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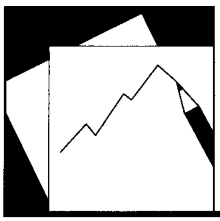

IMF Working Paper

Grants, Remittances, and the Equilibrium Real Exchange Rate in Sub-Saharan African Countries

Joannes Mongardini and Brett Rayner

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Grants, Remittances, and the Equilibrium Real Exchange Rate in Sub-Saharan African Countries[1]

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Abstract

This paper builds on the methodology developed by Chudik and Mongardini (2007) to estimate the relationship between grants and remittances and the equilibrium real exchange rate in Sub-Saharan African (SSA) countries using panel techniques. The results indicate that grants and remittances are not associated, in the long run, with an appreciation of the real effective exchange in SSA and are therefore not likely to give rise to *Dutch disease* effects. These findings suggest that grants and remittances may be serving to ease supply constraints or boost productivity in the non-tradable sector in the recipient economies.

JEL Classification Numbers: F3, F5, F31, F35

Keywords: Equilibrium Real Exchange Rate; Remittances; Official Development Assistance; Grants; Africa

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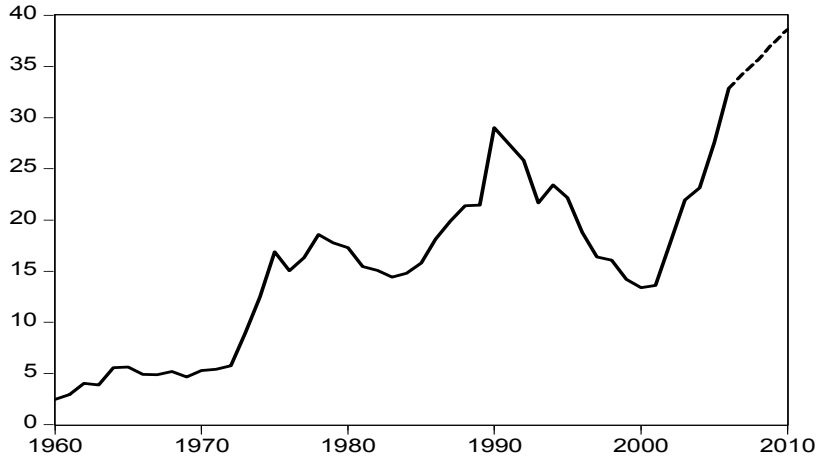
Contents

I. INTRODUCTION

The international community committed itself in 2000 to achieving eight Millennium Development Goals (MDGs) by 2015, which range from halving extreme poverty around the world to halting the spread of HIV/AIDS and providing universal primary education.[2] The achievement of these goals is predicated on a substantial scaling-up of official grants to low-income countries, particularly in Sub-Saharan Africa (SSA), to finance the increase in public expenditures required to meet the MDGs. Some of the scaling-up has already taken place, but much more will follow in the coming years, as the target date approaches and advanced economies redouble their efforts to honor their commitments (Figure 1).

Figure 1. The Scaling-Up of Grants:
Net Official Development Assistance to Sub-Saharan Africa
(Billions of 2000 US$)



Source: OECD. Projections based on OECD DAC data.

The large transfer of resources needed to achieve the MDGs raises an important economic question long debated in the literature: will such resource transfers be associated with movements in the equilibrium real exchange rate in the recipient economy? If so, such movements would have important implications regarding the growth and international competitiveness of the economy and may ultimately undermine the intended effect of the transfer. For example, a real exchange rate appreciation would imply a decrease in international competitiveness and a movement of resources from the tradable to the non-tradable sector; a phenomenon known as *Dutch disease*. On the other hand, a real depreciation would imply an increase in international competitiveness and a movement of resources from the non-tradable to the tradable sector. In either case, it is important to understand the relationship between resource transfers and the equilibrium real exchange rate so that economic policy can react appropriately.

[2] For a complete list of the Millennium Development Goals, see the United Nations Millennium Development Goals website at http://www.un.org/millenniumgoals/.

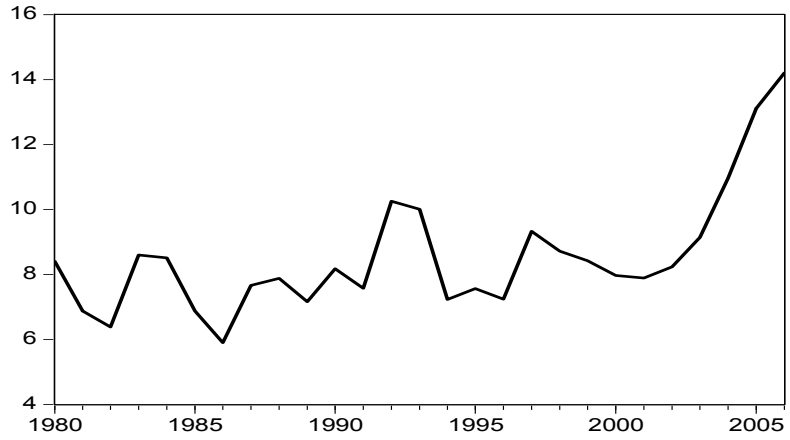
The current debate on the effects of scaling-up of official grants to SSA recalls the original discussions between Ohlin and Keynes on the subject of resource transfers. In those discussions, Ohlin (1929) argued that relative prices, including the real exchange rate, can fully adjust following the transfer of resources, thus bringing the economy to a new, steady-state equilibrium with full employment.[3] Keynes (1929), on the other hand, posited that prices (including wages) in the non-tradable sector may not adjust fully and completely following a large resource transfer. The resulting real exchange rate, then, may be significantly different from that necessary to maintain full employment. Thus, it is not only the level of the real exchange rate that matters, but also the deviation of that level from its underlying equilibrium level.

This potential deviation of the real exchange rate from its equilibrium level is particularly relevant for the scaling-up of aid to achieve the MDGs. If relative prices, including the real exchange rate, adjust fully and quickly to a new steady-state equilibrium following a resource transfer, as argued by Ohlin in 1929, then a scaling-up of official grants should not pose any further concerns about developing countries' growth prospects beyond the resource allocation effects associated with movements in the level of the real exchange rate. However, if the scaling-up results in significant deviations of the real exchange from equilibrium levels, then Keynes's original concerns about the impact of the resource transfer on growth and employment would be relevant today for SSA countries facing potentially very large grant inflows. Specifically, if the actual real exchange rate deviates from its equilibrium, the result would be a misallocation of resources across sectors and, in the case of an overvaluation, a loss of reserves and potential balance of payments crisis. In this light, it is important not only to examine the effects of the current scaling-up, but also to examine the effects of the scaling-up potentially coming to an end. Keynes's original concerns about potential deviations of the real exchange rate from equilibrium would also be relevant when large resource transfers dry up.

