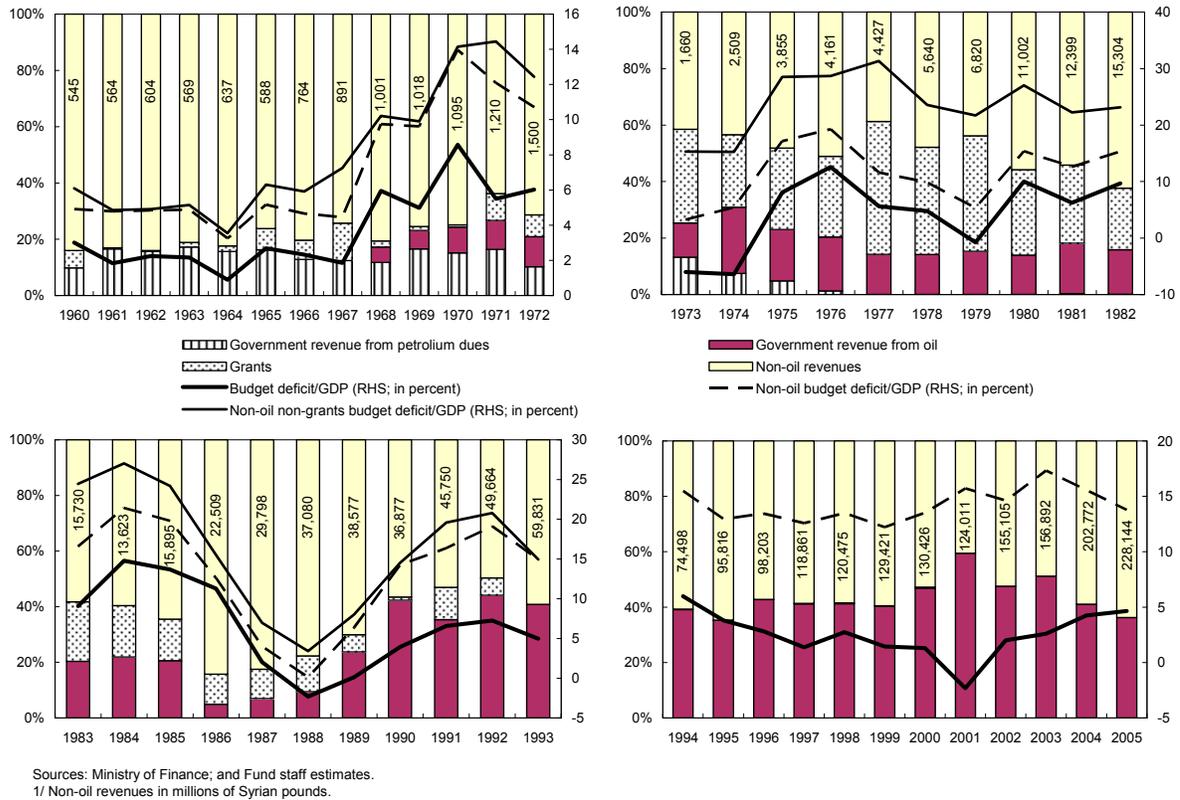
V. THEORETICAL DETERMINANTS OF THE EQUILIBRIUM REAL EXCHANGE RATE AND ESTIMATION RESULTS

A. Theoretical Determinants of the Equilibrium Real Exchange Rate

Many variables have been identified in the literature with possible impacts on the ERER. The decision to include these variables in the empirical analysis has been guided by their relevance to the country(s) studied and by their availability or the availability of a suitable proxy for them.

➢ **Oil and other related activities** could have an important impact on the ERER. Several empirical studies showed the positive impact of oil wealth or prices on the ERER (MacDonald and Ricci, 2003; and Zalduendo, 2006). Saadi-Sedik and Petri (2006) showed the positive impact of grants on the ERER for Jordan. In the case of Syria, the oil-related activities include oil production, petroleum dues and official grants. We measure the impact of oil through net oil exports to GDP. Although many studies used real oil prices to capture the TOT impact of oil, using oil prices would not be appropriate in the case of Syria due to the substantial change in the level of production between 1960

and 2005, and the move from importer to exporter.[18] With the depletion of oil resources, what influences the ERER is the value of the exported extracted oil resources and not only the unit price.[19] Furthermore, measuring the oil impact through the value of net oil exports makes it possible to assess the cumulative impact of the three oil-related income components (oil, petroleum dues, and grants) which were mainly driven by oil market developments (see Box 1). On the other hand, the fact that the other related income components existed for a relatively short period hinders the separate analysis of their impact, making the aggregate analysis (with oil) of their impact a more appealing choice.[20] We measure the impact of oil-related income (rent) through the rent-to-GDP ratio.[21]

➤ Developments in **relative productivity** capture the Balassa-Samuelson effect.[22] Countries with higher productivity growth in the tradables sector (where such growth tends to concentrate) can sustain an ERER appreciation without losing competitiveness. We use the relative real per capita GDP for Syria to its trade partners as a proxy for relative productivity.[23]

➤ An increase in **government expenditures (consumption)** would reduce the fiscal balance and consequently weaken the CA position putting downward pressure on the exchange rate, especially if they are biased toward tradables. In the context of a restricted trade system and administrative prices for many nontradables, higher demand for tradables would boost their relative prices, causing the real exchange rate to depreciate. Examples of negative relation between the exchange rate and large fiscal and current account deficits include the Syrian pound depreciation in the mid 1980s, the Jordanian dinar depreciation in the late 1980s, and the recent depreciation of the U.S. dollar. Ravn and others (2007) investigated the effects of government spending shocks using panel

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[18]Zalduendo (2006) investigated the correlation between REER and real oil prices for a set of oil countries. He found that Syria has the weakest correlation (0.16).

[19]In countries where oil production is stable the impact on the ERER would be well captured through changes in oil prices.

[20]In the empirical analysis, we examine both the impact of oil and the impact of oil-related income.

[21] One could add to the oil-related income private remittances given their similarity to grants. However, remittances are not well captured in the BOP data in Syria due to the fact that most of the transactions took place in the unofficial market for most of the period.

