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***Foreign Capital Inflows, Economic  
Policies and the Real Exchange Rate  
in Sub Saharan Africa: Is there an  
Interaction Effect?***

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## **Abstract**

This paper presents a dynamic heterogeneous panel data model in which the reaction of the real exchange rate to external finance includes interactions with the measure of the trade openness, fiscal, monetary and *nominal* exchange rate policies of twenty-four primary-exporting Sub-Saharan African countries from 1978-2001. As expected, a rise in international transfers by itself exerts an upward pressure on the real exchange rate. However, this estimated positive effect of capital inflows was offset by associated policy interventions to liberalise trade controls and address problems of credit rationing in the private sector. This augurs well for the achievement of the Millennium Development Goals.

**Keywords:** Capital inflows, real exchange rates, Sub-Saharan Africa, economic policies

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## 1. Introduction

At the millennium summit in September 2000, world leaders pledged to cut extreme income poverty and hunger by half from its 1990 level by 2015. A subsequent report by the UN Millennium Project Task Force (UNDP, 2005) estimated a total investment requirement of US\$70 to US\$80 per capita in 2006, rising to US\$120 to US\$160 in 2015 at constant 2003 US dollars for a typical low-income country such as Ghana, Uganda and Tanzania in order to meet and maintain this ambitious Millennium Development Goal (MDG). While a rising proportion of investment requirements are expected to be met through the mobilisation of domestic resources, these developing countries were projected to experience an aggregate MDG financing-gap of between 10 percent to 20 percent of GDP per annum averaged from 2005 to 2015. For many low-income economies — particularly in Sub-Saharan Africa (SSA) — this projected MDG resource gap will be financed largely through foreign grants-in-aid, migrant remittances, concessionary loans and donations from non-governmental organisations, as opposed to foreign direct or portfolio investment and non-concessionary loans from commercial banks.

Regardless of how this gap is financed, however, the conclusions in the empirical literature on the impact of “excessive” external capital inflows on *real* exchange rates have been less than unanimous. At the heart of this debate are the controversial findings by some researchers that many SSA states have sustained depreciation in their real rates despite their relatively high ratios of capital inflows to GDP. An explanation for these controversial results by Hansen and Tarp (2000, 2001) has focused on misspecification errors present in some econometric studies on the macroeconomic implications of increasing net external finance. However, Nyoni (1998) for Tanzania, Sackey (2001) for Ghana and Outtara and Strobl (2004) for a group of twelve *Communauté Financière Africaine* (CFA) Franc Zone countries argued that the reason for this observed real depreciation effect of capital inflows lay in the fact that much of the additional foreign transfers to low-income SSA economies were conditional on policy reforms which were more strictly enforced in the past decade than hitherto. They also noted that an increasing proportion of development assistance to the SSA region had been directed to raising supply-side productivity through investment in infrastructure and social services. The inference is that the negative macroeconomic implications of the expected surge in external finance needed to meet the MDGs can be managed provided that a rising share of such capital inflows are rigorously monitored. Such should improve the competitiveness of private enterprise and reduce the cost of doing business in the SSA region in particular.

The pattern of aid allocation in recent years has supposedly changed in ways that epitomise donor willingness to increase disbursements in support of a higher level of public expenditure on poverty-reducing ventures in those states with a proven record of economic policy reform and good government. This suggests that the interaction of international capital inflows and economic liberalisation may be an important, hitherto omitted variable that affects the volume and extent of the inflationary impact of external finance on the real exchange rates of the poor countries with underdeveloped market systems and infrastructure. The question therefore arises as to the potency of different types of economic policy measures in shielding the real exchange rate from the potential appreciation pressure of the substantial external inflows needed to meet the MDGs. But despite a growing interest in this topic, there has been little empirical research to systematically analyse the importance of the interaction effects associated with international finance when the involvement of donor agencies simultaneously promotes policy and structural reforms in the recipient economies.