An additional dimension of the empirical question at hand relates to the impact of remittances on the equilibrium real exchange rate. Remittances to SSA countries have more than doubled since 2001, partly reflecting new banking rules and regulations on money laundering in advanced economies following the terrorist attacks of September 11, 2001 (Figure 2). Such a large increase in remittances may affect growth performance in SSA countries in a manner similar to grants.

[3] In this study, we follow convention and define the real exchange rate as the relative price of non-tradables to tradables.

Figure 2. The Scaling-up of Remittances to Sub-Saharan Africa (Billions of 2000 US$)



Source: Lee, Haacker, and Singh (2008), IFS, WDI, and IMF country desk data

This paper seeks to provide empirical evidence of the relationship between resource inflows, such as grants and remittances, and the equilibrium real exchange rate. The paper argues that it is not the international transfer per se that matters, as grants or remittances can be saved or spent on tradables, and therefore not affect the equilibrium real exchange rate in the recipient economy. It is instead the use of the transfer in the non-tradable sector that has the potential to affect the equilibrium real exchange rate and thus lead to deviations of the real exchange rate from equilibrium. If grants and remittances are used to increase demand in the non-tradable sector, one would expect the equilibrium real exchange rate to appreciate. However, if grants and remittances are used to ease supply constraints or increase productivity in the non-tradable sector, then the transfers may actually be associated with a depreciation of the equilibrium real exchange rate (Section II). Section III presents the data and methodology used to estimate the relationship between grants and remittances and the real exchange rate for 36 SSA countries, following closely previous work by Chudik and Mongardini (2007). Panel estimation results are then presented in Section IV, while Section V draws policy conclusions.

II. Recent Literature

The recent empirical literature on the subject is inconclusive on the relationship between transfers, such as grants and remittances, and the equilibrium real exchange rate. A few recent studies have found evidence that grants and remittances lead to appreciation of the real exchange rate while others have found exactly the opposite. For example, Rajan and Subramanian (2005) find evidence that grant inflows have systematic, adverse effects on a country's competitiveness, as reflected in a decline in the share of labor intensive and tradable industries in the manufacturing sector. They suggest that these effects stem from the real exchange rate overvaluation caused by grant inflows. They also find evidence that private-to-private transfers like remittances do not seem to create these same adverse effects. In a panel of 39 conflict and 44 nonconflict countries, Elbadawi et al. (2008) confirm that foreign aid leads to an appreciation of the equilibrium real exchange rate. However, aid

seems to have little impact on the real exchange rate overvaluation following a conflict. Saadi-Sedik and Petri (2006) find that that both grants and remittances in Jordan are positively related to the equilibrium real exchange rate, with grants having a larger impact than workers' remittances. Lane and Milesi-Ferretti (2004) provide evidence in a cross-country panel study of 64 countries to show that, on average, countries with net external liabilities (and implicitly large resource outflows to service these liabilities) have more depreciated real exchange rates. Conversely, grant-based resource inflows would be associated with a more appreciated real exchange rate. They also show that the main transmission mechanism seems to be the relative price of non-tradable goods, as Keynes had originally suggested.

On the other hand, Berg et al. (2007) analyze the recent experience of the scaling-up of grants in five SSA countries. They conclude that "there is no evidence of aid-related *Dutch disease* in the sample countries, with the real effective exchange rate remaining stable or depreciating."[4] Similarly, Li and Rowe (2007) find grant inflows to be associated with a depreciation of the real exchange rate in Tanzania, a conclusion that is shared by several other case studies including Ogun (1995) on Nigeria, and Sackey (2001) on Ghana. Cerra et al. (2008) conclude that if grants are used to ease supply constraints in the non-tradable sector, the real exchange rate will depreciate. Lee, Haacker, and Singh (2008) provide evidence in a panel study of 36 SSA countries that the real exchange rate and remittances are negatively correlated, suggesting that there is no *Dutch disease* effect from private transfers.

The lack of consensus on the impact of transfers such as grants and remittances on the real exchange rate suggests that perhaps previous studies have neglected to identify the correct measurement of the impact of the transfers on the economy. After all, transfers such as grants and remittances can be saved or spent on tradables as well as non-tradables. It is only the portion of grants and remittances used in the non-tradable sector that would lead to a change in the equilibrium real exchange rate. If that spending serves to increase demand in the non-tradable sector, one would expect the equilibrium real exchange rate to appreciate. However, if the transfers serve to ease supply constraints in the non-tradable sector, one would expect the equilibrium real exchange rate to depreciate. In this study, two measures of grant spending are introduced to better capture the true relationship between the resource transfer and the equilibrium real exchange rate. The results of these specifications are examined alongside the results of specifications that use more standard measures of transfer spending, such as grants and remittances in percent of GDP. These measures of grant and remittance spending are described in greater detail in the following section.

III. Data and Empirical Methodology

Of primary interest to this study is the long-run relationship between grants and remittances and the equilibrium real exchange rate. For this reason, the pooled mean group (PMG)

[4] Berg et al. (2007), p. 2.

estimator developed by Pesaran et al. (1999) is used as the main estimation technique.[5] The PMG estimator is based on an ARDL procedure that constrains the long-run coefficients to be homogenous across groups while allowing for heterogeneous short-run dynamics.

For this study, the PMG estimator is preferred to other common estimators such as the mean group estimator or the dynamic fixed-effect estimator because the long-run movements of the real exchange rate are expected to be generated by a similar process across countries. The mean group estimator does not take such information into account. Also, it would seem inappropriate to impose homogenous short-run dynamics for all countries, as is the case with the dynamic fixed-effect estimator, because short-run movements of the real exchange rate are likely to be influenced by country specific characteristics, including the type of exchange rate regime. The general reduced form equation to be estimated therefore takes the form:

$$\Delta RER_{i,t} = \phi_i (RER_{i,t-1} + \beta_i X_{i,t-1}) + \sum_{j=1}^{p-1} \lambda_{i,j} \Delta RER_{i,t-j} + \sum_{j=0}^{q-1} \delta_{i,j} \Delta X_{i,t-j} + \gamma_i D_t + \varepsilon_{i,t} \qquad (1)$$

where *RER* is the real exchange rate, *X* is a vector of fundamental determinants of the equilibrium real exchange rate that includes grants and remittances, and *D* is a set of deterministic regressors that includes intercepts and time trends. Also, *i* and *t* are country and time subscripts, respectively.[6] The construction of the real exchange rate and all fundamental variables are described in detail in Table A1 of the appendix. Given the focus of this study on the long-run relationships between the equilibrium real exchange rate and transfers such as grants and remittances, it is the vector of β_i that is of primary interest. Also, given the limited time span of the data (1980-2006 in most cases) the vector of fundamentals (*X*) is restricted to no more than four or five variables per specification.[7]

Unit root tests on the real exchange rate and the variables that will comprise the *X* vector can be seen in Table A2 of the appendix. For presentation purposes, only the Levin, Lin, and Chu (2002) test is reported in Table A2. Other unit root tests for panel data including the Breitung (2000), Im, Pesaran, and Shin (2003), and Hadri (2000) tests generally confirmed these findings. The unit root test broadly argue in favor of non-stationarity of the variables suggesting that the variables can be considered integrated of order one. The Levin, Lin, and Chu test, however, does indicate that some variables may be stationary.