[22] Balassa (1964) and Samuelson (1964) argue that a productivity increase in the tradable sector induces a rise in wages in this sector. As labor is assumed to move freely between sectors, the higher wage level in the tradable sector will spill over to the nontradable sector. If productivity in the nontradable sector remains constant, this rise in wages will bring about higher prices of nontradable goods. The overall price level in the economy rises and the real exchange rate appreciates.

[23] This ratio is obtained by dividing Syria's per capita real GDP by the weighted trade partners' per capita real GDP. Better proxies could be total factor productivity or non-oil GDP. However, data limitation prevents their use.

structural VAR analysis and data from four industrialized countries. They found that an increase in government spending leads to an expansion in output and private consumption, a deterioration in the trade balance, and a depreciation of the real exchange rate. This negative relation does not preclude the possibility of positive impact of government expenditure on the REER through inflation in the short run (Rogoff, 1996). We measure the impact of government expenditures through the expenditure-to-GDP ratio.

➢ Restrictions on imports and protection of domestically produced goods via tariffs and nontariff barriers enable countries to sustain an appreciated ERER. In the case of Syria, protective measures have been used extensively during the period we are investigating. A common proxy for the severity of trade restrictions or **openness to trade** is the ratio of the sum of exports and imports to GDP.[24]

➢ High **net foreign assets** (NFA) improve the solvency of the country and alleviate the pressure to devalue domestic currency. With high solvency, capital inflows from abroad would increase causing the ERER to appreciate. The income generated from accumulated NFA has a similar impact. Significantly high NFA could have a wealth effect that increases demand for nontradables and hence contributes to an appreciation of the exchange rate. We measure the impact of NFA through the NFA-to-GDP ratio. To account for the change in policy toward accumulating large NFA in the early 1990s beyond solvency requirements we introduce a dummy variable.

Many other variables were examined in the literature including TOT, real interest rate differential, and the budget deficit. While a TOT shock is important for commodity exporting countries, using the net oil export would capture its impact when it is relevant. The prevalence of capital account controls since the 1950s suggests a rather weak effect of interest rate differentials on the ERER. In addition, the administrative interest rate structure makes it very difficult to compare Syrian pound rates with rates on foreign currencies. In the long run, it is not conceivable to have a non-stationary budget deficit since this would imply an unsustainable fiscal stance. With oil-related income largely exogenous, the authorities' main policy variable was to adjust expenditures to smooth demand with most of the flexibility exercised in capital spending. Hence, the fiscal stance in Syria could be better assessed through examining government expenditures.

B. Estimation Results and Data Issues

Figure 5 depicts the REER and its theoretical determinants. The positive relation between the REER and the oil-related income is very clear especially during the1970s and the 1980s. The decline in oil-related income in the 1980s along with expansionary fiscal stance led to

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[24] One could argue that this proxy might be inappropriate in the case of Syria because changes in oil exports do not reflect changes in openness. An alternative proxy for openness to trade could be the imports-to-GDP ratio. We will examine both proxies.

deterioration in the NFA level and the forced correction in the exchange rate. Higher oil-related income and prudent fiscal policy in the 1990s and the 2000s helped accumulate large NFA. Figure 5 also shows the positive relation between relative productivity and the REER, and the move toward more openness in Syria especially since 2000.

Figure 5. Syrian Arab Republic: Real Effective Exchange Rate and its Theoretical Determinants, (1960–2005)
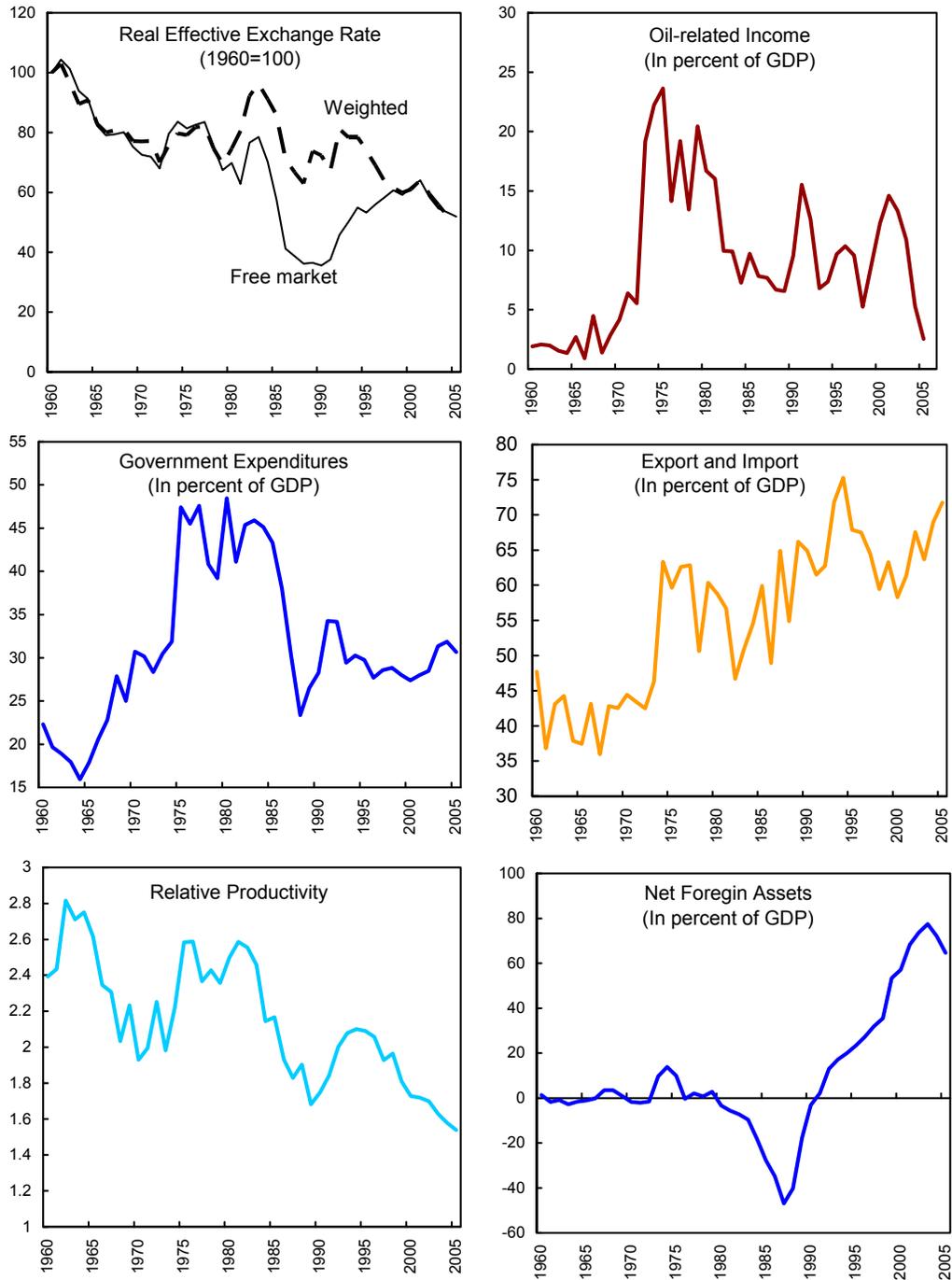
Sources: Country authorities; and Fund staff estimates.