Consequently, the motivation for the econometric analysis in this paper is to examine the degree to which the real exchange rate adjustment mechanism is influenced by the correlation between aggregate net foreign capital inflows and structural reforms which commonly accompany international assistance to SSA countries. Following Athukorala and Rajapatirana (2003), the basic real exchange rate model outlined in the traditional Dutch-disease literature will here be extended to include a set of four interaction terms which measure the marginal effect of the relationship between annual changes in the share in GDP of total net external inflows and selected government response policy tools. The four types of policy-related variables used in generating our interaction terms are: (i) the liberalisation of trade controls as captured by the year-on-year movement in the sum of imports and exports relative to GDP, (ii) budgetary reforms as represented by annual changes in the share in GDP of government expenditure, (iii) financial sector management approximated by annual changes in aggregate net domestic credit relative to the preceding one year's real GDP and (iv) nominal exchange rate adjustments measured by yearly variations in the official domestic currency value of the US dollar.

The paper is set out as follows. Section 1 gives an overview of past movements in the real exchange rate and foreign capital inflows for the panel of twenty-four SSA countries given in Column 1 of Appendix Table 1 from 1978 to 2001. The choice of states was largely dictated by data availability, but it contains many of the major SSA economies (excluding South Africa and Nigeria) with a high dependence on a few primary-commodity exports. Section 2 describes the empirical framework and econometric technique to be used. Section 3 presents the estimation results. Section 4 tests their robustness. The concluding section summarises the main findings and draws some policy implications.

## **2. The Real Exchange Rate Trend and Foreign Capital Inflows**

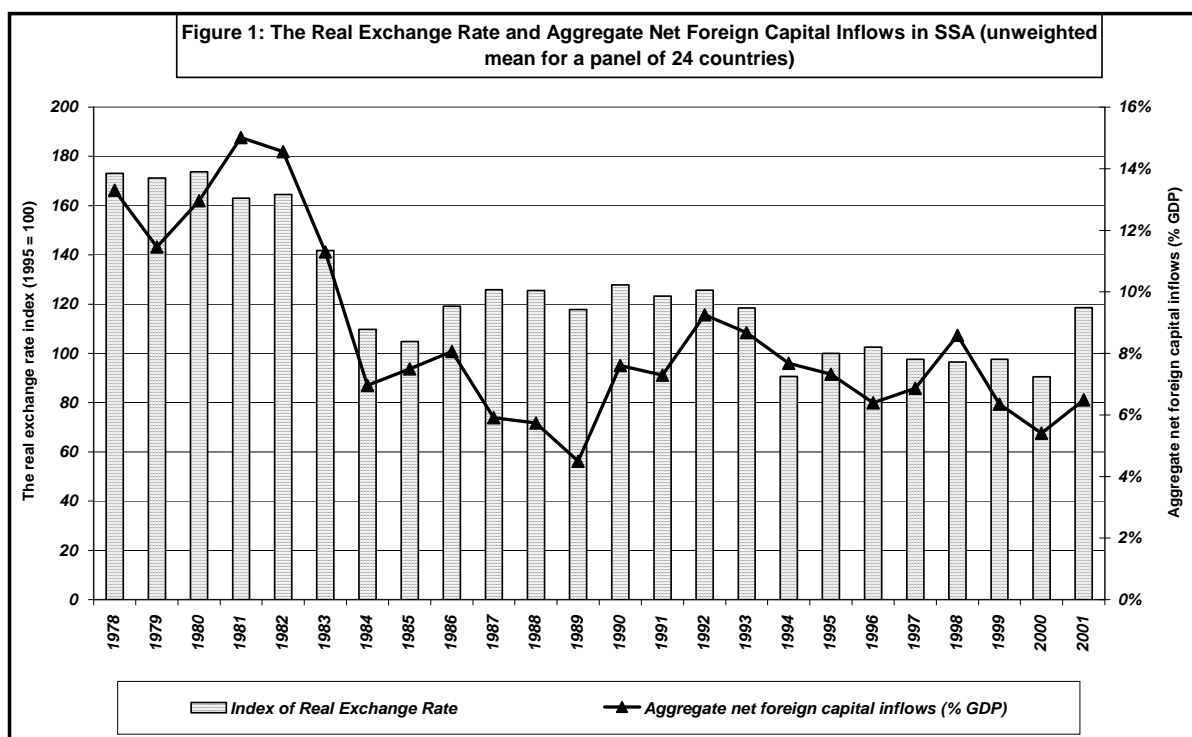
It is clear from the debate in the literature that the nature of the linkage between foreign capital transfers and real exchange rates can take a variety of interrelated forms. In this section, therefore, we provide a descriptive account of the trends and patterns of movement in real rates and total net external inflows for our panel of twenty-four SSA states as a whole from 1978 to 2001. Such a simple backward-looking approach should help us to gain an initial insight into whether or not additional net inflows induced Dutch-disease consequences in recipient SSA economies. This enquiry is important because of the current revival of emphasis on "scaling up" development assistance to help poor countries in general, and Africa in particular, in order to reach the Millennium Development Goals by 2015.

