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Aid and Dutch Disease

Evidence from Moroccan and Tunisian time-series data

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Abstract

We examine aid-induced Dutch Disease—after controlling for the effects of remittances and FDI flows—in the context of two North African countries, Morocco and Tunisia. We do so by performing a multivariate time series analysis of aggregated annual data over the period 1980-2009. Aid causes real exchange rate appreciation in the case of Morocco, especially in the long run, but has no effect on the real exchange rate in the case of Tunisia. Remittances cause a real depreciation in Tunisia but have no significant effect in Morocco, while FDI does not have an effect on the real exchange rate in either country. We discuss the policy implications of the main results: aid and other types of foreign exchange inflow have the …/

Keywords: aid, Dutch Disease, Morocco, Tunisia, VAR estimation
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…. potential to cause Dutch Disease but this is not automatic in the way suggested by the strongest critiques of aid. Morocco and Tunisia provide contrasting outcomes. Our results confirm the importance of the macroeconomic framework in which aid is provided, and the key role for infrastructure and other supply-side improvements to the final real-economy impact of aid and other inflows.

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Tables and figures appear at the end of the paper.

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1 Introduction

The potential for aid inflows to cause a slowdown in economic growth via a Dutch Disease effect has been much cited in critiques of aid (Doucouliagos and Paldam 2009; Moyo 2009).[1] Yet, the issue is not so clear-cut. While the discussion has emphasized the potentially negative demand-side effect of aid, in causing a real exchange rate (RER) appreciation that undermines the production of exportables and import-substitutes, aid may, by providing infrastructure and improving institutions, raise the economy's supply-side response.[2] If this supply-side effect is strong enough it could offset any adverse demand-side impact. Moreover, aid is typically not the only inflow; revenues from natural resources, FDI, and remittances will all affect the equilibrium RER.

The issue of aid and Dutch Disease is therefore an empirical one. We examine aid-induced Dutch Disease—after controlling for the effects of remittances and FDI flows—in the context of two North African countries, Morocco and Tunisia. We do so by undertaking a multivariate time-series analysis of aggregated annual data over the period 1980-2009 and explore whether aid flows to Morocco and Tunisia generate Dutch Disease effects.

Studying the topic of official development assistance (ODA) and Dutch Disease in the context of Morocco and Tunisia is important for at least three reasons. First, both countries receive significant amounts of FDI and remittances (see Figure 1) and it is useful from a policy-making standpoint to explore the Dutch Disease effects of aid, controlling for the impact of these other sources of foreign capital. In particular, it is vital to examine how remittances and aid differ in their macroeconomic effects, since their disbursement occurs via different channels. Second, economic reform has been undertaken. Exchange rate controls were a hallmark of macroeconomic policy in the two countries, but in the early 1990s both countries introduced current account convertibility (partial convertibility). This affects the macroeconomics of how any inflow, aid or otherwise, influences the real economy. Also, both countries have undertaken important trade and financial sector reforms while reforms on the institutional front have lagged (see Addison and Baliamoune-Lutz 2006). These too affect the potential for aid to have a positive supply-side effect. Third, the share of manufacturing in GDP and exports has risen in Morocco and Tunisia (see Figure 2), and since economic diversification is critical to the quality of growth, it is insightful to investigate the link between aid and the growth of manufacturing output. In addition, to our knowledge, there are no time series studies focusing on the issue of aid and Dutch Disease in these two countries.

Our methodology consists of using time-series estimations and annual macroeconomic data. In addition to focusing on the effects of ODA, we control for the effects of the terms of trade, government consumption, monetary growth, manufacturing output growth, remittances and FDI flows. More specifically, we use the vector autoregression (VAR) estimation technique and study the impact of aid flows on the RER. The VAR methodology allows us to control for bi-directional effects between real exchange rates and aid, FDI, remittances, the share of

[1] On the aid effectiveness literature, see Hansen and Tarp (2001); Dalgaard et al. (2004), Addison et al. (2005), Rajan and Subramanian (2008), Baliamoune-Lutz and Mavrotas (2009), Doucouliagos and Paldam (2009), Winters and Wright (2010), and Mekasha and Tarp (2011).

[2] If aid is spent on investment in infrastructure, government institutions, and social services, such as education and health, it will enhance productivity in the economy which would offset any Dutch Disease-induced loss of competitiveness.

the manufacturing sector in the economy, the growth in government consumption and monetary growth. We formally examine the time series properties of the variables using a battery of unit-root tests and we also use Granger causality[3] to test the direction of causality between relevant variables. We obtain statistical evidence suggesting that aid has Dutch Disease effects in the case of Morocco but not in the case of Tunisia. A final section in the paper draws on the empirical results to outline policy implications. In particular, we comment on the implications of our results for the debate on aid effectiveness and aid allocation.

2 An analytical framework

There is now a large literature on Dutch Disease, and a somewhat more limited literature on aid and Dutch Disease. It is not our intent to survey those literatures here (see instead Younger 1992; White and Wignaraja 1992; Elbadawi 1999; Vos 1998; Adam and Bevan 2006; Li and Rowe 2007; Issa and Ouattara 2008; Mongardini and Rayner 2009; and Rajan and Subramanian 2011). Instead, we highlight the following dimensions which are relevant to Morocco and Tunisia.

The standard Dutch Disease model is essentially a theory of the demand-side impact of a capital inflow. The key driver of the adverse switch from tradables to non-tradables production, is the assumption that the economy sits on its production-possibility frontier (PPF) prior to the capital inflow, be it aid, remittances, or any other type of inflow. By assumption, the economy is small and open, that is, it is a price-taker for tradables in world markets. The capital inflow raises aggregate demand, but the tradables market can only clear via a quantity adjustment, since prices are fixed by assumption, while the non-tradables market, in which prices are determined only by domestic supply and demand, must clear through upward price adjustment. This rise in the price of non-tradables to tradables is the real exchange rate appreciation, associated with the economy's movement along its PPF towards non-tradables and away from tradables.

The model is therefore essentially static, although the growth story emerges via inference as analysts assume that non-tradables are an inferior driver of growth as compared to tradables. But to get at the growth effect properly, we must examine more thoroughly the economy's supply-side. Here there are two possibilities. The first is that the economy sits on its PPF, but the capital inflow is used in a way that shifts the PPF itself, by adding to the physical and human capital stock, for example. The second is that the economy sits within the PPF, and the inflow moves the economy closer or further away from a point on the PPF, by altering the efficiency with which factors of production are used.

It would stretch the imagination to argue that either Morocco or Tunisia have been on their PPF's. The presence of considerable unemployment together with low investment in production characterized their economic histories. Moreover, sector-policies and weak institutions induced multiple distortions and inefficiencies, leading to the misallocation of productive factors. We therefore need to assess the impact of any capital inflow in its potential to shift the aggregate and sector supply-curves as well in addition to the focus of the standard Dutch Disease model on the demand side—the relative price switch.

[3] A times series X Granger-causes time series Y if past values of X have information which helps predict Y above and beyond information included in past values of Y itself (Granger 1969, 1980). In this paper, when we say a variable causes, or has an effect on, another variable, we mean Granger causality.

Once we drop the assumption that the economy sits on its PPF, Dutch Disease effects may or may not materialize. Indeed, increased demand for non-tradables in middle-income countries such as Morocco and Tunisia could proceed without significant impact on the relative price of non-traded goods, suggesting that there would be no reason for labour and other inputs to move from the tradable to the non-tradable sector.

In summary, while the early Dutch Disease literature offered an elegant and insightful theory as to why resource-rich countries might suffer from a resource boom, their insights must be applied with considerable care to aid inflows.

Existing literature suggests that the evidence on the empirical link between aid and the RER is mixed. Similarly, the theoretical effect of ODA is rather ambiguous. An inflow of aid can cause an appreciation in the real exchange rate[4] if it leads to higher demand for non-traded goods relative to traded goods—a Dutch Disease effect. On the other hand, aid can cause real exchange rate depreciation if the capital inflow is used to fund projects that require an increase in demand for imports (inputs) and traded goods relative to non-traded goods. In theory, this could be a plausible outcome for middle-income countries such as Tunisia and Morocco, which have been investing in reasonably good-quality infrastructure, such as roads and ports and access to electricity, and have outperformed other middle-income countries in several areas. For example, the World Bank's World Development Indicators data (World Bank 2013) show that in 2009 the population with access to electricity in Tunisia and Morocco was 97 per cent and 99.5 per cent of the total population, respectively, compared with 81.5 per cent in middle-income countries. In 2010, those living in urban areas were 56.7 per cent and 66.1 per cent of the total population in Morocco and Tunisia, respectively, compared to 48.3 per cent in middle-income countries; while paved roads (per cent of total roads) were 70.4 per cent in Morocco and 76 per cent in Tunisia, compared to 55 per cent in middle-income countries.