Unit root tests suggest that REER and its theoretical determinants are integrated of order one, or I (1), (Table 1). Hence, one or more cointegration relationships may exist. Cointegration tests suggest that one cointegration vector exists between REERF and its theoretical determinants and two vectors exist using the weighted exchange rate in defining the REER (REERW) (Table 2).[25]

Table 1. Syrian Arab Republic: Unit Root Tests 1/

Null hypothesis: ( ) has a unit root	Levels		First Differences	
	T-Statistics	P-Value	T-Statistics	P-Value
Log of REERF (LREERF)	-2.10	0.25	-4.48	0.00
Log of REERW (LREERW)	-1.14	0.69	-5.74	0.00
Log of openness variable (LOPEN)	-1.45	0.55	-11.04	0.00
Log of relative productivity variable (LPROD)	-1.01	0.74	-7.32	0.00
Log of government expenditures to GDP variable (LEXPGDP)	-1.68	0.44	-6.38	0.00
Log of oil-related income to GDP variable (LRENTGDP)	-2.30	0.18	-9.73	0.00
Net oil balance to GDP variable (NTOLGDP)	-2.65	0.09	-5.12	0.00
NFA to GDP variable (NFAGDP)	-1.18	0.67	-3.55	0.01
NFA to imports variable (NFAIMP)	-1.41	0.57	-3.67	0.01

Source: Authors' calculations.
1/ Augmented Dickey-Fuller test equation, lag length selected automatically based on Schwarz Info Criterion.

Table 2. Syrian Arab Republic: Multivariate Cointegration Test Results

REERF	Rank Test (Trace)		Maximum Eigenvalue	
Cointegration Tests 1/	Trace Statistic	P-Value 2/	Max-Eigen Statistic	P-Value 2/
None (r=0)	130.394	0.000	54.485	0.001
At most 1 (r<=1)	75.909	0.015	33.431	0.056
At most 2 (r<=2)	42.478	0.146	23.785	0.142
At most 3 (r<=3)	18.692	0.515	10.666	0.681
At most 4 (r<=4)	8.027	0.463	6.292	0.576
At most 5 (r<=5)	1.734	0.188	1.734	0.188
REERW				
Cointegration tests 1/				
None (r=0)	138.251	0.000	54.796	0.000
At most 1 (r<=1)	83.455	0.003	36.505	0.003
At most 2 (r<=2)	46.950	0.061	24.726	0.061
At most 3 (r<=3)	22.224	0.286	11.653	0.286
At most 4 (r<=4)	10.571	0.239	7.515	0.239
At most 5 (r<=5)	3.056	0.080	3.056	0.080

Source: Authors' calculations.
1/ Linear trend in data, and an intercept, but no trend in the cointegration equation.
2/ MacKinnon-Haug-Michelis (1999) p-values.

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[25] For the REERF the rank test suggests two cointegration vectors at 5 percent significance level while the maximum eigenvalue test indicates only one. Gregory (1994) showed that both tests have tendency to over-reject the null hypothesis, i.e., suggest more cointegrating vectors due to small sample bias. Thus, as the sample size (T) falls, or the number of variables (n) or lags (j) increases, the critical values should be adjusted upwards. He also pointed out that the size is better for eigenvalue test suggesting if results conflict, more weight should be given to eigenvalue test. Drawing on these conclusions, we use the eigenvalue test to conclude the existence of one cointegration vector. Reinsel and Ahn (1988) suggest that the critical values be adjusted upwards by a multiplicative scaling factor or "degrees-of-freedom correction term" given by T/(T - nj). Applying this adjustment would definitely change the conclusion from the rank test.

Table 3 provides the estimation results for the long run or steady state relation ship from a vector error correction model (VECM) using the free rate to define the REER. All long-term parameter estimates for the theoretical determinants are significant and consistent with the theoretical relationship underlying the ERER. Higher oil-related income, relative productivity, and NFA are associated with a more appreciated ERER. Trade openness and higher government expenditures put pressures on the ERER. The sign of the government expenditures suggest that higher government expenditures translate into higher imports and weaker CA position, which is confirmed by the strong correlation between government expenditures and imports (Figure 6).

Table 3. Syrian Arab Republic: Long-Term Coefficient From Vector
Error Correction Model Estimates Using the Free Market Rate 1/

Cointegrating Eq:	Model 1	Model 2	Model 3
LREERF(-1)	1	1	1
LOPEN(-1)	1.109218		1.032961
	[4.89266]		[8.27809]
NFAGDP(-1)	-0.390453	-0.567631	
	[-4.26961]	[-6.35985]	
NFAIMP(-1)			-0.059083
			[-1.84412]
LOPENMP(-1) 2/		0.920989	
		[4.03514]	
LPROD(-1)	-0.386543	-1.140857	-1.440717
	[-2.15107]	[-6.78902]	[-13.0600]
LEXPGDP(-1)	0.885232	0.45976	-0.080857
	[4.52821]	[2.40367]	[-1.44864]
LRENTGDP(-1)	-0.385116	-0.30991	
	[-4.72624]	[-3.79176]	
NTOLGDP(-1)			-6.195046
			[-6.58773]
C	-1.782015	4.060958	-0.439565
Error Correction Term	-0.177934	-0.10485	-0.225343
	[-1.95015]	[-1.46778]	[-1.70309]

1/ Sample: 1963–2005, included 43 observations after adjustments and t-statistics in [   ].
2/ Log of imports-to-GDP ratio.