The bilateral real exchange rate index ( $RER_t$ ) is here defined as the ratio of the domestic price of non-tradables ( $P_N$ ) to tradables ( $P_T$ ) with a base value of 100 in the year 1995. Therefore, increases in the real rate variable represent an appreciation of the index, while decreases denote a depreciation in the domestic price of non-traded goods and services relative to tradables. However, in the absence of readily available price indices for traded and non-traded goods and services, the construction of empirical measures for the real exchange rate index poses a significant problems. Discussions on how to measure the real exchange rate index have generated little consensus. As a result, the real exchange rate variable has commonly been approximated by available domestic and world price indices and official currency exchange rates (see for example Edwards, 1988; Cottani *et al.*, 1990; Ghura and Grennes, 1993; Athukorala and Rajapatirana, 2003).

For our analysis here, we follow Edwards (1988) and the other researchers mentioned immediately above in utilising the United States producer price index ( $PPI$ ) as a proxy for the foreign price of tradables ( $P_T$ ). Our choice of this traded goods price index, as opposed to the price of imports of goods and non-factor services, also reflects a need to eliminate cross-country variations in import restrictions, including tariffs, export subsidies and international transport costs. Then too, the use of the US producer price implicit deflator enables us to capture the foreign competitive value of traded goods at the manufacturing site or farm gate, excluding the price of any non-tradable marketing, distribution and other final consumption services that are included in the data for consumer price indices (Betts and Kehoe, 2001). In measuring the domestic price of non-traded goods and services ( $P_N$ ), our preferred approximation is the gross domestic product (GDP) implicit deflator as opposed to the domestic consumer price index used in the aforementioned studies. The choice of the GDP deflator was made largely because of the ready availability of a long-enough time series data set for all the twenty-four SSA countries which we include in our sample. Then too, the GDP deflator provides a much broader, economy-wide coverage of output price fluctuations in low-income countries and is less susceptible to manipulation by government policy. It may therefore embody a less random measurement error compared to the consumer price index.

Figure 1 below depicts the trend in our estimated mean of the ratio of the GDP implicit deflator to the domestic price index of traded goods and services (hereafter referred to as the real exchange rate index) from 1978 to 2001. Additionally, we present on the right-hand vertical axis, the annual average of the ratio to GDP of aggregate net foreign capital inflows approximated by the current account balance, excluding net official capital grants. Each time period  $t$  in the graph represents the unweighted mean of these measures for the twenty-four SSA countries presented in Column 1 of Appendix Table 1.

In the period under consideration, the panel of SSA economies as a whole experienced an overall declining trend in their mean index of the real exchange rate and aggregate net capital transfers as a percentage of GDP. Starting with an initial value of 173.14 in 1978, the real exchange rate index declined consistently in the eight years to 1985. At this end date, it reached 104.76 (base index value of 100 in 1995). During the same period, the measure of aggregate capital inflows was almost cut in half from 13.30 percent of GDP to 7.49 percent. The general inference of the time series data in Figure 1 is that ratios of net external capital inflows to GDP of more than 8 percent were usually accompanied by a real rate index of greater than the base value of 100. Such an outcome anticipates a positive correlation between the two variables in the results of our econometric analysis in subsequent sections.



The underlying positive correlation, however, obscures a lot of disparities in the association between the index of the real exchange rate and that for net capital inflows from one year to another. For example, Figure 1 shows that the measure of total net foreign capital declined consistently in the second half of the 1980s from 6.96 percent of GDP in 1984 to a minimum of 4.50 percent in 1989. The real exchange rate index, on the other hand, moved in the opposite direction, rising from 109.78 to 117.79. The index of real exchange rates and the measure of external finance was therefore inversely correlated in the late 1980s. Interestingly, post 1982 to the early 1990s covers a period of debt crisis. It also corresponds to the time when most African countries maintained fixed exchange rate regimes which resulted in the overvaluation of their currencies in real terms. However, by the mid-1990s, many of our SSA states qualified for assistance under the Enhanced Highly Indebted Poor Countries (HIPC) Initiative and were offered additional foreign-grants-in-aid and debt relief conditional on a successful implementation of IMF-World Bank approved structural adjustment programs. The relatively low mean index of real exchange rates of less than the base value of 100 attained in 1994 to 2001 was presumably due to the fact that an increasing proportion of external assistance flows to the SSA region was made available to productivity-enhancing investment initiatives which were more rigorously monitored than in the earlier time periods.