In this paper, we study the impact of ODA, while controlling for the effects of two other types of capital inflows. The first is remittances by Moroccan and Tunisian workers residing abroad to their respective home country (see Figure 1). The second is net FDI flows into Morocco and Tunisia. As noted earlier, the share of remittances in GDP far exceeds the share of ODA in both countries, especially since the mid-1990s. The share of FDI in GDP also has exceeded the share of ODA for most of the 2000s and, in the case of Tunisia, for most of the 1990s (see Figure 1).

In theory, the effect of remittances is ambiguous. An increase in remittances may lead to an increase in recipient country's consumption of non-tradable goods or lead to a reduction in its supply of labour, if leisure is a normal good—an income effect. Both effects would lead to an increase in the relative price of non-tradables relative to tradable goods and thus contribute to real exchange rate appreciation, with negative effects on the country's international competitiveness. Conversely, an increase in remittances may lead to a rise in the recipient's savings and investment rates that could cause a rise in the relative price of tradables and improve the country's competitiveness. Similarly, FDI inflows may have no effect on, or may cause a real depreciation if used to buy imports. However, FDI inflow can cause real appreciation if it is spent on non-tradables (Baffes et al. 1999).

[4] A real appreciation as a result of aid flows is one possible reason identified by Radelet (2006) as an explanation for aid ineffectiveness.

In addition to these three types of capital inflows, we control for the effects of terms of trade (TOT) changes, the growth in manufacturing output, growth in government consumption and monetary (M2) growth. We also include a dummy variable to control for the shift to current-account convertibility—partial convertibility.

An improved terms of trade can have two contradictory effects: A substitution effect and an income effect reflected in an increased demand for non-tradables. If the income (substitution) effect dominates, an improvement in the terms of trade would cause a real appreciation (depreciation), although Edwards (1988) contends that the income effect—real appreciation—is likely to dominate the substitution effect.

The theoretical impact of growth in the manufacturing sector on the RER may be negative; producing a depreciative effect. Growth in manufacturing or tradable output implies higher productivity in this sector relative to the non-tradable sector. This implies a decline in the relative price of tradable goods and a possible real depreciation. On the other hand, the theoretical impact of government consumption expenditure on RERs is ambiguous and depends on whether government consumption expenditure is more biased towards tradables or non-tradables. Many empirical studies report a bias towards non-tradable goods, suggesting that increases in public consumption expenditure would lead to a real appreciation. Finally, under a small economy assumption (applicable to Morocco and Tunisia) a rise in money growth would increase the price of non-traded goods and thus, may lead to real exchange rate appreciation.

3 Empirical analysis

3.1 Model specification and data

The relationship we examine is illustrated by the following general functional notation:

$$REER = f(ODA, REMIT, FDI, MANUFGR, TOT, GOVCONSGR, M2GROWTH)$$

REER is the index of real effective exchange rates.[5] The explanatory variables include aid as per cent of GDP (*ODA*), the share of remittances in GDP (*REMIT*), the share of foreign direct investments in GDP (*FDI*), the growth rate of manufacturing output (*MANUFGR*), the terms of trade index (*TOT*), the growth rate of government consumption (*GOVCONSGR*), and monetary (M2) growth (*M2GROWTH*). A more detailed description of the variables is included in Appendix A.

It is important to note that the right-hand–side variables may be endogenous and could also be on the left-hand side as dependent variables. In this case, vector autoregression (VAR) estimation may be used to study the dynamics of the relationships among the variables. The VAR technique is a non-structural approach to modelling time series; it imposes little a priori

[5] We use effective real exchange rate (REER) instead of RER because the latter is a bilateral trade index, while the former is a trade-weighted multilateral index which is more suited to our focus on overall (international) price competitiveness of the country's exports. The REER is an average of the bilateral real exchange rates between a country and each of its trading partners, weighted by the respective trade shares of each partner (see Catão 2007). As defined by the International Monetary Fund (IMF), changes in the REER index are associated with changes in the country's price competitiveness. A discussion of the theoretical motivation for using the REER is provided by the IMF (see McGuirk 1987).

structure. Indeed, by treating each endogenous variable in the model as a function of its lagged values and the lagged values of all other endogenous variables, the VAR technique allows us to estimate the relationships without using a structural model.

The base equation is as follows:

$$y_t = \sum_{j=1}^{p} \alpha_j y_{t-j} + \sum_{j=1}^{q} \beta'_j x_{t-j} + \varepsilon_t$$

Where, in the first equation of the VAR model, y_t represents the real effective exchange rate *(REER)*; x_t represents the vector of explanatory variables; α_j and β_j are scalars and coefficient vectors, respectively. We treat all the variables as endogenous, except the intercept and the dummy variables for the shift in the exchange rate regime—partial convertibility. We estimate a series of VAR equations simultaneously. Each of the equations uses one of the endogenous variables as the dependent variable and its lagged values as well as the lagged values of the other endogenous variables on the right-hand side, in addition to the intercept and the dummy variable for exchange rate policy shift.

3.2 Unit-root tests

Given that these are macroeconomic data, we need to test the series to determine whether they are stationary in level, i.e., whether they are integrated of order zero. We perform Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit-root tests and report the results in Table B1 in Appendix B.

The results related to Moroccan data provide ample evidence that all variables are stationary, i.e., integrated of order 0. On the other hand, the Tunisian data show mixed results. The ADF, Phillips-Perron, and KPSS tests indicate that the variables REER (log),[6] ODA, TOT, and REMIT have unit root, while the variables FDI, GOVCONSGR, MANUFGR, and M2GROWTH are stationary. On the other hand, the KPSS tests indicate that remittances, GOVCONSGR, MANUFGR, and M2GROWTH are stationary while all the other variables have unit-root.

Given the mixed results of these unit-root tests and, more importantly, given that the ADF and the KPSS tests—the KPSS test differs from the other unit-root tests in that it assumes that the series is trend-stationary under the null—do not take into account structural breaks, while the Phillips-Perron test assumes the structural break is *known*, we need to use the Zivot-Andrews unit-root test. In general, if the break point is determined endogenously or is unknown the more refined test provided by Zivot and Andrews (1992) tends to yield more reliable results. We report the results from the Zivot-Andrews test of unit root with unknown structural break in Table 2.

The Zivot-Andrews test statistic values indicate that, after we control for a shift in the intercept, a change in the slope of the trend, or a change in both the slope and the intercept, all the variables, or their logarithmic form in the case of REER in both countries and

6 The log transformation was used to stabilize the variance of the exchange rate variable. It was not needed in the case of the other variables.

remittances in Tunisia, are stationary in their levels; i.e., they are I(0).[7] Given that it is more reasonable to consider that structural breaks in the time series are determined endogenously, we will base our analysis on the results from the Zivot-Andrews tests and treat all the series as stationary. We also account for potential shift as a result of the change in exchange rate regime with the introduction of current-account convertibility, in December 1992 in Tunisia and January 1993 in Morocco.[8]

3.3 VAR estimation results

Given that the series are found to be stationary in levels, there is no justification for cointegration tests. Thus, we proceed to estimate unrestricted VAR equations and explore the dynamics of real exchange rates in the two countries and, in particular, examine how they are influenced by aid inflows, remittances, and inward FDI flows, as well as other relevant factors.

The VAR estimates are reported in Tables B2 and B3. We test for lag length using several criteria, including the sequential modified LR test statistic, the final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and the Hannan-Quinn information criterion (HQ). In most tests, the appropriate lag length for all variables turned out to be two lags.

The VAR results related to Moroccan data (Table B2) indicate that while the coefficient on the variable ODA is positive, implying aid causes real appreciation in the short run, it is statistically non-significant. This is also supported by the impulse responses in Figure 6. Monetary growth seems to cause real appreciation in the short run. On the other hand, an increase in the growth of government consumption and manufacturing output leads to an appreciation of the real exchange rate. We also note that the dummy variable in the first equation is statistically significant and positive, suggesting that Morocco has experienced significant real appreciation in the post-1993 (current account convertibility) period. The other variables have non-significant coefficients.

Column (2) shows the estimates for the case where the dependent variable is REMIT (remittances). We note that the only variables with statistically significant coefficients are the growth of manufacturing output which has a positive impact on remittances; terms of trade, with a negative effect; and growth in government consumption which has a positive effect. The effects of the right-hand-side variables on FDI (column 3) are for the most part nonsignificant. The only variable that has a statistically significant and positive coefficient is REMIT, suggesting that remittances cause an increase in FDI in Morocco in the short run.