Figure 6. Syrian Arab Republic: Government Expenditure and Imports, 1961–2005
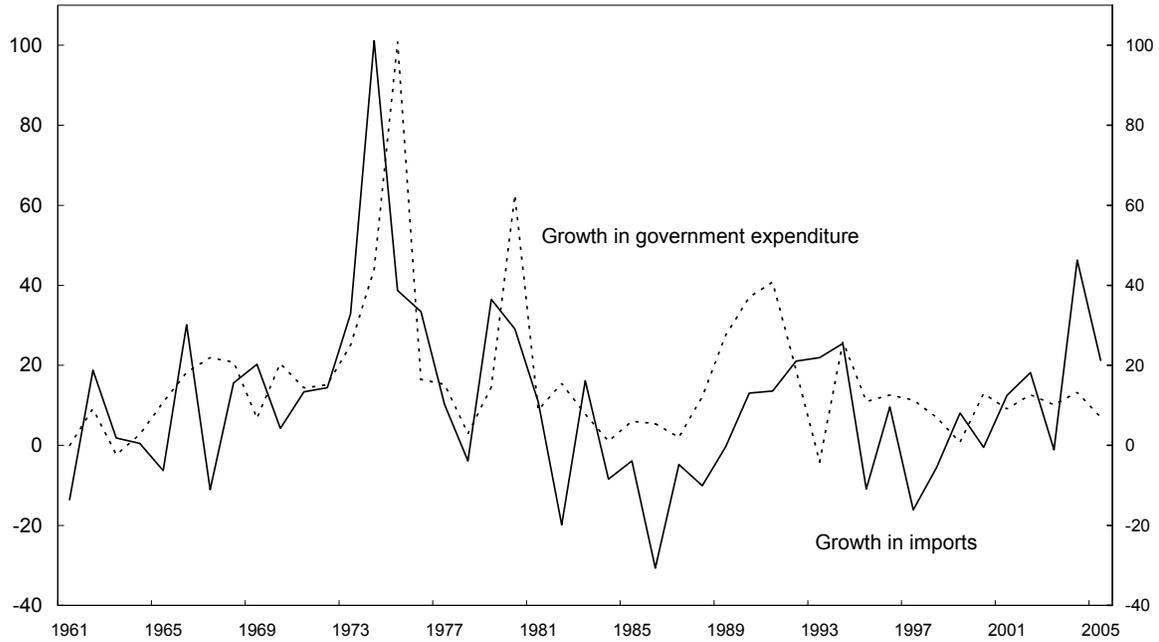
Source: Syrian authorities

The error correction term is significant and suggests that half of the gap between the observed real effective exchange rate and equilibrium real exchange rate could be closed within two years. Based on model 1 in Table 3, the ERER steady state relation with fundamentals could be written as:

$$ERER = 1.7 - 1.11\,LOPEN + 0.39\,NFAGDP + 0.39\,LPROD - 0.88\,LEXPGDP + 0.39\,LRENTGDP$$

The short-term dynamics (Table A1 in Appendix II) are consistent in impact with the long-term effect with the exception of government expenditures, which suggests that higher government expenditures could lead to an appreciation in the REER in the short run.

The results from the REERW are shown in Appendix II (Table A2). The first cointegrating vector provides results for the steady state relationship similar to those obtained using the NEERF. The parameters estimates in second vector, however, have either implausible signs or are insignificant. As we indicated in Section III-B, the measurement problems associated with REERW could affect the inferences based on results obtained based on it.

Figure 7 shows the smoothed (using HP-filter) ERER and the unsmoothed ERER and the actual REER. The results suggest that the Syrian pound was in line with fundamentals in 2005 when compared to its equilibrium level. The figure also shows the large overvaluation of the SP in the early 1980s that has led to the strong adjustment (to remove the misalignment) in the mid-1980s in the form of the exchange crises. Table 3 shows that the results are robust for alternative specifications such as defining openness as the ratio of imports to GDP and for the use of net oil exports instead of oil-related income.

Figure 7. Syrian Arab Republic: REERF, Smoothed and Unsmoothed ERER, and Misalignment (1960=100;1960–2005)
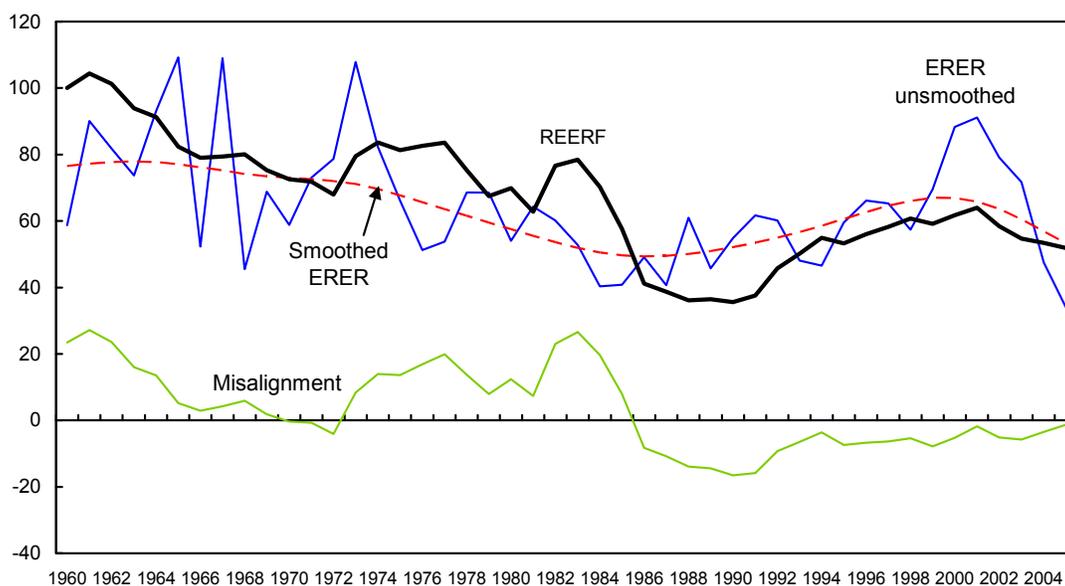
Source: Authors' calculations.