One item of evidence of the restoration of internal and external competitiveness arising from structural adjustment programs with consequent real rate depreciation was the annual average rise in the share in GDP of exports of 2.17 percent over the period 1994 to 2001. This improvement in export performance followed from a decline of 2.11 percent observed in the previous sub-period 1986-1993. Likewise the share of savings in GDP which declined by 0.13 percent a year from 1986 to 1993, rose by 0.44 percent in the ensuing sub-period 1994 to 2001. Consequently, the ratio of gross domestic investment to GDP, with associated growth in per capita income across our sample of SSA economies, increased from a minus 1.19 percent and 1.11 percent a year

respectively from 1986 to 1993 to a plus 1.69 percent and 0.30 percent per annum from 1994 to 2001. It would appear that any neglect of the possible endogeneity between capital inflows and associated economic conditions would imply that inferences often made in the literature concerning the overall effects of aggregate net foreign resources on the index of the real exchange rates are potentially misleading. The characteristics of the econometric methods employed to deal with the issue of simultaneity bias in panel data models are discussed in the next section.

### 3. The Empirical Framework of the Real Exchange Rate Model

The discussion in this section is conducted under the following headings: (i) the basic real exchange rate model, (ii) the extended real exchange rate model and (iii) the potential sources of misspecification errors in panel data models.

#### 3.1. The Basic Real Exchange Rate Model

The determinants of an equilibrium real exchange rate that is compatible with the attainment of internal and external balances in SSA countries have been extensively discussed by Ghura and Grennes (1993), Nyoni (1998), Adenauer and Vagassky (1998), Sackey (2001) and Outtara and Strobl (2004) among others. All of these studies adopted the general reduced form regression equation proposed by Edwards (1988). An empirical counterpart of Edwards' baseline equation for the major determinants of bilateral real exchange rates for the *ith* Sub-Saharan African country in a given period *t* considered in this study is written as follows:

$$\begin{aligned} \Delta \text{Log}(RER_{it}) = & \beta_0 + \beta_1 \text{Log}(1 + NERFY_{it}) + \beta_2 \text{Log}(TRD_{it}) + \beta_3 \text{Log}(INVY_{it}) + \beta_4 \text{Log}(MXY_{it}) \\ & + \beta_5 \text{Log}(YPC_{it}) + \beta_6 \text{Log}(GCY_{it}) + \lambda \Delta \text{Log}(NDCY_{it}) - \delta \Delta \text{Log}(ERT_{it}) \\ & - \Theta \text{Log}(RER_{it-1}) + f_i + \varepsilon_{it} \dots \dots \dots (2.1) \end{aligned}$$

where  $\Delta$  is the first difference operator and  $RER_{it}$  is the empirical measure of the actual bilateral real exchange rate index for country *i* in a given period *t*. *NERFY* is the measure of *aggregate or total* net international capital inflows expressed as a percentage of gross domestic product. For the purpose of estimation, the aggregate net external capital series is expressed as the natural logarithm of one plus the variable in order to reduce the range of variation and surmount the problem associated with negative observations. The symbol *TRD* is the index of the external terms of trade; *INVY* is the ratio of gross domestic investment in GDP; *MXY* is the sum of imports and exports as a proportion of GDP; *YPC* is the growth in real per capita GDP used as a proxy for technological progress; *GCY* is government consumption expenditure as a percentage of GDP. The term  $\Delta \text{Log}(NDCY_{it})$  is the change in the natural log of the ratio of net domestic credit in nominal local currency to the previous year's GDP in constant 1995 local currency. The representation  $\Delta \text{Log}(ERT_{it})$  is the periodic change in the nominal or official exchange rate expressed as the price of one US dollar in domestic currency terms. Hence, increases in the  $\Delta \text{Log}(ERT_{it})$  variable correspond to a devaluation of the official exchange rate, while decreases denote appreciation in the nominal domestic currency value in terms of the US dollar. The term  $f_i$  is country-specific fixed effects;  $\varepsilon$  is the error term and the coefficients  $\beta_0$  and  $\beta_1$  to  $\beta_6$ ,  $\lambda$ ,  $\delta$

and  $\Theta$  are the parameters to be estimated. The nearer the value of the coefficient  $\Theta$  is to unity, the faster the real exchange rate adjusts towards its implied long-run equilibrium when shocked. The subscript  $i$  denotes the country index and  $t$  is the time period index <sup>1</sup>.