For the purposes of the PMG estimator, the existence of a long-run relationship between the variables of interest is most important, not the order of integration of each individual

[5] The Fully Modified OLS developed by Pedroni (2000) and the Panel Dynamic OLS estimator developed by Mark and Sul (2003) were also used as robustness checks. In most cases, the results were similar but less significant using these two techniques and will therefore not be reported.

[6] A multiple equation estimation approach would certainly be preferred to this single equation approach. However, given data availability, it would not be feasible to accurately estimate a multiple equation system.

[7] Only balanced panels were used for the PMG estimations.

variable.[8] Indeed, many studies examining long-run relationships between variables using PMG estimation, including Pesaran, Shin, and Smith (1999) and Elbadawi et al. (2008), simply assume the existence of a long-run relationship and do not explicitly test for one. In this study, however, several panel cointegration tests were conducted to test for the existence of a long-run relationship between the variables of interest. Four different tests were conducted following Pedroni (2000) including the Panel ADF, Panel PP, Group ADF, and Group PP tests.[9] The results of the cointegration tests for the various specifications can be seen in Table 1 as well as in Table A3. The results are encouraging with all four tests confirming the existence of a cointegrating vector in most cases, and with at least one test confirming the existence of a cointegrating vector in all cases. An additional benefit of working with cointegrated equations is that potential endogeneity between the real exchange rate and the fundamentals does not affect the long-run coefficients.

The long-run coefficients in equation (1) were first estimated by including various combinations of fundamentals excluding grants and remittances. These estimates update the work conducted by Chudik and Mongardini (2007) and are available in Table A3 of the appendix. Results of these exploratory regressions are closely in-line with the results of Chudik and Mongardini (2007) and indicate that terms of trade (TOT), trade openness (OPN), relative productivity (GDP), government spending (GOV), and debt service (DS) are all significant determinants of the equilibrium real exchange rate in SSA countries.[10] Additionally, the measure of the net external position developed by Lane and Milesi-Ferretti (2001, 2007) was included for its role in determining the equilibrium real exchange rate in SSA countries. The results confirm the findings of Lane and Milesi-Ferretti (2004) that countries with higher levels of net external liabilities also tend to have more depreciated real exchange rates.[11]

Given their significance in the exploratory regressions and in the associated literature, the terms of trade (TOT), trade openness (OPN), and relative productivity (GDP) variables were then included with grants as a percent of GDP (ODA) and then with remittances as a percent of GDP (REM) in order to assess the impact of these transfers on the real exchange rate.[12] Recall, however, that grants and remittances as a percent of GDP give no indication of how much of these transfers are spent on non-tradables. Next, the terms of trade, trade openness, and relative productivity variables were included with each of the two measures of grant

[8] See Pesaran, Shin, and Smith (1999) as well as Elbadawi, Kaltani, and Schmidt-Hebbel (2008).

[9] Details on these panel cointegration tests can be found in Pedroni (2000).

[10] See specifications V and VI in Table A3 of the appendix. Given the price of oil on the behavior of the real exchange rate in oil exporting countries, those countries were excluded from the sample in Table A3. A separate specification for oil-exporting countries can be seen in Table A4 of the appendix.

[11] See specification VII in Table A3 of the appendix.

[12] Due to data limitations, regressions that included both ODA and REM did not generally provide meaningful results.

spending to assess the relationship between these transfers and the equilibrium real exchange rate.

The first of the two alternative measures of grant spending was constructed following Berg et al. (2007), who suggest that the appropriate measure can be defined as the widening of the fiscal deficit (net of grants) that accompanies an incremental increase in grants, which is defined here as phi (φ):[13]

$$\varphi \equiv \frac{\Delta(G-T)}{\Delta Grants} \tag{2}$$

where G is total expenditures (excluding external interest), T is non-aid domestic revenue, and Δ is the difference operator.

To then get a measure of the total amount of grants that is spent by the government that can be consistently compared across countries, their measure of the share of grants that is spent (φ) is multiplied by grants as a percent of GDP. This measure of grant spending (ODA1) is defined as:

$$ODA1 \equiv \varphi \frac{Grants}{GDP} \tag{3}$$

This measure of grant spending can be interpreted as the amount of grants a government uses to finance expenditure increases or tax reductions. This measure reflects only the government's decision to spend grants, but does not distinguish between what is spent on tradables or non-tradables. In other words, it does not capture the economy's absorption of spending out of grants, the key determinant of the impact on the equilibrium real exchange rate.

The second measure of grant spending was constructed to capture the amount of grants that are channeled to the non-tradable sector. [14] The key insight is that data on changes in the level net foreign assets held by a country can be used to isolate grant spending in the non-tradable sector. Only savings and spending in the non-tradable sector will affect the level of net foreign assets, while spending on the tradable sector typically does not.[15] In this way, the change in net foreign assets that stems from an incremental increase in grants can be represented by:

[13] Following Berg et al. (2007), this measure is truncated at zero and unity.

[14] We are indebted to Peter Allum for the insight into this measure of grant spending.

[15] Grants that are spent by the government on tradables do not result in a sustained net foreign asset accumulation. This is less clear-cut when grants finance a tax reduction, and the private sector purchases tradables: the impact on net foreign assets will depend on the exchange rate policy, with possible NFA build-up under a float. However, grants-based tax reductions a relatively uncommon, and are not expected to undermine the general validity of the ODA2 measure developed below.

$$\frac{\Delta NFA}{\Delta Grants} = (1-\varphi) + \varphi\omega \tag{4}$$

where, as before, φ represents the proportion of grants that is spent, and omega (ω) is defined as the proportion of grant spending that is funneled toward non-tradables. Also, ΔNFA is the change in a country's net external position as defined in Lane and Milesi-Ferretti (2001, 2007). Therefore, the first term on the right-hand side captures the increase in NFA stemming from the saving of grants while the second term captures the increase in NFA from spending grants on non-tradables.[16]

Combining equations (2) and (4), the amount of grants spent in the non-tradable sector that can be consistently compared across countries (ODA2) can then be isolated as:

$$ODA2 \equiv \varphi\omega\frac{Grants}{GDP} = \left[\frac{\Delta NFA + \Delta(G-T)}{\Delta Grants} - 1\right]\frac{Grants}{GDP} \tag{5}$$

Therefore, ODA2 is more likely to capture any potential real exchange rate movements related to grants being spent on non-tradables.

IV. Estimation Results

The first step in the assessment of the relationship between grants and remittances and the equilibrium real exchange rate was to examine the relationship between grants (ODA) and remittances (REM) as a percent of GDP and the equilibrium real exchange rate. The results of the pooled mean group estimations can be seen in specifications I and IV of Table 1, respectively. These estimations show a negative relationship between grants and remittances and the equilibrium real exchange rate, although the coefficients on the latter are not statistically significant. The coefficient on grants as a percent of GDP (ODA) is estimated to be -0.256 suggesting that a one percentage point increase in grants to GDP is associated with a quarter percent depreciation in the real exchange rate.