Finally, the results reported in column (4) indicate that a real appreciation causes the growth of manufacturing output to fall or slow down. This is an expected result as an appreciation has a negative impact on the competitiveness of tradable goods (manufactures). Similarly, we find that an increase in aid flows has a negative effect on the growth of manufacturing output. This is an interesting result given that ODA inflows do not seem to cause real exchange rate appreciation in the *short run*, but as we will see below ODA flows do cause *long-run* real appreciation in Morocco. We also find that an improvement in the terms of trade (TOT), and

[7] This is also supported by eigen values of the VAR model's coefficient matrices (stability tests) as shown in Table B5.

[8] See Baliamoune-Lutz and Lutz (2008) and Baliamoune-Lutz (2010).

growth in government consumption, both have a negative influence on manufacturing output growth. Finally, the negative and highly significant coefficient on the dummy variable suggests that the rate of growth in manufacturing output has slowed down since the early 1990s.

Turning to the results based on Tunisian data (Table B2), we note that there are stark differences with the results derived using Moroccan data. While in both countries ODA does not have statistically significant short-term effects on real exchange rates, in Tunisia remittances and FDI inflows seem to cause real *depreciation*. On the other hand, real exchange rate appreciation has a positive impact on remittances. Similar to the result for Morocco, the short-run impact of government consumption growth on the growth of manufacturing output is negative. In contrast, the coefficient on the dummy variable (in column 4) is positive, suggesting that the Tunisian economy has experienced higher growth, on average, in manufacturing output since the early 1990s.

3.4 Granger causality

VAR estimates, however, are primarily useful to analyse short-term effects. In order to examine the long-term impact of inflows and other relevant effects, we perform Granger causality to help us ascertain whether a variable is weakly exogenous, a necessary condition for strong exogeneity. Granger-causality tests are commonly interpreted as long-run causality tests. Summarized results from Granger causality/block exogeneity tests are reported in Table 3. The results indicate that aid flows seem to cause, or at least precede, real exchange rate appreciation and have a negative impact on the manufacturing sector in the long-run in Morocco but not in Tunisia, while remittances and FDI flows have no long-run effect on real exchange rate in Morocco but cause depreciation of real exchange rates in Tunisia. An improvement in terms of trade causes real exchange rate appreciation in Tunisia but has no effect in Morocco. Interestingly, there is negative bi-directional Granger causality between real exchange rate and growth in manufacturing output in Morocco. An appreciation in real exchange rates has a strong positive effect on remittances in Tunisia but has no effect in Morocco.

Thus, there is evidence of aid-induced Dutch Disease in the case of Morocco, especially in the long-run, but no such evidence in the case of Tunisia. Interestingly, monetary growth seems to cause real appreciation in Morocco in both the short- (VAR equation) and the long-run (Granger-causality), while growth in government consumption causes depreciation in both the short- and long-run. On the other hand, in Tunisia M2 growth and government consumption growth do not seem to have a statistically significant impact. In addition, there is no empirical evidence that aid inflows Granger cause government consumption or M2 growth. These results are not shown but may be obtained from the authors.

4 Summary and policy discussion

Understanding foreign aid's potential to cause Dutch Disease remains crucial to the aid-effectiveness debate. Dutch Disease effects of aid may contribute to our understanding of why aid has not been effective in promoting growth and development in some countries while many macro-level cross-sectional studies find that aid has positive effects on growth. Indeed, a recent and insightful study by Mekasha and Tarp (2011) employs different meta-analysis

techniques and data from 68 empirical studies[9] from the aid-growth literature and finds that 'the effect of aid on growth is positive and statistically significant'. Similarly, Arndt et al. (2010) find a positive and statistically significant long-run effect of aid on growth.

Our analysis suggests that Dutch Disease effects do not need to materialize if the recipient has a sound macroeconomic environment to manage aid inflows: policy matters. Our empirical estimates show that aid inflows did not cause real exchange rate appreciation in Tunisia. On the other hand, we find that aid inflows in Morocco (Granger) caused higher real exchange rates and lower growth in the manufacturing sector in the long run. This seems to suggest that Morocco did not put in place sound macroeconomic instruments for the management of aid flows. We should, however, note that one caveat of this paper is the issue of small sample size. We emphasize that the results need to be used with caution.

There are at least five, not necessarily mutually exclusive, possible explanations of the differences in the results. First, Prati and Tressel (2006) show, both theoretically and empirically, that the adverse effects of aid volatility and aid-induced Dutch Disease 'can be mitigated through changes in net domestic assets of the central bank—a variable that reflects both monetary and fiscal policy'. When authorities reduce net domestic assets, they can prevent real exchange appreciation and maintain tradable-sector competitiveness. Figure 3 shows the behaviour of ODA inflows and net claims on the central government—a proxy for net domestic assets—both as a percentage of GDP, by the central bank. Morocco has in general a much higher ratio of net claims on the central government than Tunisia and it does not appear that Morocco was sterilizing aid inflows. Monetary policy responses are especially important during periods of high aid inflows (see Prati and Tressel 2006).

Second, and consistent with the first point, it seems that excess monetary growth in Morocco has a stronger correlation with high aid flows. Table 4 shows that Morocco received on average more aid (as a percentage of GDP) than Tunisia did. We note that there is a positive correlation between excess money growth and aid flows in Morocco, especially in the 1980s and the first half of the 1990s. There is no evidence of a significant positive correlation in the case of Tunisia. This could suggest that Morocco did not sterilize aid during the years when the aid ratio was high and thus aid flows were injected in the economy. Note that both explanations (1 and 2) suggest that Morocco did not tighten monetary policy during periods of high aid inflows.

Third, there is some evidence of a lower ratio of net foreign assets to money supply (Figure 4) in Morocco compared to the ratio in Tunisia. The decline in the ratio was stronger in Morocco during the first half of the 1980s when aid flows were relatively high. This may also suggest that there was some sterilization of the aid flows in Tunisia but not so much in Morocco. Fourth, the difference in the results may also be explained by the difference in openness to international trade (Figure 5). Tunisia traditionally had higher openness to trade—trade volume as a percentage of GDP. This may have acted as a mitigating factor, offsetting potential exchange rate appreciation in Tunisia. Finally, given that Morocco is operating inside its PPF, aid flows should not normally cause real appreciation in the short run, as supported by our empirical results. However, given that Morocco lags behind Tunisia in human capital—educational levels in Tunisia are significantly higher—and has lower openness to trade, and a somewhat less sophisticated export sector, Dutch Disease effects

[9] The 68 studies are the same as those examined in Doucouglias and Paldam (2008) who use meta-analysis and conclude that aid has been ineffective at the macro level.

seem to materialize in the long-run, as supported by the empirical findings. One plausible explanation is that Morocco may have significant structural bottlenecks, particularly due to relatively lower human capital levels.

For policymakers and their donor partners, two key implications stand out. First, aid should be allocated in ways that improve the supply-side of the economy. This will inevitably differ between countries, as each country has somewhat different bottlenecks. For some countries, human capital is the binding constraint, while for others it is infrastructure, especially in the transport sector that serves exportables. The insights from the growth diagnostics literature need to be connected up to policymaking in the macro-economic management of aid flows. Second, the difference in outcomes for Morocco and Tunisia points to the importance of deepening the domestic financial system, to create thicker markets for debt instruments, thereby increasing the potency of monetary policy. As Morocco illustrates, the management of the monetary impact of capital flows, be they aid, remittances or others, depends on the authorities ability and willingness to use the instruments of open market operations to offset some of the inflows impact on the monetary base. That in turn requires deeper capital markets that can only be the result of structural reforms to develop the financial system as a whole. Donors should consider giving more technical assistance and other support to achieving this.

Aid and other types of foreign-exchange inflow have the potential to cause Dutch Disease but this is not automatic in the way suggested by the strongest critiques of aid (see in particular Moyo 2009). Morocco and Tunisia provide contrasting outcomes. Our results confirm the importance of the macro-economic framework in which aid is provided, and the key role for infrastructure and other supply-side improvements to the final real-economy impact of aid and other inflows.