Theoretically, we anticipate a positive relationship between the measure of total net international transfers,  $NERFY$  and the real exchange rate. The rationale is that an inflow of foreign capital independent of policy initiatives raises the equilibrium real exchange rate by allowing aggregate expenditure on investment and consumption by the public and private sectors to exceed domestic income. This, in turn, generates additional demand for both traded and non-traded goods and services. The increased demand for non-tradables will put upward pressure on their prices *vis-à-vis* those of tradables which face a close to perfectly elastic supply in the world market. However, our descriptive analysis in section 1 suggests that the real exchange rate effect of the total net foreign inflow variable may be endogenous in its relationship with associated structural adjustment reforms. This implies that the exclusion of the marginal effect of interactions between aggregate net foreign capital inflows and economic policy conditions from the basic real exchange rate equation will bias estimates of the parameter coefficients obtained for all the other variables in the model.

### 3.2. The Extended Real Exchange Rate Model

The econometric analysis in this study attempts to solve the problem of omitted variable bias by extending the basic real exchange rate model in equation 2.1 to include additional interaction terms generated by multiplying the measure of total net foreign inflows with selected macro-economic policy variables. As was said, we envisage four main types of policy options for cushioning the real exchange rate against the Dutch-disease effects of potential capital inflows. They comprise: (i) a measure of international trade liberalisation as proxied by changes in the share in GDP of the sum of imports and exports, (ii) fiscal policy reform as represented by variations in the ratio of government consumption spending to GDP, (iii) financial sector management as approximated by fluctuations in the ratio of net domestic credit to the prior year's GDP and (iv) a measure of nominal exchange rate adjustments as captured by the yearly movements in the official local currency value of the US dollar. With variables defined as before, our extended real exchange rate function is specified as:

$$\begin{aligned} \Delta \text{Log}(RER_{it}) = & \beta_0 + \beta_1 \text{Log}(1 + NERFY_{it}) + \beta_2 \text{Log}(TRD_{it}) + \beta_3 \text{Log}(INVY_{it}) + \beta_4 \text{Log}(MXY_{it}) \\ & + \beta_5 \text{Log}(YPC_{it}) + \beta_6 \text{Log}(GKY_{it}) + \lambda \Delta \text{Log}(NDCY_{it}) - \delta \Delta \text{Log}(ERT_{it}) - \Theta \text{Log}(RER_{it-1}) \\ & + \eta_1 [(\Delta \text{Log}(MXY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] + \eta_2 [(\Delta \text{Log}(GKY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] \\ & + \eta_3 [(\Delta \text{Log}(NDCY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] + \eta_4 [(\Delta \text{Log}(ERT_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] \\ & + f_i + \varepsilon_{it} \dots \dots \dots (2.2) \end{aligned}$$

In the extended real exchange rate model, the coefficient  $\eta_1$  on the interaction of the yearly changes in the ratio of total net resource inflows to GDP  $[\Delta \text{Log}(1 + NERFY_{it})]$  with annual changes in external trade relative to GDP  $[\Delta \text{Log}(MXY_{it})]$  is expected to show a negative sign. This is because a boost in net external inflows, which is accompanied by a liberalisation of trade controls, including import tariffs and quotas, will improve access to markets abroad and augment the availability of foreign products in

<sup>1</sup> The definition of variables is given in Appendix Table 2.



the economy in line with the increased demand for them. Trade openness will also promote competition, raise the efficiency of resource allocation and enhance positive externalities arising from access to improved technology (Grossman and Helpman, 1991, Romer, 1990, Ghura and Hadjimichael, 1996). These developments, in turn, will lower the domestic price of tradables in relation to what it was before the restrictions on them were relaxed, particularly in severely indebted small-sized economies like Niger, Malawi and Rwanda where growth in aggregate production and demand expenditures have been constrained by insufficient foreign exchange earnings prior to the transfer of external resources. To the extent that the relatively cheaper foreign products can be substituted for local goods and services, the demand for, and price of non-tradables will fall causing the equilibrium real exchange rate to depreciate.