This result is not without support in the related literature or without theoretical underpinnings. For example, Li and Rowe (2007) estimate the same coefficient to be -0.29 for Tanzania. Ogun (1995) and Sackey (2001) also find evidence of this negative relationship. Moreover, these results can be considered theoretically consistent given that transfers such as grants and remittances can be used to ease supply constraints or increase productivity in the non-tradable sector, which can lead to a depreciation of the equilibrium real exchange rate. Theoretically, it is only the portion of the transfer that is used in the non-tradable sector in the domestic economy that has the potential to affect the equilibrium real exchange rate. In light of this result, the remainder of the analysis will focus on the impact of

[16] The monetary authorities can also use aid to supply foreign exchange liquidity, which could have an impact on the real exchange rate. This study is not concerned with this effect, although this is indirectly captured in the change in ΔNFA in equation (4). For a more detailed description of this channel, see Berg et al. (2007).

grant spending, first in general (ODA1) and then specifically spending in the non-tradable sector (ODA2). The results of the specifications that examine the impact of the two measures of grant spending (ODA1 and ODA2) will be discussed in turn.

Table 1. Pooled Mean Group Estimates- Grants and Remittances 1980-2006

Dependent Variable: RER				
Specification	I	II	III	IV
TOT	0.312	0.210	0.220	0.013
	(9.296)	(3.560)	(4.253)	(0.234)
OPN	-0.163	-0.736	-0.684	-0.728
	(-3.178)	(-14.942)	(-17.969)	(-9.014)
GDP	0.428	0.400	0.353	1.066
	(7.268)	(4.059)	(4.491)	(6.079)
ODA	-0.256			
	(-9.329)			
ODA1		-0.003		
		(-1.780)		
ODA2			-0.008	
			(-3.868)	
REM				-0.044
				(-1.461)
EC	-0.280	-0.197	-0.244	-0.174
	(-4.358)	(-4.598)	(-4.123)	(-2.934)
HM	7.640	9.520	34.37	6.170
	(0.110)	(0.050)	(0.000)	(0.190)
Panel PP	-2.004	-2.427	-1.588	-2.324
	(0.053)	(0.021)	(0.113)	(0.027)
Panel ADF	-2.512	-2.346	1.522	-3.457
	(0.017)	(0.026)	(0.125)	(0.001)
Group PP	-2.332	-2.927	-2.119	-3.230
	(0.026)	(0.006)	(0.042)	(0.002)
Group ADF	-2.843	-2.743	3.710	-2.716
	(0.007)	(0.009)	(1.522)	(0.010)
Observations	783	756	729	405
Countries	29	28	27	15

Note: Numbers in parentheses are t-statisitcs with the exceptions of HM and cointegrations tests which are p-values. EC refers to the error correction term and HM refers to the Hausman test. All specifications include a maximum of one lag.

Results of the estimation that includes the first measure of grant spending (ODA1) as constructed following Berg et al. (2007) can be seen in specification II of Table 1. The coefficient on ODA1 is found to be negative, although statistically insignificant. The implication is that either grant spending does not lead to a long-run appreciation of the real exchange rate or that this is not the most appropriate way to capture grant spending as discussed above. This finding is in line with that of Berg et al. (2007) who find no evidence of *Dutch disease* stemming from surges in grant inflows in a small sample of SSA countries comprising Ethiopia, Ghana, Mozambique, Tanzania, and Uganda. They suggest that their finding could be stemming from coincident negative terms of trade shocks or from high import propensities. This is unlikely to be the cause of the negative but insignificant coefficient found in this study, as both terms of trade shocks (TOT) and openness (OPN) are controlled for in the regression analysis. Instead, the insignificant coefficient is likely coming from the fact that this measure of grant spending reflects only the government's decision to spend grants, but does not distinguish between what is spent on tradables and non-tradables. If grants are spent entirely on tradables, one would expect to see no impact on the real exchange rate. In other words, ODA1 does not capture the economy's absorption out of grant spending.

The results of the estimation that includes the ODA2 measure of grant spending that accounts only for the proportion of the grants that is channeled toward the non-tradable sector can be seen in specification III of Table 1. Results are quite similar to those found in specification II, although the coefficient on grant spending in the non-tradable sector (ODA2) is negative and statistically significant whereas the coefficient on ODA1 was not significant. Specifically, the coefficient on ODA2 is estimated to be -0.008.[17] This result implies that a 1 percent increase in grant spending in the non-tradable sector is associated with a 0.8 percent depreciation of the equilibrium real exchange rate, suggesting that grants are used primarily to ease supply constraints or to increase productivity in the non-tradable sector.

The ability of ODA2 to capture spending on non-tradable is evidenced by the size and significance of its estimated coefficient relative to that of ODA1. Because spending on tradables should, in theory, have no impact on the real exchange rate, and because ODA1 does not distinguish between spending on tradable and non-tradables, one should expect the coefficient on ODA1 to be smaller in magnitude and significance when compared to that of ODA2. Indeed, this expectation is confirmed by comparing the results of specifications II and III.

The estimates also indicate that changes in the amount of grants spent on non-tradables (ODA2) have a larger impact on the equilibrium real exchange rate than do changes in grants spent in general (ODA1), as evidenced by Table 2. On average, SSA countries have experienced a 1.8 percent annual depreciation in their equilibrium real exchange rates between 1980 and 2006. While more than 90 percent of this depreciation is explained by

[17] Because ODA1 and ODA2 can take a value of zero, their values are not expressed in logarithms (see Table A1). Their coefficients, therefore should be interpreted as semi-elasticities rather than elasticities as is the case for ODA.

relative productivity changes, openness, and terms of trade, the most powerful contribution for grants is found for the ODA2 measure, which explains about 7 percent of the depreciation change.

Table 2. Contribution of Fundamentals to Changes in ERER, 1980-2006

	Average Annual Change (In percent)	Contribution to ERER movement (In basis points)		Contribution to ERER movement (In percent)	
		Specification:		Specification:	
		II	III	II	III
ERER	-1.76				
TOT	-1.54	-0.32	-0.34	18.38	19.25
OPN	1.14	-0.84	-0.78	47.93	44.05
GDP	-1.51	-0.60	-0.53	34.32	30.03
ODA1	-0.04	0.01		-0.63	
ODA2	0.15		-0.12		6.68
Sum		-1.76	-1.76	100.00	100.00

Note: Contribution to ERER movement (in basis points) is calculated as the product of average annual change and the estimated elasticity from Table 1.

It should be noted however, that the negative relationship found between grant spending on non-tradables and the equilibrium real exchange rate could be also be partially stemming from potential reverse causality between grants and the real exchange rate. Countries with a significantly depreciated real exchange rate are, at times, more likely to be the beneficiary of large grant inflows if the depreciated real exchange rate is stemming from a crisis period, for example. If this were the case, however, one might expect all three grant measures to be significantly correlated with the ERER, as there is no obvious reason why a crisis period would be linked to grants spent on non-tradables, rather than tradables. Indeed, if foreign exchange is scarce during the crisis, purchases of tradables are more likely repressed, and would rise disproportionately with new grant inflows, making for a strong relationship between ODA or ODA1 rather than ODA2.