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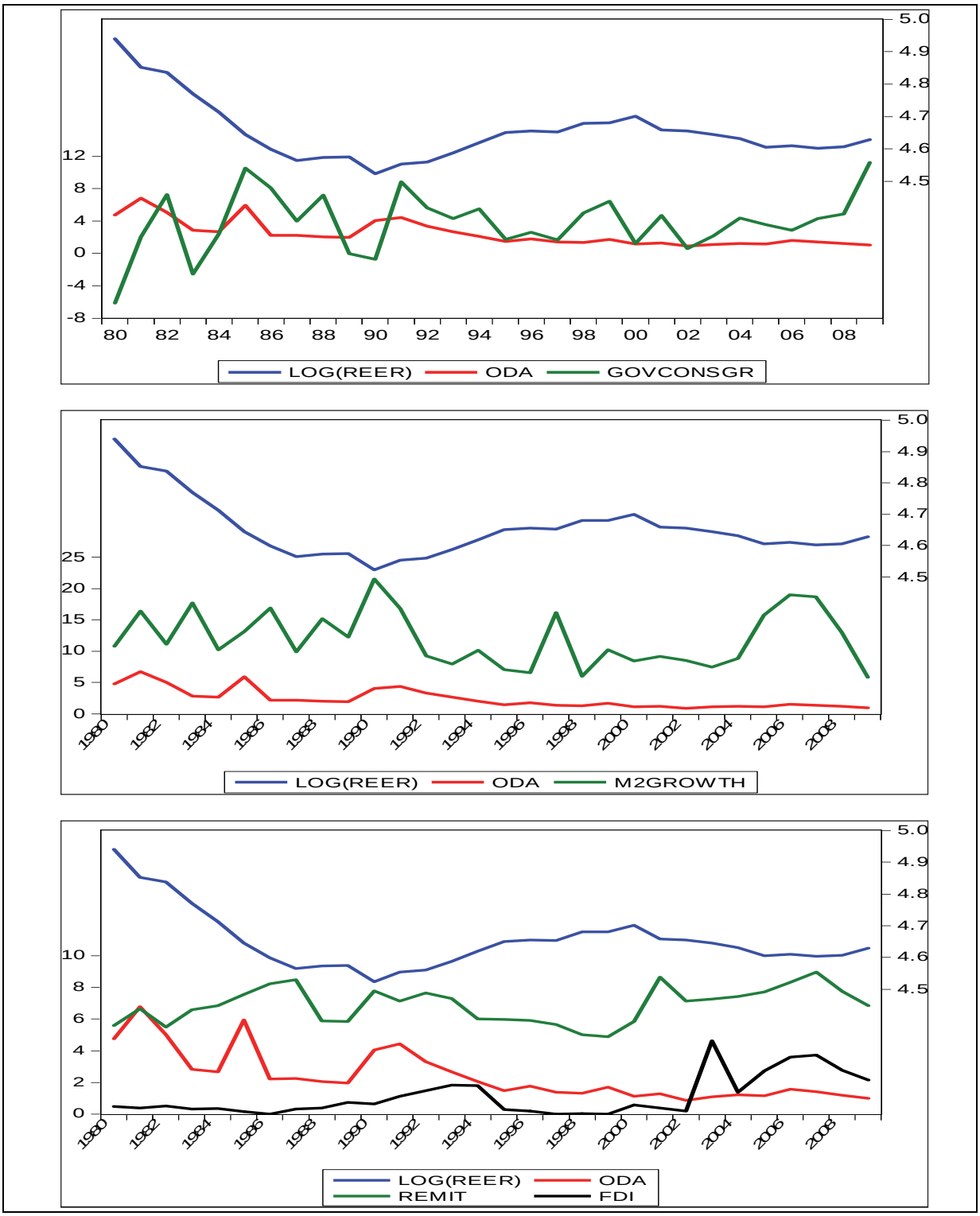
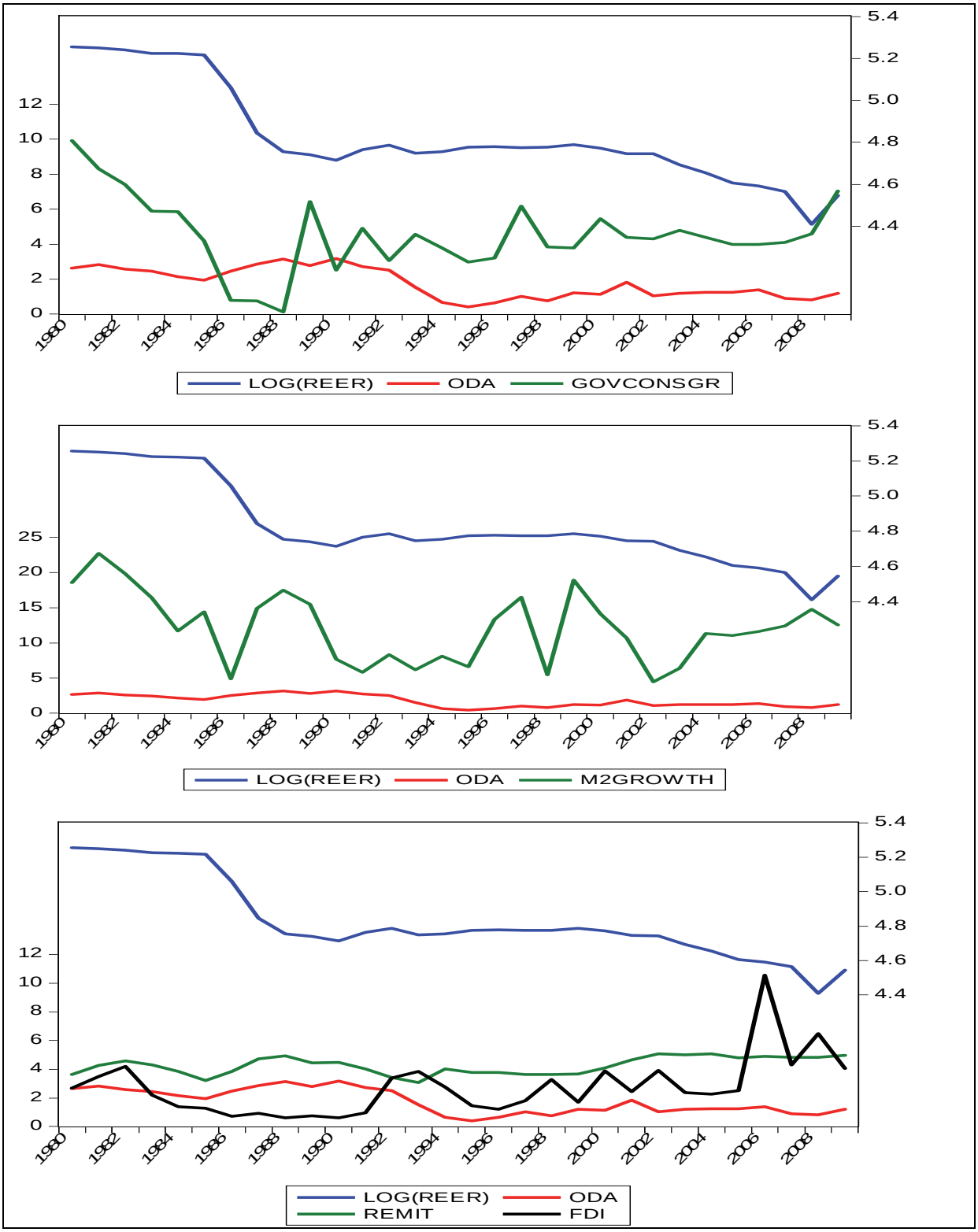
Figure 1: Capital flows, government consumption growth, monetary growth and REER (log, right axis)

1A: Morocco



Source: World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund). See Appendix A for variable definition.

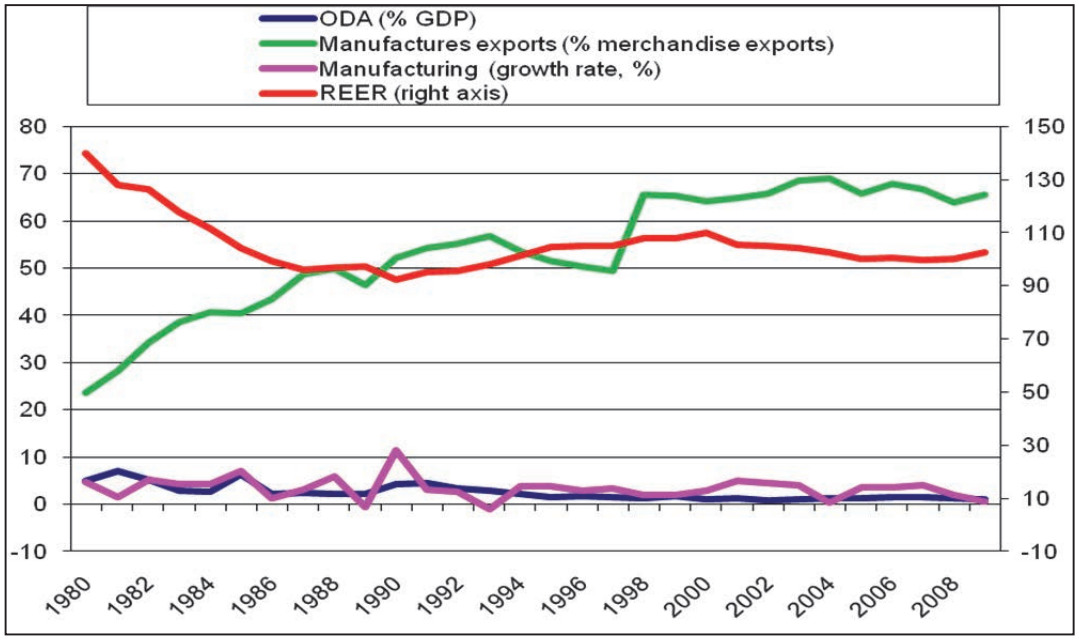
1B: Tunisia



Source: World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetray Fund). See Appendix A for variable definition.