By contrast, interactions between the annual movements in the total net foreign inflow variable and government consumption expenditure in relation to GDP  $[\Delta \text{Log}(GCY_{it})]$  and net domestic credit relative to the preceding year's real GDP  $[\Delta \text{Log}(NDCY_{it})]$  are expected to be positively correlated with the real exchange rate. One plausible reason for these positive relationships is that an inflow of external capital which finances additional government recurrent expenditure will raise aggregate demand for both tradables and non-tradables. But as tradables are generally supplied under perfectly elastic world market conditions, their price will probably not rise much, if at all. The domestic price of non-tradables will however. This raises the real rate of exchange. Then too, foreign inflows which go into domestic banking systems will allow further credit creation. Again, this will increase the demand for non-tradables which are not perfectly elastic in their supply and so drive up their price *vis-à-vis* that for imports which are. The real rate of exchange will once again go up.

The sign on the partial correlation coefficient on the interaction between the total net foreign inflow variable and the local currency exchange rate against the US dollar  $[\Delta \text{Log}(ERT_{it})]$  is ambiguous. It follows that an inflow of foreign funds that is accompanied by a devaluation of the *nominal* exchange rate will raise the price of tradables expressed in domestic currency terms. The real exchange rate will depreciate by definition, other things being equal. However, the expected increase in the domestic currency value of tradables will lead to a switch in the expenditure pattern of government and households in favour of non-traded goods and services owing to their relatively lower domestic prices. Such will aggravate the inflationary pressures in the internal market, given that the upward shift in the demand for non-tradables is not fully matched by an increased supply in the short term, so appreciating the real exchange rate. In addition, if the cost of production of non-tradables rises as a consequence of the increased domestic price of its imported components, then the real exchange rate will further appreciate. Thus, we cannot determine *a priori* the expected value of the  $\eta_4$  on the indicators for nominal exchange rate policy interaction terms in equation 2.2.

### 3.3. The Potential Sources of Misspecification Errors in a Dynamic Panel Model

Specification error in econometric modelling is a collective term which covers any departure from the assumptions of the classical linear regression model. In the context of dynamic panel data models, researchers over the past decade have frequently considered five types of specification bias which may prejudice the estimates of parameter coefficients in equations 2.2 above. They comprise errors induced by the

presence of country-specific effects, cross correlation between residuals of different regression equations, country heterogeneity in panel data models, non-stationarity or unit roots in data and the joint endogeneity of the explanatory variables.

The formulation of our extended real exchange rate model in equation 2.2 shows the presence of country-specific effects  $f_i$ . The inclusion of these individual country effects  $f_i$  are generally designed to capture the effects of those omitted variables, as well as unobservable characteristics that are peculiar to the  $i$ th country and which are constant over time. The country-specific effect could be either an intercept that varies for each cross-sectional unit in the panel (i.e., fixed effect) or a random variable drawn from a common distribution with mean  $\mu$  and variance  $\sigma_\alpha^2$  (i.e., random effect). Depending on whether  $f_i$  is treated as fixed or random, panel data models are usually estimated using Fixed or Random Effects Estimators. The basic problem for these Estimators is that they require strict exogeneity of the regressors with respect to the error-term  $\varepsilon_{it}$ . Consequently, if any of the right hand side variables at a given time period  $t$  are correlated with the error-term, then the Fixed Effect or Random Effect Estimators are inconsistent.

To provide a consistent estimation of dynamic panel data models, we have followed Anderson and Hsiao (1981), Attanasio *et al.* (2000), Hansen and Tarp (2000) and Carkovic and Levine (2002) in removing country-specific effects  $f_i$  by taking the first difference of our extended regression specification. Besides, differencing the regression model makes it possible to address the problem of non-stationarity or unit roots in data (Maukherjee *et al.*, 1998). Equation 2.3 below gives the resulting model used in our empirical analysis of the importance of economic policy conditions for the relationship between foreign capital and the real exchange rate.