However, the results regarding the misalignment need to be interpreted with caution since they are subject to a margin of uncertainty. This is due to limitations of ERER analysis arising from (i) the type of long-run relationship,[26] (ii) uncertainty about fundamentals, (iii) data uncertainty, and (iv) uncertainty arising from smoothing techniques.[27]

The continued decline in net oil exports (oil-related income) and increase in openness, with the removal of many trade barriers over the last few years, are likely to widen the current account deficit and put downward pressures on the ERER. The sharp decline of the

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[26] This problem refers to the issue that ERER models are models of real exchange rate determination because they attempt to connect the observed real exchange rate to fundamentals. Hence, empirically estimated coefficients are interpreted as equilibrium coefficients, which link the unobserved equilibrium exchange rate and the fundamentals (the equilibrium relationship is assumed to equal the empirical long-term relationship). See Égert and others (2005) for more discussion on this issue.

[27] See Saadi-Sedik and Petri (2006) for a detailed discussion about this point.

unsmoothed ERER and downward slope of the smoothed ERER in Figure 7 reflects mainly the impact of the previous two variables. An external sustainability analysis shows that maintaining the current level of NFA would require a CA surplus, while allowing a gradual decline in the NFA level (by 2 percentage points of GDP annually) would require significantly lower CA deficits (Figure 8) that the projected CA. In addition, the transition to market economy and removing subsidies are likely to have an impact both on the ERER and REER. While the net impact of all these factors is difficult to project, the fact that the Syrian economy is facing these real shocks clearly calls for greater flexibility in the exchange rate regime.

Figure 8. Syrian Arab Republic: External Sustainability Assessment
(In percent of GDP)
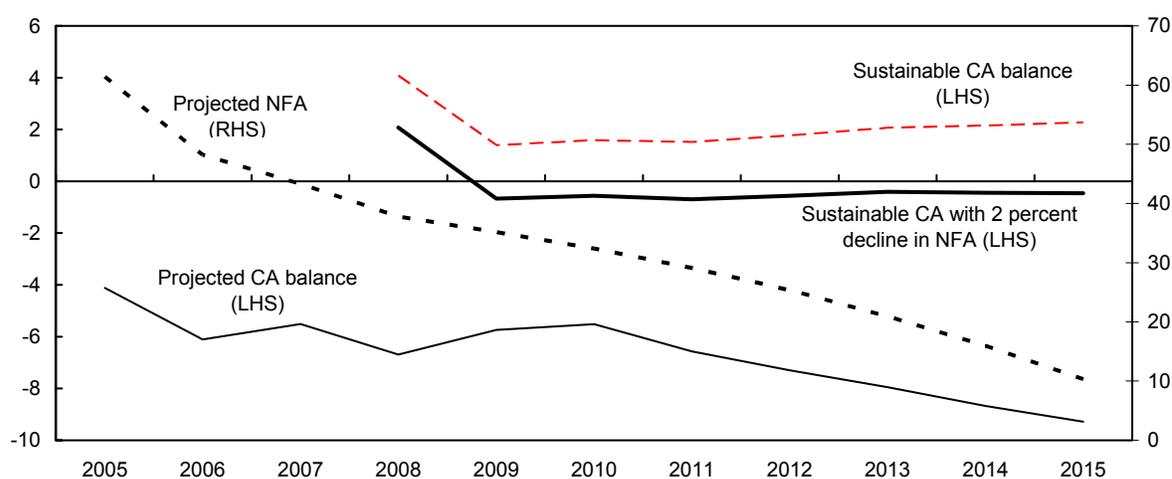
Sources: Authorities' data; and staff projections and calculations.

VI. CONCLUSIONS

Drawing on the existing literature and taking into account the specifics of the Syrian economy, this paper estimates the long-run relationship between the equilibrium real exchange rate and oil-related income as well as other fundamentals. The analysis concludes that, in the long run, the ERER appreciates with higher oil-related income, productivity and NFA, but depreciates with higher government expenditures.

The results suggest that while the exchange rate seemed in line with fundamentals in 2005, greater flexibility will be needed in the future to facilitate the adjustment of the real exchange rate, which may well be required, given the prospective depletion of oil reserves and further trade liberalization. In addition, the transition to a market economy and the reform of the price subsidy system, which the authorities have already initiated, will also affect the developments of the ERER and REER and hence call for greater flexibility to facilitate aligning the Syrian pound with fundamentals and avoid loss in competitiveness or a disruptive adjustment.

Preparing the ground for a gradual move toward greater flexibility will be necessary. The central bank needs to develop the capacity, instruments and markets to run a flexible regime. Currently the central bank lacks any indirect monetary policy instruments and has relied exclusively on credit ceilings, moral suasion, and refinancing facilities to regulate domestic liquidity. These tools are increasingly insufficient to rein in the activities of the new private banks that are less susceptible to moral suasion than the public banks. In addition, issues related to central bank independence, inflation forecasting capacity, and communications strategy in response to economic and financial shocks will need to be addressed.

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APPENDIX I. EXCHANGE SYSTEM DEVELOPMENTS IN SYRIA[28]

Prior to February 1961, Syria had two exchange rates (markets). The official rate was set by the Exchange Office (SP 3.565 per U.S. dollar buying and SP 3.585 selling) and applied to the proceeds of major exports, and the payment for most imports and a few services. All other transactions took place on the free market rate. The difference between the two rates was very small (rarely exceeding 1.5 percent) until about the end of 1959. Since then, due to increasing pressures on the BOP and the authorities' decision to shift certain imports to the free market rate, the difference widened.[29] In February 1961, the free market was abolished and pervasive exchange controls were introduced including quantitative limits on imports.