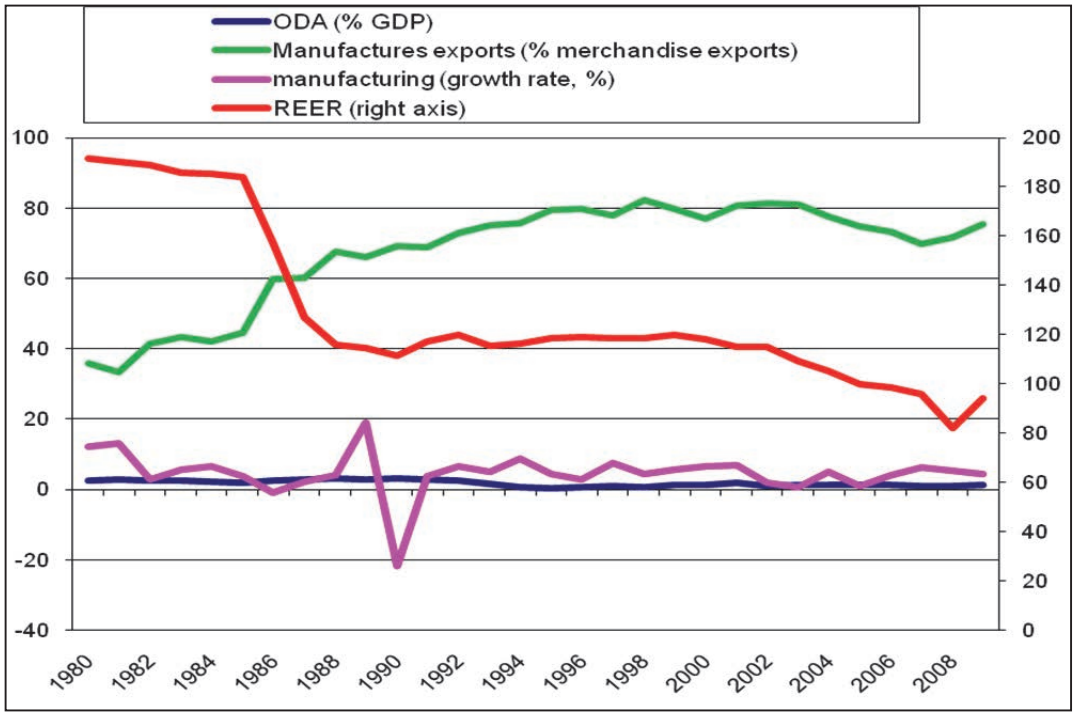
Figure 2: ODA, exchange rates, and manufacturing

Morocco



Source: World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund). See Appendix A for variable definition.

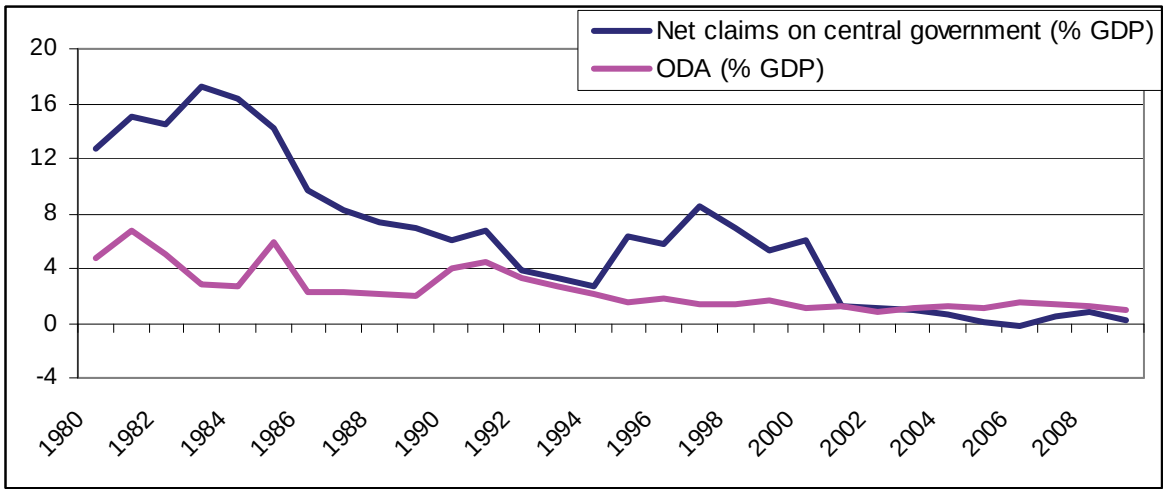
Tunisia



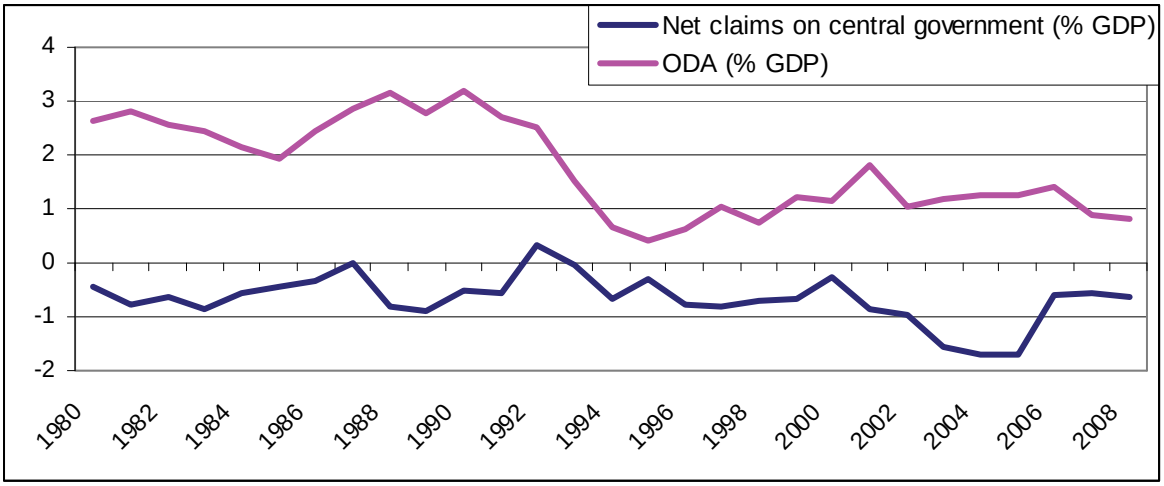
Source: World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund). See Appendix A for variable definition.

Figure 3: ODA and net claims on central government (by the central bank)