$$\begin{aligned} \Delta \text{Log}(RER_{it}) = & \beta_0 + \beta_1 \Delta \text{Log}(1 + NERFY_{it}) + \beta_2 \Delta \text{Log}(TRD_{it}) + \beta_3 \Delta \text{Log}(INVY_{it}) + \beta_4 \Delta \text{Log}(MXY_{it}) \\ & + \beta_5 \Delta \text{Log}(YPC_{it}) + \beta_6 \Delta \text{Log}(GCY_{it}) + \lambda \Delta \text{Log}(NDCY_{it}) - \delta \Delta \text{Log}(ERT_{it}) - \Theta \Delta \text{Log}(RER_{it-1}) \\ & + \eta_1 [(\Delta \text{Log}(MXY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] + \eta_2 [(\Delta \text{Log}(GCY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] \\ & + \eta_3 [(\Delta \text{Log}(NDCY_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] + \eta_4 [(\Delta \text{Log}(ERT_{it})) * (\Delta \text{Log}(1 + NERFY_{it}))] \\ & + \varepsilon_{it} - \varepsilon_{it-1} \dots \dots \dots (2.3) \end{aligned}$$

But the new differenced residual-term  $\varepsilon_{it} - \varepsilon_{it-1}$  in equation 2.3 is, by construction, correlated with real exchange rate annual changes lagged one period. Then too, some regressors may be jointly endogenous with the dependent variable (i.e., real exchange rate yearly changes) despite the assumption of strict exogeneity presumed by classical regression estimators. Earlier researchers, Maukherjee *et al.*, (1998), Hansen and Tarp (2000), Carkovic and Levine (2002), recommended the use of an Instrumental Variable (IV) and Two-Stage-Least Squares (2SLS) estimators in dealing with the possible simultaneity of the explanatory variables and the problem of correlation between the lagged dependent variable and the new differenced error term  $\varepsilon_{it} - \varepsilon_{it-1}$ .

Another commonly observed source of specification bias in dynamic panel data models is that the error terms from the different regression equations may be correlated and that the estimated magnitude of parameter coefficients may not be equal among cross-sectional units in the panel study (Maukherjee *et al.*, 1998; Attanasio *et al.*, 2000; Santos-Paulino, 2002; Hsiao 2003). These authors found that pooled regressions, which disregard cross-equation error correlation and parameter heterogeneity in the model

specification, could lead to inconsistent estimates of the slope coefficients of the explanatory variables of interest. One example of an econometric approach suitable for the analysis of cross-sectional residual autocorrelation and parameter heterogeneity is the Three-Stage Least Squares (3SLS) estimator. The 3SLS method allows the error-term of each cross-section unit in the panel data regression model to be freely correlated across and within regression equations. The characteristics of the 3SLS method are similar to those of the Seeming Unrelated Regression Estimator (SURE), except that the residual used in the estimation of a feasible Generalised Least Squares (GLS) is obtained from a 2SLS regression specification. It is this feature which makes the 3SLS estimator appropriate for analysing data observed for a comparatively large number of periods and for a relatively small number of countries (Maukherjee *et al.*, 1998).

The next section presents the results of our 3SLS estimation procedure which corrects for the various sources of misspecification bias outlined in this sub-section. The instruments used in our 3SLS estimation procedure are the explanatory variables of the regression models lagged two periods. Interestingly, the magnitude of the coefficient estimates obtained using the 3SLS estimator is not significantly different from those of an ordinary 2SLS method. However, the fact that the t-statistics obtained from the 3SLS regressions were frequently larger, with correspondingly lower standard errors compared to those from 2SLS equations, suggests that the former is the more efficient technique for analysing our sample of study. Such a discrepancy between the 3SLS and 2SLS estimates emphasises the relative importance of correcting for the misspecification bias caused by cross equation residual correlation for the efficiency of our estimated partial regression coefficients. These autocorrelated error terms may arise from the fact that a random event which affect one SSA country, say a decline in the world price of cocoa for Côte d'Ivoire and Ghana, may affect earnings from livestock exports, migrant remittances and other forms of external financial inflows for neighbouring countries like Burkina Faso. Then too, civil strife in Rwanda in the 1990s profoundly affected the Congo Democratic Republic, Tanzania, Burundi and Uganda.

#### **4. The Extended Real Exchange Rate Model: Empirical Results**

Table 1 summarises the results of our 3SLS regressions using pooled cross-sectional annual time series data for our twenty-four SSA countries from 1978 to 2001. The regressions were performed using EViews Version 3.1. Regression 1 reports results for the basic (or restricted) real exchange rate model. It shows that an increase in total net external inflows by one percent of GDP in a current year  $t$  was significantly correlated with an increase of 0.06 percent in the real exchange rate in both the short- and long-term when all other independent variables were held constant. The estimated positive impact of foreign capital inflows on the real exchange rate is consistent with the conventional Dutch disease theory. Even so, there is substantial evidence in the literature to suggest that the marginal effect of external finance on *relative* domestic price changes will be biased by the omission of the interaction effect of the set of economic policy interventions that come with them.