As a result of these developments, a stabilization program was put into effect in November 1961, and was the basis for the Stand-By Arrangement with the Fund in March 1962. In accordance, the authorities embarked on a policy of liberalization,[30] thus reversing the previous restrictive measures. With the improvement in the BOP position in 1962, the authorities reintroduced the free market rate on July 17, 1962 and announced a new official rate of SP 3.8 per U.S. dollar (buying). The free market rate was virtually at par with the new official rate until March 1963, when the central bank decided to discontinue its intervention in the free market in order to avoid excessive use of official reserves. As a result, the free market rate depreciated and restrictions similar to those imposed in February 1961 were reintroduced including abolishing the legal free market in May 1963. In January 1964, a parallel market was established where the rate was set in that market by the Commercial Bank of Syria in consultation with the central bank. The scope and access to the parallel market had been adjusted from time to time affecting the exchange rate in the unofficial free market.

In the first half of 1965, a large part of Syria's foreign trade was nationalized and different state agencies were established and granted the exclusive right to trade in a specified list of commodities. During that period, the parallel and free market rates depreciated and the gap between them and the official rate widened reflecting the deterioration in the BOP. The authorities intervened in the markets through measures aimed at improving the BOP, including imposing restrictions on imports[31] and affecting the demand and supply in the free market by changing the surrender requirements and the list of imports that could be financed

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[28] This appendix is based on information obtained from staff reports and recent economic development reports from 1951–2007.

[29] In January 1961, the monthly average of the premium of the official rate over the free rate was as high as 16 percent.

[30] Including liberalizing the import licensing system.

[31] Including quotas.

at the official rate. By 1971, the depreciation in the parallel market rate reached about 20 percent. However, the BOP improved significantly in the 1972–75 period due to a large increase in petroleum transit dues, Arab aid after the 1973 war, and the increase in oil prices and production during that period. This helped the authorities to unify the official and the parallel market rates in July 1973 at SP 3.73 per U.S. dollar.

The 1976–78 period was characterized by a large trade deficit, which widened nearly fourfold between 1974 and 1978. However, the inflow of grants from Arab oil-producing countries and small depreciations of the unified rate helped the authorities to maintain relative stability in the exchange market with the free market rate in neighboring countries slightly depreciated from the official rate. Since 1979 the grants provided by neighboring countries under the Baghdad Agreement of 1978, had been the principal means of financing the large current account deficits. These grants rose sharply after 1978, to the equivalent of 11 percent of GDP in 1981, before starting a steep decline in the following two years to about 6 percent of GDP in 1983.

In response to these developments, the authorities curtailed the provision of foreign exchange to private importers and then waived penalties for noncompliance with regulations governing payments for imports. Private importers seeking own-financing arrangements put pressures on the unofficial free market. The supply of foreign exchange in the unofficial free market, which came mainly from remittances, tourism, private exporter receipts evading surrender requirements and private capital held by Syrians abroad fell short of market demand, which led to a large depreciation of the Syrian pound. In addition to the previous measures, the authorities reestablished the parallel market in April 1981 at a rate of SP 6.3 per U.S. dollar and after a few adjustments the rate was fixed at SP 5.45 per U.S. dollar. A more depreciated rate, the tourist rate,[32] was also introduced in May 1982. However, all previous measures failed to prevent the sharp depreciation of the unofficial free rate and by 1983 the free rate had depreciated by about 60 percent relative to the official rate.

The weak current account position continued during 1984–87, reflecting declining receipts from oil exports, strong demand for imports, and reduced inflows of grants and private remittances. Exports fell due to the weakening of oil prices, poor harvests that limited agricultural exports, reduced capacity utilization in industry due to shortages of raw materials and spare parts, and the overvalued official exchange rates applicable to exports. Consequently, the spread between the official rates and the unofficial free market rate widened further. The authorities responded by introducing a fourth selling rate in

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[32] The large and increasing spread between the official parallel exchange rate and the rate in the unofficial market presented strong incentives for workers' remittances and similar foreign exchange inflows to be channeled through the unofficial market. To counter this diversion, the authorities established in May 1982 a third exchange rate, the "tourist rate," that covered private remittances, all tourist receipts and payments, and private financial transactions.

September 1985 at SP 11.25 per U.S. dollar, applicable only to medical and travel expenses by Syrian nationals abroad.

In early August 1986, the rate in the unofficial free market had reached SP 27 per U.S. dollar, leading the authorities to introduce on August 11, 1986 a new exchange rate, the "promotion rate" at the level of SP 22.00 per U.S. dollar. This rate was loosely tied to the value of the Syrian pound in the Amman and Beirut foreign exchange markets, but was kept below the rates prevailing in these markets. The promotion rate applied to private remittances, travel abroad for tourism and medical treatment, and imports of printed materials. Concomitant with the introduction of the promotion rate, the special rate to cover medical and travel expenses abroad was abolished. On October 1, 1986, two specific rates were introduced for payments for airline tickets by nonresidents and for transfers of profits by airline companies. On September 20, 1987, a decision was made to change (effective January 1, 1988) the official rate to SP 11.20/11.25 per U.S. dollar. Consequently, the parallel and tourist rates were abolished.

Despite many changes in the exchange system and the transfer of transactions to more depreciated rates, strains persisted in the exchange market. The rate for the Syrian pound in neighboring exchange markets continued to be more depreciated than the promotion exchange rate due to the inability of the official market to meet all of the economy's demand for foreign exchange at the official and promotion rates.