Morocco

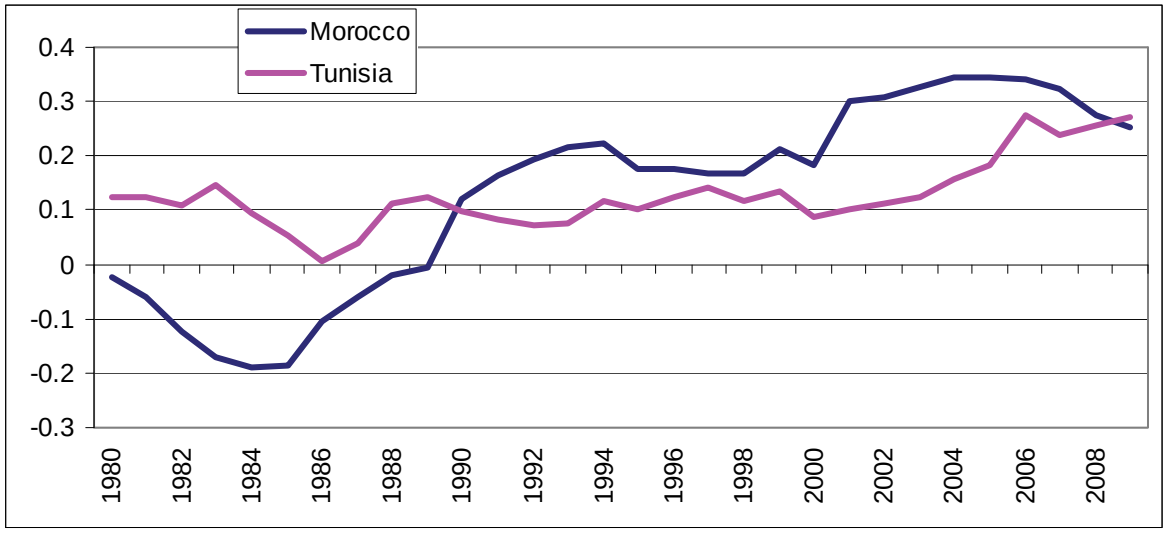


Tunisia



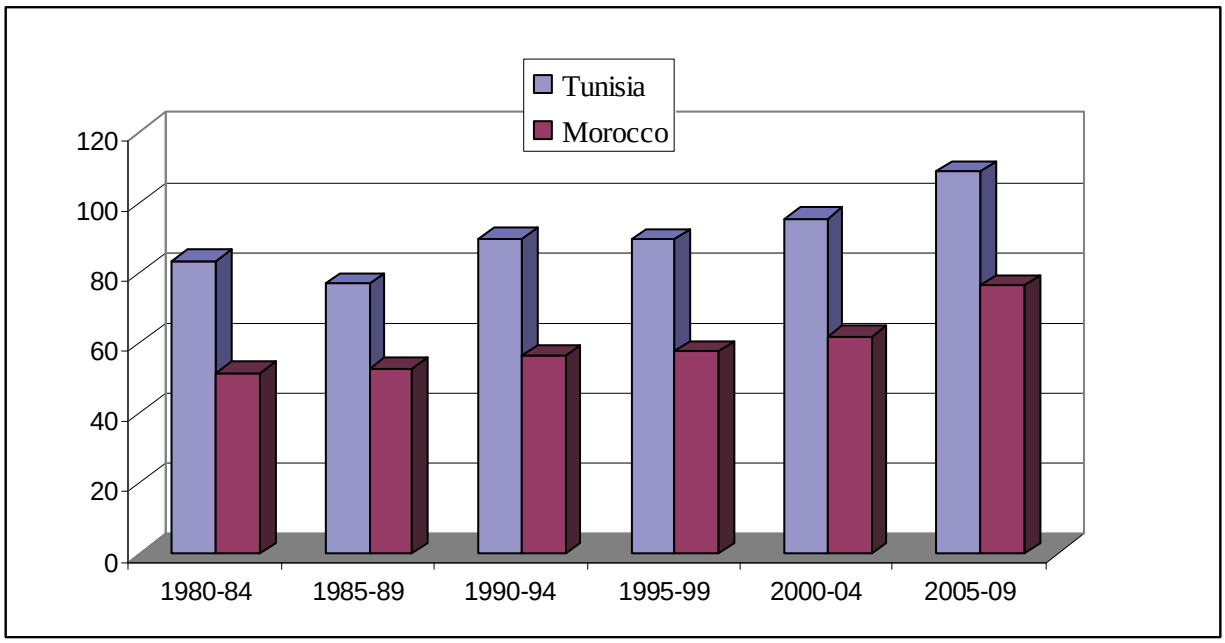
Source: World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund). See Appendix A for variable definition.

Figure 4: Net foreign assets as % of money supply



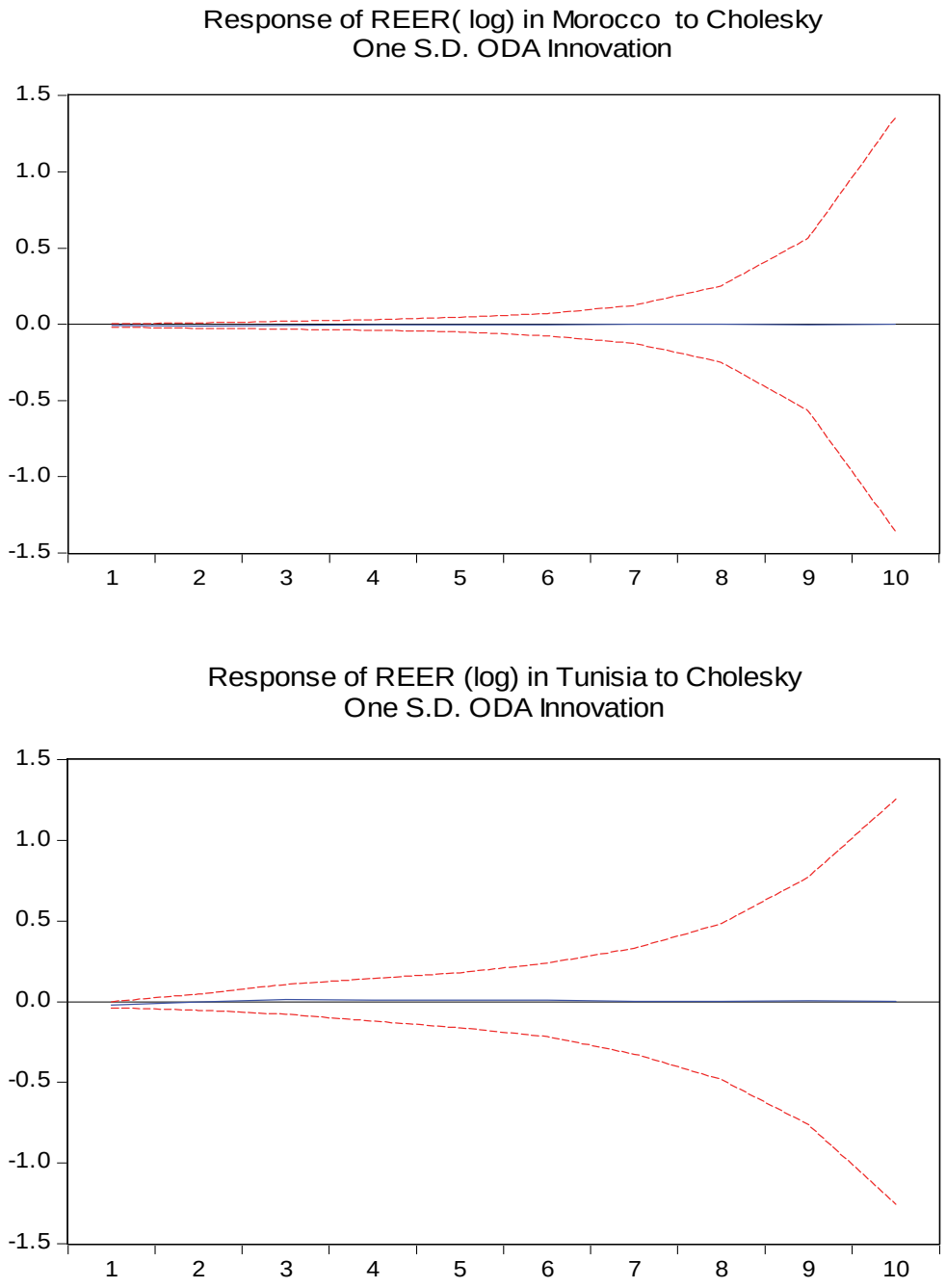
Source: World International Financial Statistics database (International Monetary Fund).
See Appendix A for variable definition.

Figure 5: Openness to trade (% GDP)



Source: World Development Indicators (World Bank) database online.
See Appendix A for variable definition.

Figure 6: Impulse responses



The standard error bands are based on 10,000 Monte Carlo repetitions.

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table 1: Capital flows (1970-2009)

	Net ODA (% of GDP)		FDI (% of GDP)		Workers' remittances (% of GDP)	
	Morocco	Tunisia	Morocco	Tunisia	Morocco	Tunisia
1970-79	2.64	5.03	0.12[a]	1.63[b]	5.74[a]	3.52[b]
1980-89	3.65	2.58	0.37	1.82	6.72	4.18
1990-99	2.42	1.47	1.45	2.09	6.33	3.74
2000-09	1.20	1.20	2.82	4.15	7.58	4.82

Notes: [a] 1975-79, [b] 1976-79.

Source: World Development Indicators (World Bank) database online.

Table 2: Zivot-Andrews Unit-root test (t-value *(break year)*)

Variable	Morocco			Tunisia		
	Intercept	Trend	Both	Intercept	Trend	Both
REER (log)	**-5.143** *(1990)*	-3.782 *(1999)*	**-4.952** **(***1990)*	**-6.550** *(1986)*	**-4.619** *(1988)*	**-6.406** *(1986)*
ODA	-4.52 *(1986)*	**-5.034** *(1985)*	**-5.134** *(1985)*	**-5.197** *(1993)*	3.155 *(1999)*	5.0193 *(1993)*
REMITTANCES[a]	**-4.826** *(2001)*	-3.891 (*1999)*	-4.961 *(2001)*	**4.843** *(1991)*	**-4.951** *(1997)*	**-5.705** *(1998)*
FDI	**-6.734** *(2003)*	**-4.482** *(2000)*	**-6.034** *(2003)*	**-5.084** *(1985)*	**-5.585** *(1987)*	**-5.423** *(1988)*
MANUFCTURING	**-6.309** *(1993)*	**-4.996** *(1997)*	**-6.143** *(1993)*	**-7.305** *(1992)*	**-7.380** *(1987)*	**-8.344** *(1992)*
TOT	**-5.223** *(1991)*	**-5.852** *(1988)*	**-5.720** *(1993)*	-3.796 *(1985)*	**-4.563** *(1987)*	-4.378 *(1986)*
GOV_CONSUMPTION_ GROWTH	-3.857 *(1997)*	**-4.475** *(2005)*	-4.523 *(2005)*	**-4.992** *(1985)*	**-5.731** *(1987)*	**-9.455** *(1989)*
M2_GROWTH	**-5.249** *(1992)*	-4.392 *(1999)*	**-5.139** *(1992)*	-4.286 *(1990)*	**-4.648** *(1987)*	-4.821 *(1996)*

Notes: Critical values for Zivot and Andrews (1992) tests are as follows.
Intercept: -4.80 (5%), -5.43 (1%); trend: -4.42 (5%), -4.93 (1%); both: -5.08% (5%), -5.57% (1%).
Significant t-values (at the 5% level of better) are in bold.
[a] For Tunisia, we use the logarithmic form which shows stronger evidence of stationary series.