It could also be that the negative relationship is pointing to the existence of excess capacity in the non-tradable sector for some of the countries in certain periods. In that case, further increases in grant spending may only serve to increase capacity utilization, with no upward pressure on the price of non-tradables and consequently the equilibrium real exchange rate. This would be particularly true in post-conflict countries, where the large amount of grants are used to demobilize combatants, which seems to be corroborated by the evidence in Elbadawi et al. (2008). While this would result in no impact of grant spending on the ERER, it would not explain the negative relationship identified above. While the importance of underutilized capacity is not ruled out, productivity gains in the nontradable sector from grant spending do appear to be an important factor.

The finding of a negative relationship between grant spending and the equilibrium real exchange rate has important implications for countries currently facing large grant inflows that will presumably not last indefinitely. First, to the extent that these countries spend the grant inflows on productivity-enhancements in the non-tradable sector, the real exchange rate will depreciate, thereby increasing the competitiveness of the domestic tradable sector.

Second, to the extent that grants are spent on productivity enhancing non-tradables, countries should be prepared for a significant adjustment when grant inflows dry up. Specifically, as grants begin to fall back to pre-scaling-up levels, countries are likely to witness significant equilibrium real exchange rate appreciation along with rising prices in the non-tradable sector. If prices are sticky or if governments resist the associated increase in prices by using their own domestic resources to support the tradable sector, this may lead to a period of real exchange rate disequilibrium and resource misallocation.

The adjustment parameter for specification III is estimated to be -0.244. The corresponding half-life of a real exchange rate deviation from its long-run equilibrium is about two and a half years, a finding similar to that of Chudik and Mongardini (2007) but quicker than that found in Elbadawi et al. (2008) and Saadi-Sedik and Petri (2006). Nevertheless, the estimated half-life is still fairly slow, suggesting that there is a small but significant potential for a disequilibrium of the real exchange rate, as Keynes had suggested. The results imply that for each 1 percent of GDP decline in grant spending on non-tradables, the equilibrium real exchange rate would appreciate by 0.8 percent. Given the estimated half-life, this initial disequilibrium will decline to only 0.4 percent within two and a half years of the decline in grants.

Indices for the deviation of the real exchange rate from its equilibrium level were constructed based on the results of specification III. An estimate of the equilibrium real exchange rate for each country was obtained by applying the estimated coefficients to the underlying fundamentals and adding a country-specific intercept.[18] Following Chudik and Mongardini (2007) and Elbadawi et al. (2008), the country specific intercept was found by taking the average difference between the actual real exchange rate and equilibrium real exchange rate, with the latter estimated on the basis of the beta vector and underlying fundamentals only. This was done on a country by country basis to ensure an accurate intercept for each country. The estimated equilibrium real exchange rate index for each non-oil and oil country can be seen in Figures A1 and A3, respectively. The estimated disequilibrium for each non-oil and oil country can be seen in Figures A2 and A4, respectively.[19]

Disequilibrium estimates are broadly in line with historical trends. For example, the CFA franc devaluation in 1994 can be seen in the graphs for Burkina Faso, Chad, Senegal, and Togo. Also, the two spikes in the graph for Ethiopia reflect the economic collapse surrounding the famine of 1984-85 and the end of the Derg regime in 1991. The civil war in Rwanda in 1994 is shown to have had a substantial impact on the equilibrium real exchange rate, although it was quickly reversed with the advent of peace. Similarly, the dismantling of socialist controls in Tanzania and the subsequent devaluation in 1986 brought the real

[18] Following the recommendations of Saadi-Sedik and Petri (2006) the fundamentals were not smoothed to avoid influencing the disequilibrium results in an arbitrary fashion.

[19] Due to the important role of the price of oil in determining the ERER in oil exporting countries, Figures A3 and A4 were calculated on the basis of Table A4. Also, Chad and Sudan are included in the non-oil group as they have only recently begun to export oil. Cote d'Ivoire is included with the oil exporters to reflect its large oil refinery sector.

exchange rate broadly in line with its equilibrium level. Disequilibrium estimates for the large oil producers such as Angola, Equatorial Guinea, Gabon, and Nigeria show that the real exchange rates in those countries become increasingly undervalued in the face of rising real oil prices during 2005-08. This undervalued disequilibrium in large oil producing countries is arising because the equilibrium real exchange rate is appreciating but the real exchange rate is not following the equilibrium movement.

V. CONCLUDING REMARKS

This study adds to the current debate on the scaling-up of aid to make progress towards the MDGs. It provides evidence to suggest that the scaling-up of grants (and remittances) to achieve the MDGs is unlikely to lead to an appreciation of the real exchange rate in SSA countries. However, the end of such scaling up could lead to a small but significant overvaluation of the real exchange rate, if the necessary decline in wages in the non-tradable sector is resisted through an unsustainable fiscal policy. It should be noted, however, that given the estimated half-life of two and a half years, any such real exchange rate disequilibrium associated with a significant decline in grants, is unlikely on average to be a major problem for SSA countries over the medium term. This seems to corroborate the anecdotal evidence in Sachs (2005), which shows that the effective use of aid can free SSA countries from poverty traps.

Using the pooled mean group estimator of Pesaran (1999) to take advantage of long-run similarities in the real exchange rate generation processes across countries while allowing for short-run heterogeneous shocks, the paper shows that it is not the amount of transfers received by an economy, but rather the amount spent on non-tradables that matters most for the real exchange rate. Specifically, an increase in transfers received by an economy is shown to be associated with a depreciation of the equilibrium real exchange rate, a finding that reflects the fact that transfers such as grants and remittances are generally channeled to productive investments that boost productivity or ease supply constraints in the non-tradable sector. It is only the portion that is used in non-tradable sector, and thus absorbed by the domestic economy, that has the potential effect on the equilibrium real exchange rate.

Another potential explanation for this finding may include the existence of excess capacity in the non-tradable sector for SSA countries. In this case, further increases in grant spending may only serve to increase capacity utilization, with no upward pressure on the price of non-tradables and consequently the equilibrium real exchange rate. This would be particularly true in post-conflict countries. Also, there may be some degree of reverse causality between transfers and the real exchange rate causing grants to increase during periods of depreciated real exchange rates.

Since the main estimation procedure used in this study relies on pooling techniques, future studies would do well to examine the robustness of this study's key results through case studies. If the long-run equilibrium real exchange rate is not generated by similar processes across countries, then case studies may provide markedly different results in some instances. Furthermore, as the availability of historical data increases, it may be possible to estimate the relationship between aid and the real exchange rate using a multiple equation system. Such a procedure would go a long way toward identifying any reverse causality between aid and the

real exchange rate. In addition, future research should also focus on estimating the impact of aid and remittances on the real exchange rate in a single equation, something that was not possible in this study due to data limitations.