In 1988, Syria's external current account recorded a surplus and started improving since then to peak at $2.5 billion in 1990, reflecting higher oil export receipts driven by higher oil production and world oil prices in the wake of the second Gulf War. Despite a sharp decline in the trade surplus to $1.1 billion in 1991 (from $2 billion in 1990) as oil export receipts weakened, the current account surplus remained stable at about $2.5 billion with about $1 billion grants from Arab countries. To promote exports and to bridge the gap with the unofficial free rate, two new and significantly depreciated exchange rates—namely, the export promotion rate and the more depreciated neighboring countries' rate (SP 40/42 per U.S. dollar)—were introduced in 1989. Since then and as part of the general economic liberalization and to price foreign exchange more realistically, the effective exchange rate has been depreciated largely by applying the more depreciated neighboring countries' rate to a larger number of international transactions while adjustments in the prevailing rates were also made from time to time. While the export promotion rate had remained unchanged since 1988, the volume of transactions subject to this rate was gradually reduced and the rate was abolished in 1991. In 1996, the authorities introduced the budget rate, which was significantly appreciated compared to the unofficial free market rate. However, this rate was brought close to the neighboring countries' (commercial) rate in 1998.

Since 1998, the budget, commercial, and unofficial free rates have been relatively stable. The current account surplus, supported by higher oil exports and a more realistic official exchange rate, resulted in a large accumulation of NFA and enabled the authorities to meet

importers' demand for foreign currency and hence lowered the pressure on the exchange rate in the unofficial market.

In the last few years, the authorities started a process of liberalizing the current account and in late 2005, they allowed the commercial banks to issue letters of credit for the export and import of 950 items representing about a quarter of the country's total imports and exports.[33] In addition the responsibility to quote the official rate for private sector transactions was shifted from the Commercial Bank of Syria to the central bank and the government authorized the central bank, within specified limits, to buy and sell foreign exchange to ensure orderly conditions in the market. As of January 2007, the commercial and budget rates have been unified and most restrictions on current transactions have been abolished.

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[33] In the past, importers used to finance these items by buying foreign currency from the unofficial market. Although the timing for intensifying the liberalization process aimed also to contain the pressures on the exchange rate due to the political developments in the region after the assassination of Lebanese former Prime Minister Hariri, it was consistent with the authorities' liberalization policy and has continued since then.

APPENDIX II. DETAILED ECM RESULTS

Table A1. Syrian Arab Republic: Short-Term Dynamics and Correction Terms Using the Free Market Rate 1/

Error Correction:	D(LREERF)	D(LOPEN)	D(NFAGDP)	D(LPROD)	D(LEXPGDP)	D(LRENTGDP)
CointEq1	-0.177934	-0.353157	-0.042503	0.072031	-0.175671	2.075063
	[-1.95015]	[-2.49316]	[-0.54981]	[0.96529]	[-1.20991]	[3.42433]
D(LREERF(-1))	0.216573	0.299604	0.205987	0.189991	0.073629	-0.728604
	[1.45546]	[1.29692]	[1.63385]	[1.56118]	[0.31095]	[-0.73726]
D(LREERF(-2))	-0.04487	0.609995	-0.197245	-0.201652	0.593426	-2.915829
	[-0.23882]	[2.09124]	[-1.23906]	[-1.31230]	[1.98479]	[-2.33669]
D(LOPEN(-1))	-0.052314	-0.396072	-0.022386	0.187202	0.132182	-0.676692
	[-0.45334]	[-2.21081]	[-0.22896]	[1.98354]	[0.71981]	[-0.88294]
D(LOPEN(-2))	-0.064101	-0.164378	0.044622	0.124156	0.027861	0.591922
	[-0.61766]	[-1.02025]	[0.50748]	[1.46280]	[0.16871]	[0.85879]
D(NFAGDP(-1))	0.025329	-0.703426	0.43837	0.197014	0.106484	6.229329
	[0.08841]	[-1.58161]	[1.80604]	[0.84088]	[0.23358]	[3.27404]
D(NFAGDP(-2))	0.177807	-0.135766	-0.087401	0.27259	0.426122	2.833226
	[0.67622]	[-0.33259]	[-0.39232]	[1.26759]	[1.01841]	[1.62240]
D(LPROD(-1))	0.132349	-0.395302	0.087665	-0.102811	-0.000173	0.917253
	[0.71609]	[-1.37768]	[0.55983]	[-0.68017]	[-0.00059]	[0.74726]
D(LPROD(-2))	0.623036	0.097066	-0.022406	0.106325	-0.181418	0.421165
	[3.82396]	[0.38374]	[-0.16231]	[0.79793]	[-0.69972]	[0.38921]
D(LEXPGDP(-1))	-0.07471	0.056154	-0.158587	-0.100097	-0.065784	-2.30187
	[-0.57748]	[0.27958]	[-1.44678]	[-0.94602]	[-0.31953]	[-2.67898]
D(LEXPGDP(-2))	0.204324	-0.053722	-0.043194	-0.010683	0.030073	0.007917
	[2.08865]	[-0.35373]	[-0.52113]	[-0.13352]	[0.19318]	[0.01218]
D(LRENTGDP(-1))	-0.014058	-0.018369	-0.018785	0.049128	0.012641	0.103359
	[-0.42166]	[-0.35489]	[-0.66500]	[1.80173]	[0.23826]	[0.46678]
D(LRENTGDP(-2))	0.008943	0.018883	0.018628	0.082151	-0.019772	0.463714
	[0.31145]	[0.42360]	[0.76572]	[3.49835]	[-0.43273]	[2.43169]
C	-0.00377	0.077012	0.003508	-0.026526	0.052621	-0.199435
	[-0.21541]	[2.83447]	[0.23661]	[-1.85325]	[1.88948]	[-1.71584]
NFA Dummy	-0.019128	-0.122679	0.031076	-0.008878	-0.15765	0.068295
	[-0.56640]	[-2.33993]	[1.08608]	[-0.32145]	[-2.93358]	[0.30450]
R-squared	0.634724	0.460953	0.552307	0.579313	0.477161	0.496682
Adj. R-squared	0.452086	0.19143	0.32846	0.368969	0.215742	0.245023
Sum sq. resids	0.137938	0.332461	0.09902	0.092264	0.349298	6.084373
S.E. equation	0.070188	0.108966	0.059468	0.057403	0.111691	0.466153
F-statistic	3.475315	1.710252	2.467342	2.754126	1.82527	1.973631
Log likelihood	62.44186	43.52795	69.56869	71.0882	42.46576	-18.97161
Akaike AIC	-2.206598	-1.326881	-2.538078	-2.608754	-1.277477	1.580075
Schwarz SC	-1.592226	-0.712509	-1.923706	-1.994382	-0.663105	2.194447
Log likelihood		297.6608				
Akaike information criterion		-9.379574				
Schwarz criterion		-5.447593				

1/ Sample: 1963–2005, included 43 observations after adjustments and t-statistics in [   ].