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table 3: Granger causality/block exogeneity (weak exogeneity) summary

Does the variable (below) Granger cause the RHS variable? (sign)	RHS variable				
	REER	Remittances	FDI	Manufacturing growth	Terms of trade
Morocco					
ODA	**YES (+)****	NO	NO	**YES (–)***	NO
Remittances	NO		**YES (+) *****	NO	NO
fdi	NO	NO		NO	**YES (–)***
Manufacturing growth	**YES (–)***	**YES (+)***	NO		NO
Terms of trade	NO	**YES (–)****	NO	**YES (–)****	
Government consumption growth	**YES (–)***	**YES (+)****	NO	**YES (–)****	NO
M2 growth	**YES (+)***	NO	NO	NO	NO
REER		NO	NO	**YES (–)***	**YES (–)***
Tunisia					
ODA	NO	NO	NO	NO	NO
Remittances	**YES (–)*****		NO	NO	NO
fdi	**YES (–)****	NO			NO
Manufacturing growth	NO	NO	NO		NO
Terms of trade	**YES (+)*****	**YES (–)****	NO	NO	
Government consumption growth	NO	NO	NO	**YES (–)****	NO
M2 growth	NO	NO	NO	**YES (+)***	NO
REER		**YES (+)*****	NO	NO	NO

Notes: More detailed results are shown in Appendix B. Inferences on the long-run effects (positive or negative effect) are based on the results from Granger-causality tests and the signs on the coefficients in the VAR equations.

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table 4: ODA and excess money growth (1980-2009)

	Morocco		Tunisia	
	ODA (% of GDP)	Excess money growth	ODA (% of GDP)	Excess money growth
1980-84	4.41	10.40	2.53	13.27
1985-89	2.88	8.51	2.64	10.90
1990-94	3.31	9.88	2.12	2.19
1995-99	1.54	6.90	0.81	6.99
2000-04	1.12	3.77	1.29	4.82
2005-09	1.27	9.64	1.11	7.71

Excess growth in money supply is defined as the difference between growth in money supply and GDP growth (%).

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online; see Appendix A for variable definition.

Appendix A

Variable Description (from corresponding data sources)

REER (index): Real effective exchange rate index represents a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country, selected countries, and the euro area. A nominal effective exchange rate index represents the ratio, expressed on the base 2005=100, of an index of a currency's period average exchange rate to a weighted geometric average of exchange rates for the currencies of selected countries and the euro area. An increase in the index implies an appreciation. Source: International Financial Statistics database, International Monetary Fund.

The source of data for the following variables is *World Development Indicators* (World Bank) database on line.

ODA: Net Offical Development Assistance received (% of GDP). This variable represents the actual international transfer by the donor of financial resources or of goods or services valued at the cost to the donor, less any repayments of loan principal during the same period.

REMIT: Workers' remittances and compensation of employees, received (% of GDP). These remittances include current transfers by migrant workers and wages and salaries earned by nonresident workers.

FDI: Foreign direct investment, net inflows (% of GDP). FDI represents net inflows of investment to acquire a lasting management interest (10 per cent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.

TOT: Terms of trade index (2000=100). This index is based upon goods and non-financial services from the national accounts. It shows the national accounts exports price index divided by the imports price index.

MANUFGR: Manufacturing, value added (annual % growth). Annual growth rate for manufacturing value added based on constant local currency. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3.

M2GROWTH: Money and quasi money growth (annual %). M2 represents the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.

GOVCONSGR: General government final consumption expenditure (annual % growth). General government final consumption expenditure—general government consumption—includes all government current expenditures for purchases of goods and services, including compensation of employees. It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Annual percentage growth of general government final consumption expenditure are based on constant local currency.

DUMMY: A variable that takes the value of 1 in post-current-account convertibility years and 0 otherwise.

Appendix B

Table B1: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit-root tests

Variables in level

	Morocco			Tunisia		
	ADF t-statistic	PP Adj. t-stat	KPSS LM-stat	ADF t-statistic	PP Adj. t-stat	KPSS LM-stat
REER (log)	-4.532***	-3.77***	0.223	-1.448	-1.455	0.587**
ODA	-4.059**	-3.947**	0.104	-1.851	-1.446	0.492**
TOT	-4.475***	-2.901**	0.295	-2.559	-1.809	0.510**
REMIT	-2.971**	-2.985**	0.167	-1.914	-1.893	0.325
FDI	-3.592**	-3.672**	0.358	-4.230**	-4.184**	0.433**
GOVCONSGR	-5.316***	-5.591***	0.135	-3.697***	-3.669**	0.146
MANUFGR	-6.958***	-6.958***	0.281	-6.986***	-7.841***	0.130
M2GROWTH	3.855***	-3.855***	0.217	-3.554**	3.418**	0.297

Notes:

ADF and PP tests: Null Hypothesis: *LOG(REER)* has a unit root.
KPSS test: Null Hypothesis: *LOG(REER)* is stationary.
The critical values differ according to the number of lags and whether an intercept or a trend (or both) are included. More details may be obtained from the authors.
** and *** denote 5% and 1% level of significance, respectively.

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table B2: VAR estimates: Morocco (t-statistics in [ ])

	Dependent variable			
	(1)	(2)	(3)	(4)
	LOG(REER)	REMIT	FDI	MANUFGR
LOG(REER(-1))	0.792648	3.760639	0.122529	7.34698
	[1.97254]	[0.20303]	[0.00584]	[1.77760]
LOG(REER(-2))	-0.071166	-1.826345	4.100162	-5.54171
	[-0.22281]	[-0.12405]	[0.24578]	[-2.16598]
ODA(-1)	0.006352	0.034700	0.319854	0.073606
	[1.18140]	[0.14000]	[1.13893]	[0.17051]
ODA(-2)	0.006267	-0.338585	-0.326706	-0.867337
	[1.16838]	[-1.36931]	[-1.16609]	[-2.01398]
REMIT(-1)	-0.002387	0.446653	0.056675	1.257973
	[-0.27074]	[1.09921]	[0.12309]	[1.77752]
REMIT(-2)	0.006053	-0.274380	0.913661	-0.640435
	[1.07619]	[-1.05829]	[3.11011]	[-1.41827]
FDI(-1)	-0.006420	0.345732	0.013235	-0.580137
	[-1.39879]	[1.63409]	[0.05521]	[-1.57434]
FDI(-2)	-0.003401	-0.043865	-0.051899	-0.462234
	[-0.70102]	[-0.19617]	[-0.20484]	[-1.18689]
MANUFGR(-1)	-0.002789	0.115311	0.057765	-0.912753
	[-0.96972]	[0.86993]	[0.38461]	[-3.95365]
MANUFGR(-2)	-0.006045	0.278922	0.212381	-0.417017
	[-2.22848]	[2.23084]	[1.49913]	[-1.91501]
TOT(-1)	0.002251	-0.152549	-0.091651	-0.211120
	[1.93505]	[-2.84543]	[-1.50875]	[-2.26101]
TOT(-2)	-0.001487	0.086964	0.104048	-0.055614
	[-1.08212]	[1.37251]	[1.44927]	[-0.50395]
GOVCONSGR(-1)	-0.001396	0.077579	-0.121678	-0.326689
	[-0.85160]	[1.02696]	[-1.42156]	[-2.48300]
GOVCONSGR(-2)	-0.004165	0.227433	0.134372	-0.056823
	[-2.08077]	[2.46483]	[1.28524]	[-0.35358]
M2GROWTH(-1)	0.002850	-0.021894	0.063875	-0.011997
	[2.23146]	[-0.37187]	[0.95750]	[-0.11700]
M2GROWTH(-2)	0.000153	-0.023333	0.004113	-0.053824
	[0.11954]	[-0.39523]	[0.06148]	[-0.52347]
C	1.137190	2.759796	-29.18908	33.43402
	(0.76432)	(35.2312)	(39.9197)	(61.3614)
	[1.48786]	[0.07833]	[-0.73119]	[0.54487]
DUMMY	0.064377	-1.196168	1.672961	-7.213995
	(0.02098)	(0.96710)	(1.09579)	(1.68437)
	[3.06845]	[-1.23687]	[1.52671]	[-4.28291]