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Table A1. Data Description and Sources

Variable	Description	Source
RER	Logarithm of the real effective exchange rate (CPI based)	IMF EER facility and WEO
TOT	Logarithm of the terms of trade for goods	WEO
OPN	Logarithm of exports plus imports of goods as a percent of GDP	WEO
GDP	Logarithm of real GDP per capita relative to weighted average of trading partners	WEO
GOV	Logarithm of government consumption as a percent of GDP relative to trading partners	WEO
DS	Total debt service as a percent of exports	WEO
NFA	Net external position as a percent of GDP	External Wealth of Nations Dataset as described in Lane and Milesi-Ferretti (2007)
ODA	Logarithm of net Official Development Assistance as a percent of GDP	OECD
ODA1	Δ(G-T)/ΔGrants multiplied by Grants as a percent of GDP where G is government expenditure and T is revenue (minus grants). Δ(G-T)/ΔGrants is truncated at zero and unity.	OECD, IMF African Department Database, WEO, and Authors' calculations
ODA2	((Δ(G-T)+ΔNFA)/ΔGrants-1) multiplied by Grants as a percent of GDP where G is government expenditure and T is revenue (minus grants). ((Δ(G-T)+ΔNFA)/ΔGrants-1) is truncated at zero and unity.	OECD, IMF African Department Database, WEO, and Authors' calculations
REM	Logarithm of remittances received as a percent of GDP	Lee, Haacker, and Singh (forthcoming), IFS, WDI, and IMF country desk data

Note: WEO is the World Economic Outlook. OECD is the Organization for Economic Co-operation and Development. IFS is International Financial Statistics/ WDI is World Development Indicators.

Table A2. Unit Root Tests

	Level		First Difference	
	LLC	p-value	LLC	p-value
RER	1.003	0.842	-9.873	0.000
TOT	-0.060	0.476	-11.751	0.000
OPN	-1.028	0.152	-10.324	0.000
GDP	-0.307	0.380	-7.713	0.000
GOV	-1.303	0.096	-10.277	0.000
DS	-0.602	0.274	-6.916	0.000
NFA	3.267	1.000	-8.136	0.000
ODA	-0.963	0.168	-8.739	0.000
ODA1	-10.303	0.000	-21.534	0.000
ODA2	-6.923	0.000	-11.436	0.000
REM	-0.749	0.227	-6.759	0.000

Note: LLC represents the Levin, Lin, and Chu t-stat.
All specifications include an intercept and deterministic time trend.

Table A3. Pooled Mean Group Estimates-Fundamentals

Dependent Variable: RER			
Specification	V	VI	VII
	1980-2007	1980-2007	1980-2006
TOT	0.077	0.131	0.102
	(2.701)	(3.381)	(2.459)
OPN	-0.471	-0.389	-0.282
	(-11.232)	(-6.396)	(-4.489)
GDP	1.115	1.164	1.315
	(18.768)	(13.449)	(17.44)
GOV	0.115	0.136	
	(2.378)	(2.221)	
DS		-0.044	-0.108
		(-2.515)	(-4.634)
NFA			0.002
			(3.200)
EC	-0.280	-0.257	-0.365
	(-4.358)	(-3.410)	(-3.587)
HM	7.640	10.570	1.840
	(0.110)	(0.060)	(0.870)
Panel PP	-2.004	-1.956	-2.061
	(0.054)	(0.059)	(0.048)
Panel ADF	-2.512	-2.195	-2.137
	(0.017)	(0.036)	(0.041)
Group PP	-2.332	-2.587	-1.964
	(0.026)	(0.014)	(0.058)
Group ADF	-2.843	-2.837	-1.974
	(0.007)	(0.007)	(0.057)
Observations	784	504	432
Countries	28	18	16

Note: Numbers in parentheses are t-statisitcs with the exceptions of HM and cointegrations tests which are p-values. EC refers to the error correction term and HM refers to the Hausman test. All specifications include a maximum of one lag.

Table A4. Pooled Mean Group Estimates for Oil Exporters

Dependent Variable: RER	
	Max 1 lag
TOT	0.223
	(2.953)
OPN	-0.135
	(-1.723)
GDP	0.171
	(2.446)
EC	-0.593
	(-3.932)
HM	2.700
	(0.440)
Country Specific Long-Run Elasticity of the Real Price of Oil	
Angola	1.138
	(4.060)
Cameroon	-0.040
	(-0.796)
Congo, Republic of	-0.056
	(-0.775)
Cote d'Ivoire	0.034
	(0.305)
Equatorial Guinea	1.528
	(0.660)
Gabon	0.488
	(3.670)
Nigeria	1.162
	(1.709)
Observations	196
Countries	7

Note: Numbers in parentheses are t-statisitcs with the exceptions of HM and cointegrations tests which are p-values. EC refers to the error correction term and HM refers to the Hausman test. All specifications include a maximum of one lag.

Figure A1. Real Effective Exchange Rates and Equilibrium Real Exchange Rates, Non-oil Countries, 1980-2006