Table A2. Syrian Arab Republic: Vector Error Correction Model
Estimates Using Weighted Exchange Rate 1/

Cointegrating Eq:	CointEq1	CointEq2				
LREERW(-1)	1	0				
LOPEN(-1)	0	1				
LEXPGDP(-1)	0.435025 [3.15713]	-1.965081 [-5.32096]				
LRENTGDP(-1)	-0.086235 [-1.88575]	0.445372 [3.63376]				
NFAGDP(-1)	0.305061 [5.08889]	-0.120544 [-0.75026]				
LPROD(-1)	-0.361936 [-3.19052]	0.164175 [0.53997]				
C	2.608728	-5.284875				
Error Correction:	D(LREERW)	D(LOPEN)	D(LEXPGDP)	D(LRENTGDP)	D(NFAGDP)	D(LPROD)
CointEq1	-0.850367 [-6.01951]	-0.051336 [-0.14717]	-0.36631 [-1.13966]	-0.921182 [-0.65363]	-0.548999 [-3.85273]	0.134839 [0.78151]
CointEq2	-0.226191 [-4.42016]	-0.121053 [-0.95802]	0.07746 [0.66529]	-1.393713 [-2.73003]	-0.078166 [-1.51434]	0.013242 [0.21188]
D(LREERW(-1))	0.522664 [3.53315]	-0.077734 [-0.21281]	0.16998 [0.50502]	-0.738496 [-0.50040]	0.408157 [2.73532]	0.135552 [0.75026]
D(LREERW(-2))	0.298508 [1.81404]	-0.094531 [-0.23265]	0.697003 [1.86165]	-1.431272 [-0.87186]	0.114773 [0.69147]	-0.198453 [-0.98745]
D(LOPEN(-1))	0.134893 [1.57038]	-0.45129 [-2.12769]	0.05578 [0.28541]	1.533511 [1.78951]	0.009835 [0.11351]	0.184538 [1.75899]
D(LOPEN(-2))	0.111876 [1.48788]	-0.122877 [-0.66182]	-0.022151 [-0.12948]	1.215884 [1.62089]	0.016438 [0.21674]	0.106869 [1.16372]
D(LEXPGDP(-1))	-0.046753 [-0.47861]	-0.27932 [-1.15801]	0.094438 [0.42490]	-2.123802 [-2.17931]	-0.067856 [-0.68866]	-0.082509 [-0.69157]
D(LEXPGDP(-2))	-0.038468 [-0.53053]	-0.104179 [-0.58187]	0.176782 [1.07157]	-0.431217 [-0.59613]	-0.037769 [-0.51641]	-0.045917 [-0.51850]
D(LRENTGDP(-1))	0.022225 [1.11813]	0.077253 [1.57402]	0.019798 [0.43777]	-0.168234 [-0.84841]	-0.01938 [-0.96661]	0.0361 [1.48707]
D(LRENTGDP(-2))	2.71E-05 [0.00140]	0.057728 [1.20737]	-0.019443 [-0.44131]	0.256693 [1.32881]	0.004855 [0.24859]	0.077048 [3.25792]
D(NFAGDP(-1))	-0.128427 [-0.66968]	0.380491 [0.80351]	0.195323 [0.44765]	4.576581 [2.39213]	0.214291 [1.10779]	0.052008 [0.22205]
D(NFAGDP(-2))	0.336502 [1.73042]	0.494661 [1.03017]	0.229481 [0.51866]	2.517043 [1.29744]	0.02916 [0.14866]	0.306972 [1.29249]
D(LPROD(-1))	0.087988 [0.68210]	0.125768 [0.39485]	-0.021531 [-0.07336]	0.536269 [0.41672]	-0.018097 [-0.13909]	-0.107223 [-0.68059]
D(LPROD(-2))	0.524183 [4.52579]	0.346613 [1.21198]	-0.164947 [-0.62593]	0.705045 [0.61018]	0.002701 [0.02312]	0.091388 [0.64605]
C	-0.017754 [-1.58698]	0.017888 [0.64757]	0.038719 [1.52113]	-0.164764 [-1.47628]	0.000823 [0.07297]	-0.020997 [-1.53671]
NFA Dummy	0.05332 [2.04284]	-0.043511 [-0.67513]	-0.09763 [-1.64401]	0.063609 [0.24429]	0.068336 [2.59561]	-0.022426 [-0.70349]
R-squared	0.705497	0.348962	0.489701	0.457802	0.697051	0.552085
Adj. R-squared	0.541885	-0.012726	0.206201	0.156581	0.528746	0.303243
Sum sq. resids	0.065856	0.401533	0.340921	6.554378	0.067006	0.098235
S.E. equation	0.049387	0.121949	0.112369	0.492701	0.049817	0.060319
F-statistic	4.311997	0.964814	1.727342	1.519819	4.141596	2.218617
Log likelihood	78.33751	39.46948	42.9877	-20.57142	77.96539	69.73984
Akaike AIC	-2.899419	-1.091604	-1.255242	1.700996	-2.882111	-2.499527
Schwarz SC	-2.244089	-0.436223	-0.599911	2.356326	-2.226781	-1.844197
Mean dependent	-0.014598	0.01184	0.011241	0.005543	0.015227	-0.014065
S.D. dependent	0.072967	0.12118	0.126122	0.536491	0.072568	0.072262

Determinant resid covariance (dof adj.)	3.40E-13					
Determinant resid covariance	2.08E-14					
Log likelihood	311.2386					
Akaike information criterion	-9.452956					
Schwarz criterion	-5.029477					

1/ Sample: 1963–2005, included 43 observations after adjustments and t-statistics in [ ].