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table B3: VAR estimates: Tunisia (t-statistics in [ ])

	Dependent variable			
	(1)	(2)	(3)	(4)
	LOG(REER)	REMIT	FDI	MANUFGR
LOG(REER(-1))	0.138534	-0.129019	-3.743390	-11.74401
	[0.61293]	[-0.24186]	[-0.28140]	[-0.38253]
LOG(REER(-2))	-0.231443	1.468102	8.311696	-3.695833
	[-1.11258]	[2.99023]	[0.67886]	[-0.13080]
ODA(-1)	0.021211	-0.004003	-0.426837	-1.122000
	[0.65974]	[-0.05276]	[-0.22557]	[-0.25692]
ODA(-2)	-0.028595	-0.000268	1.410875	3.692145
	[-0.94187]	[-0.00374]	[0.78958]	[0.89531]
LOG(REMIT(-1))	-0.115287	0.633833	-1.218143	-1.011427
	[-1.16599]	[2.71613]	[-0.20932]	[-0.07531]
LOG(REMIT(-2))	-0.301482	0.341615	6.431141	-16.63776
	[-2.49264]	[1.19673]	[0.90342]	[-1.01272]
FDI(-1)	-0.004772	0.010282	-0.111715	0.012760
	[-0.96272]	[0.87883]	[-0.38289]	[0.01895]
FDI(-2)	-0.012007	0.012450	0.102875	0.371737
	[-2.35589]	[1.03506]	[0.34296]	[0.53698]
MANUFGR(-1)	-0.000221	-0.000864	-0.030619	-0.697586
	[-0.11218]	[-0.18576]	[-0.26391]	[-2.60527]
MANUFGR(-2)	-0.001584	0.004857	-0.111435	-0.766074
	[-0.94227]	[1.22385]	[-1.12602]	[-3.35419]
TOT(-1)	0.022401	-0.018523	-0.332496	0.680515
	[5.30364]	[-1.85818]	[-1.33753]	[1.18616]
TOT(-2)	0.002337	-0.019076	0.053164	0.251432
	[0.46100]	[-1.59467]	[0.17821]	[0.36520]
GOVCONSGR(-1)	0.000514	0.035483	0.125927	-2.822699
	[0.06724]	[1.96765]	[0.28002]	[-2.71972]
GOVCONSGR(-2)	0.003373	-0.003036	0.705980	0.281167
	[0.40799]	[-0.15559]	[1.45087]	[0.25037]
M2GROWTH(-1)	-0.003718	0.001744	0.266165	0.690972
	[-1.24229]	[0.24697]	[1.51117]	[1.69986]
M2GROWTH(-2)	0.001854	0.001056	0.035793	0.511743
	[0.77406]	[0.18678]	[0.25395]	[1.57322]
C	3.310630	-2.710804	-7.949076	-7.692259
	[5.07139]	[-1.75945]	[-0.20689]	[-0.08675]
DUMMY	0.037551	-0.074486	2.806142	18.33662
	[0.70687]	[-0.59410]	[0.89750]	[2.54117]

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table B4: Lag order selection

VAR Lag Order Selection Criteria
Endogenous variables: LOG(REER) ODA REMIT FDI MANUFGR TOT GOVCONSGR M2GROWTH
Exogenous variables: C DUMMY
Sample: 1980 2009

Morocco

Lag	LogL	FPE	AIC	SC	HQ
0	-352.1822	36.51264	26.29873	27.05999	26.53145
1	-246.5538	2.424645	23.32527	27.13157	24.48890
2	-105.2166	0.050839*	17.80118*	24.65252*	19.89570*

Tunisia

Lag	LogL	FPE	AIC	SC	HQ
0	-312.8701	2.202641	23.49072	24.25198*	23.72345
1	-216.2891	0.279130	21.16351	24.96981	22.32713
2	-121.1716	0.158904*	18.94083*	25.79216	21.03535*

Notes:

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table B5: VAR stability tests

Morocco

Roots of characteristic polynomial
Endogenous variables: LOG(REER) ODA REMIT FDI MANUFGR TOT GOVCONSGR M2GROWTH
Exogenous variables: C DUMMY
Lag specification: 1 2

Root	Modulus
-0.607911 - 0.581617i	0.841329
-0.607911 + 0.581617i	0.841329
0.828516 - 0.101500i	0.834710
0.828516 + 0.101500i	0.834710
-0.292918 - 0.763357i	0.817628
-0.292918 + 0.763357i	0.817628
0.409198 - 0.694478i	0.806067
0.409198 + 0.694478i	0.806067
-0.793692	0.793692
0.547704 - 0.435035i	0.699454
0.547704 + 0.435035i	0.699454
0.088185 - 0.574215i	0.580947
0.088185 + 0.574215i	0.580947
-0.193256 - 0.415865i	0.458575
-0.193256 + 0.415865i	0.458575
-0.135384	0.135384

No root lies outside the unit circle.
VAR satisfies the stability condition.

Tunisia

Roots of characteristic polynomial
Endogenous variables: LOG(REER) ODA LOG(REMIT) FDI MANUFGR TOT GOVCONSGR M2GROWTH
Exogenous variables: C DUMMY
Lag specification: 1 2

Root	Modulus
0.533309 - 0.804601i	0.965299
0.533309 + 0.804601i	0.965299
-0.578265 - 0.621245i	0.848727
-0.578265 + 0.621245i	0.848727
0.691419 - 0.447312i	0.823498
0.691419 + 0.447312i	0.823498
-0.443743 - 0.650281i	0.787256
-0.443743 + 0.650281i	0.787256
0.714910 - 0.223816i	0.749126
0.714910 + 0.223816i	0.749126
-0.721915	0.721915
0.720480	0.720480
-0.070252 - 0.569935i	0.574248
-0.070252 + 0.569935i	0.574248
-0.397145 - 0.148958i	0.424161
-0.397145 + 0.148958i	0.424161

No root lies outside the unit circle.
VAR satisfies the stability condition.

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.

Table B6: Granger causality/block exogeneity

DM: Null hypothesis dependent variable is weakly exogenous (Chi square, p value*)

	Dependent variable				
	REER (log)	Remittances	FDI	Manufacturing growth	Terms of trade
Morocco					
ODA	6.35 [0.041]	2.46 [0.29]	1.69 [0.42]	5.43 [0.06]	2.90 [0.23]
Remittances	1.16 [0.55]		11.21 [0.00]	3.91 [0.14]	0.57 [0.07]
FDI	2.37 [0.30]	2.73 [0.25]		3.75 [0.15]	5.22 [0.07]
Manufacturing growth	5.33 [0.06]	5.52 [0.06]	2.82 [0.24]		2.25 [0.32]
Terms of trade	3.86 [0.14]	8.17 [0.01]	3.14 [0.20]	7.41 [0.02]	
Government consumption growth	4.78 [0.09]	6.74 [0.03]	4.01 [0.13]	6.18 [0.04]	2.72 [0.25]
M2 growth	5.01 [0.08]	0.30 [0.86]	0.93 [0.63]	0.29 [0.86]	0.50 [0.77]
REER (log)		0.099 [0.95]	0.75 [0.68]	5.72 [0.05]	4.97 [0.08]
Tunisia					
ODA	0.93 [0.62]	0.009 [0.99]	1.19 [0.55]]	1.53 [0.46]	0.09 [0.95]
Remittances (log)	17.16 [0.00]		0.98 [0.61]	1.74 [0.41]	1.55 [0.45]
FDI	6.09 [0.04]	1.67 [0.43]		0.29 [0.86]	0.39 [0.81]
Manufacturing growth	0.93 [0.62]	1.88 [0.38]	1.28 [0.52]		0.55 [0.76]
Terms of trade	31.93 [0.00]	8.16 [0.01]	1.81 [0.40]	1.91 [0.38]	
Government consumption growth	0.22 [0.89]	4.24 [0.11]	2.97 [0.23]	8.04 [0.01]	0.80 [0.67]
M2 growth	2.17 [0.33]	0.09 [0.95]	2.33 [0.31]	5.26 [0.07]	0.84 [0.65]
REER (log)		11.50 [0.00]	0.47 [0.79]	0.30 [0.85]	3.55 [0.16]

The lag structure was determined by two criteria: the Final Prediction Error (FPE) and Akaike Information Criterion (AIC).

Source: Results obtained using Eviews and data from World Development Indicators (World Bank) database online, and International Financial Statistics database (International Monetary Fund); see Appendix A for variable definition.