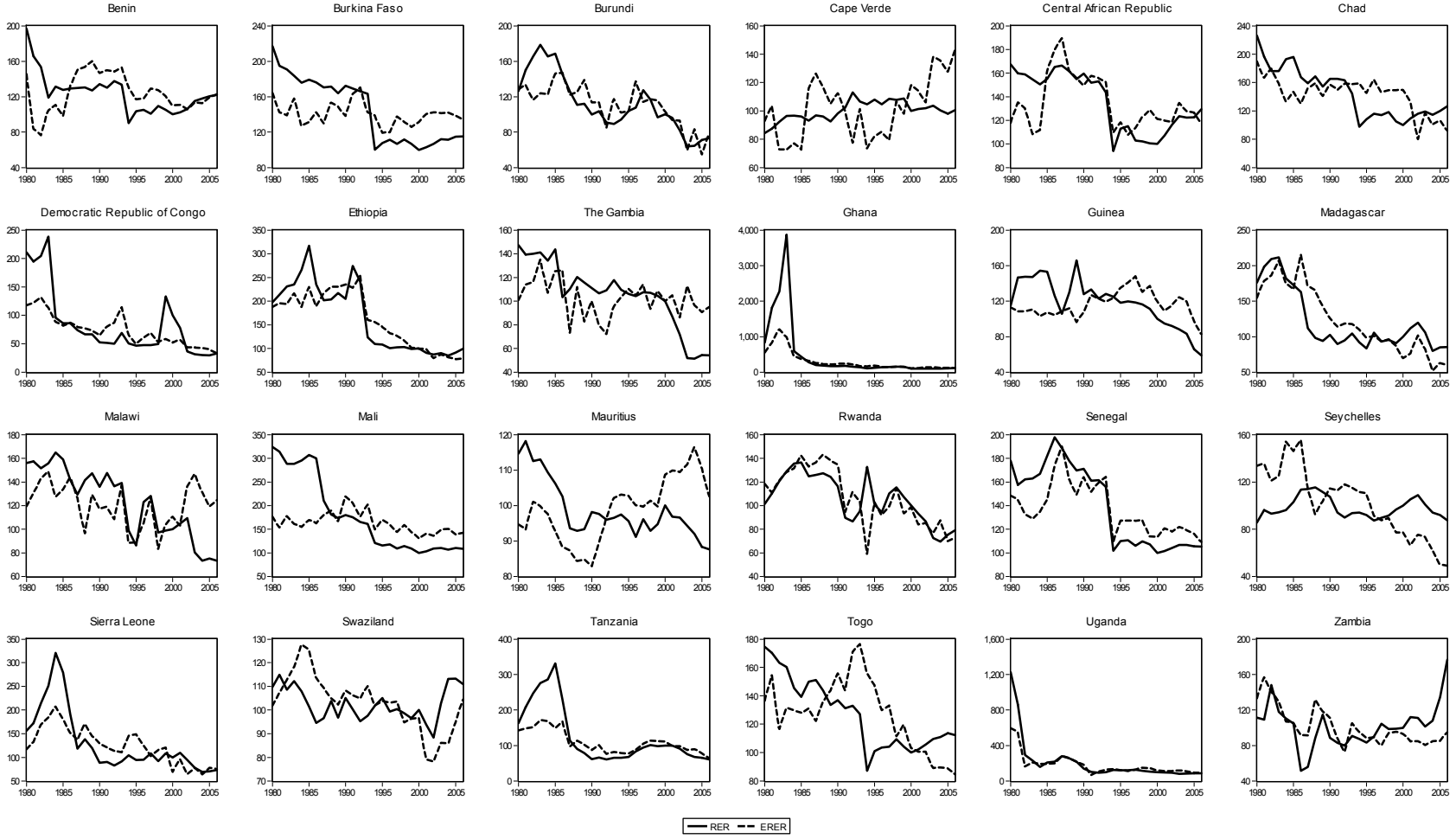


Figure A2. Real Exchange Rate Disequilibria, Non-oil Countries, 1980-2006 (in percent)

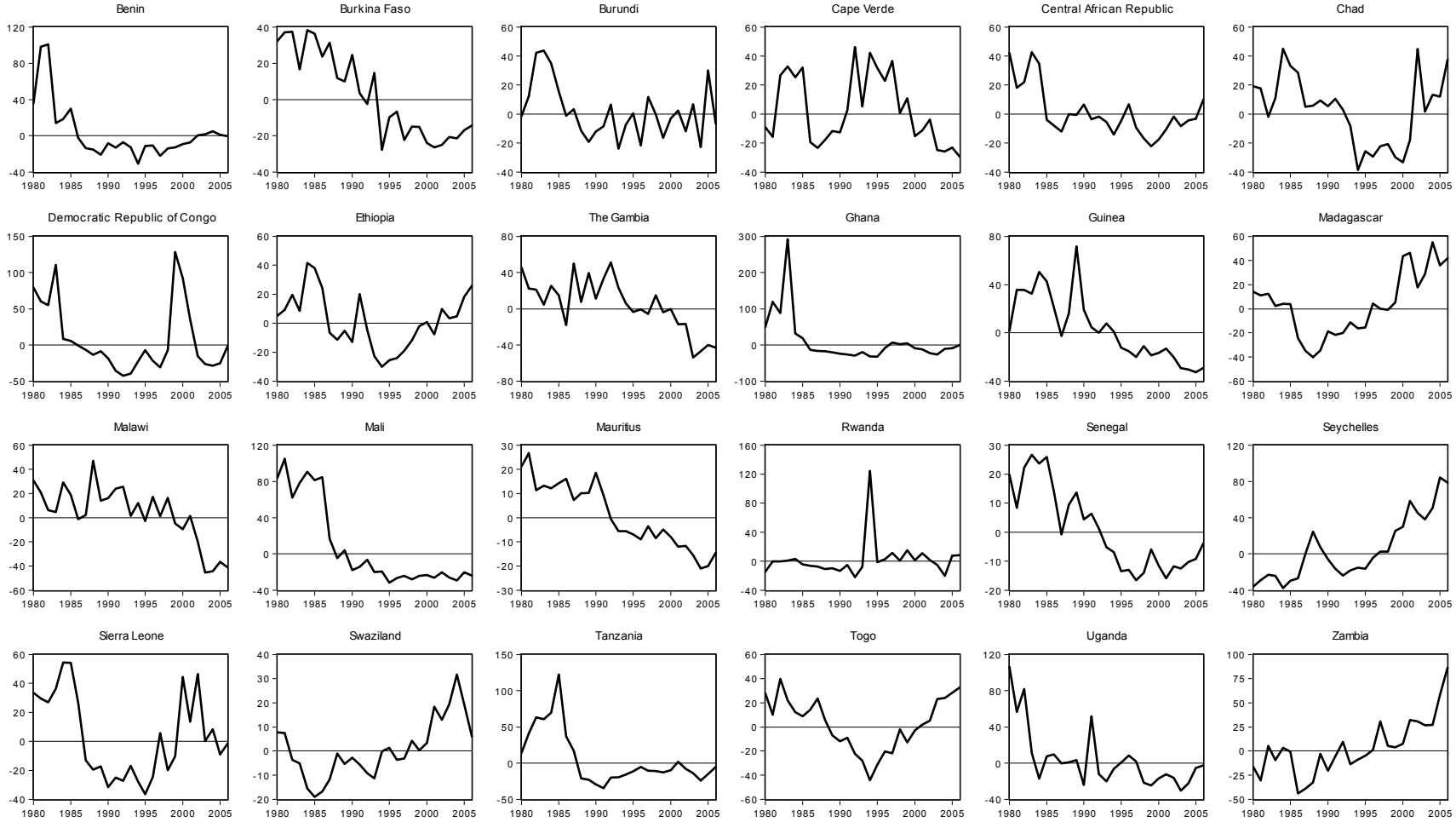
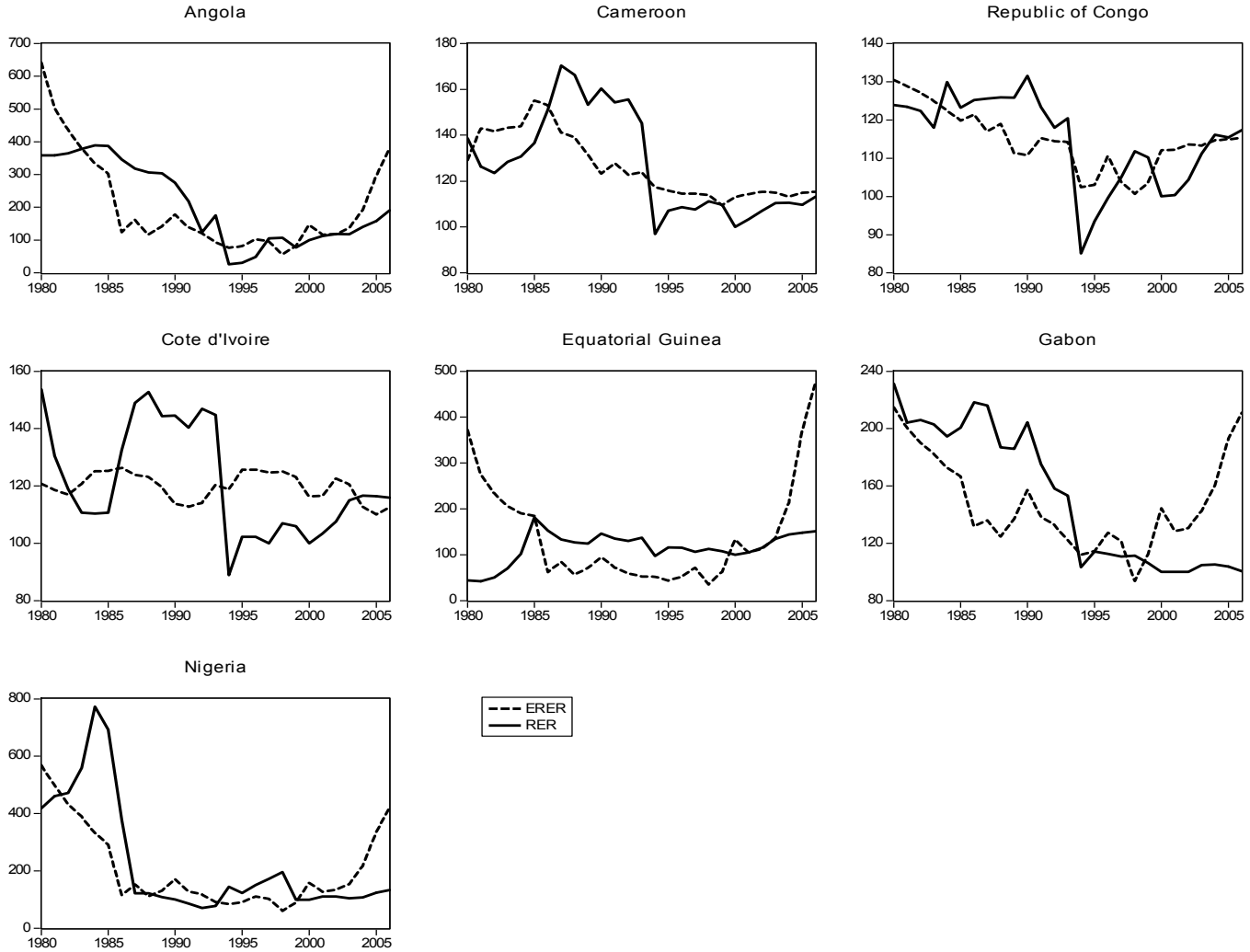
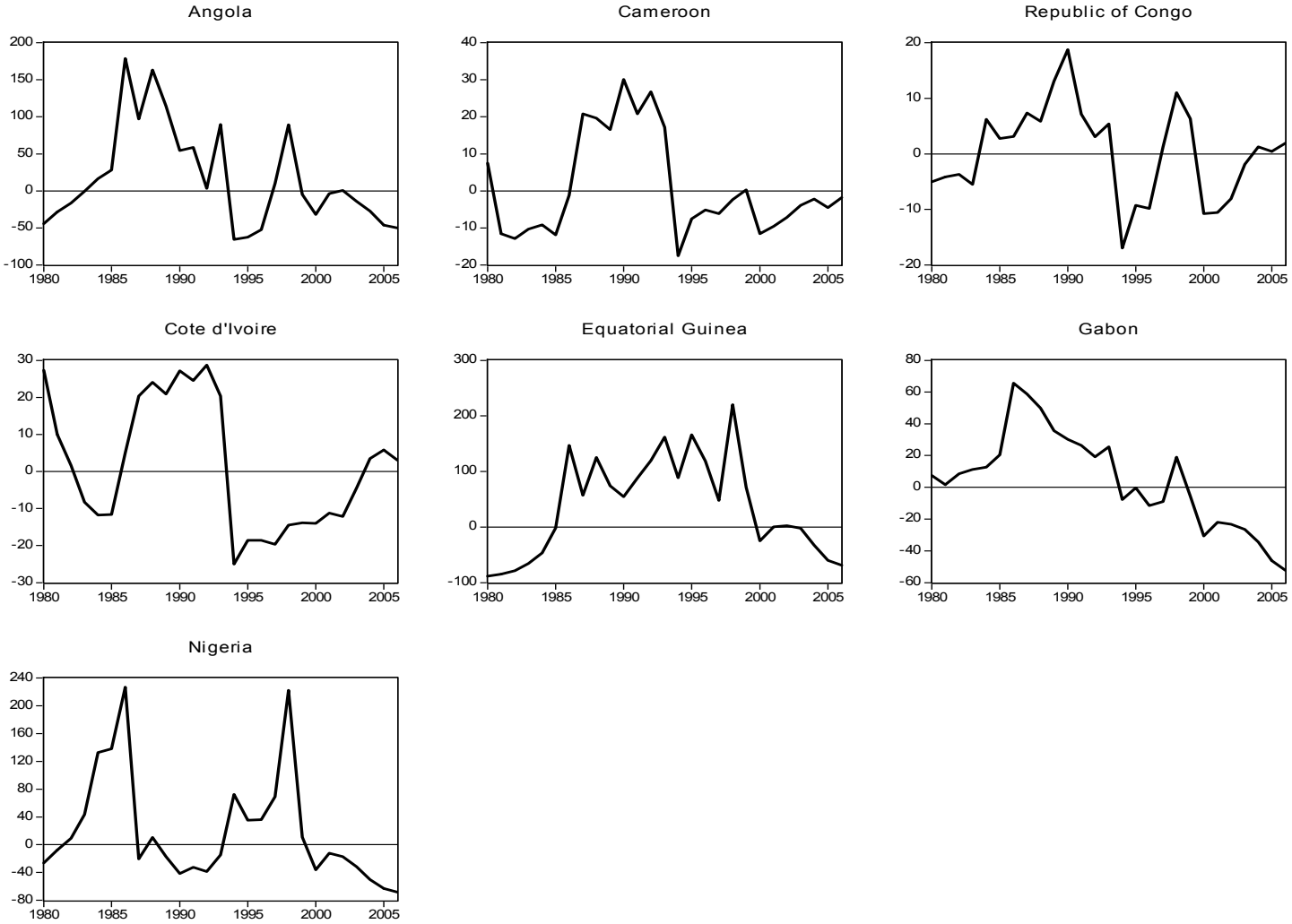


Figure A3. Equilibrium Real Exchange Rates and Real Exchange Rates, Oil Countries



Note: ERER calculated on the basis of Table A4.

Figure A4. Real Exchange Rate Misalignments, Oil Countries (in percent)



Note: Misalignments calculated based on the results of Table A4.