The main objective of this section, therefore, is to test the null hypothesis that the relationship between total net international inflows and the real exchange rate is significantly influenced by the nature of an accompanying economic policy stance. Specifically, we examine whether the expected real appreciation effect of capital inflows obtained for the *restricted* regression is robust with respect to our choice of four foreign capital-policy interaction terms used as additional control variables in the *extended (or unrestricted)* models. These interaction terms are first added separately as further explanatory variables in regressions 2 to 5. Following Athukorala and Rajapatirana (2003), the four interaction variables are then considered simultaneously in regression 6.

Differentiation of each extended regression with respect to the external finance variable will yield the implied overall marginal impact (derivative) of such transfers on the real exchange rate in the short term.

**Table 1: Estimates of the Real Exchange Rate Model (1978 to 2001)**

Dependent variable: The change in the natural log of the bilateral real exchange rate index (with base year equal to 100 in 1995)

Mean of dependent variable: -2.29%

Number of observations: 576

Estimation method: Three-Stage Least Squares (3SLS)

<i>Independent (x) variables</i>	<i>Mean values</i>	<i>Reg. 1</i>	<i>Reg.2</i>	<i>Reg.3</i>	<i>Reg.4</i>	<i>Reg.5</i>	<i>Reg.6</i>	<i>Reg.7</i>	<i>Reg.8</i>
Constant	1.000	<b>-0.01</b> [-19.27]	<b>-0.01</b> [-22.70]	<b>-0.04</b> [-16.00]	<b>-0.01</b> [-14.00]	<b>-0.01</b> [-10.52]	<b>-0.01</b> [-13.35]	<b>0.02</b> [-12.06]	<b>-0.03</b> [-2.63]
DLNERFY	-0.11%	<b>0.06</b> [54.57]	<b>0.04</b> [6.22]	<b>0.08</b> [8.09]	<b>0.06</b> [8.30]	<b>0.11</b> [15.11]	<b>0.03</b> [11.87]	0.10 [1.66]	<b>-0.31</b> [-4.96]
DLTRD	-1.43%	<b>0.02</b> [19.12]	<b>0.01</b> [7.38]	<b>0.01</b> [2.03]	<b>0.04</b> [14.12]	<b>0.02</b> [7.58]	<b>0.01</b> [8.78]	<b>0.19</b> [5.26]	0.02 [0.85]
DLINVY	-0.67%	<b>-0.01</b> [-30.31]	<b>-0.01</b> [-3.22]	<b>0.00</b> [1.66]	<b>0.01</b> [3.86]	<b>-0.01</b> [-6.37]	<b>0.02</b> [33.99]	0.03 [1.46]	0.00 [0.11]
DLMXY	0.47%	<b>-0.32</b> [-65.12]	<b>-0.37</b> [-11.08]	<b>0.27</b> [62.22]	<b>-0.34</b> [-9.43]	<b>-0.34</b> [-19.70]	<b>-0.36</b> [-26.42]	<b>-0.35</b> [-11.12]	<b>-0.15</b> [-4.82]
DLYPC	-0.23%	<b>-0.18</b> [-18.88]	<b>-0.24</b> [-23.06]	<b>0.15</b> [-12.17]	<b>-0.18</b> [-17.42]	<b>-0.28</b> [-28.98]	<b>-0.32</b> [-15.23]	<b>-0.20</b> [-2.74]	<b>-0.19</b> [-2.72]
DLGCY	-1.11%	<b>-0.15</b> [-36.73]	<b>-0.16</b> [-7.98]	<b>0.13</b> [-41.16]	<b>-0.16</b> [-12.51]	<b>-0.15</b> [-6.50]	<b>-0.15</b> [-16.63]	-0.04 [-1.36]	<b>-0.12</b> [-5.84]
DLNDCY	5.27%	<b>0.27</b> [6.73]	<b>0.22</b> [6.04]	<b>0.26</b> [28.88]	<b>0.20</b> [4.52]	<b>0.23</b> [9.08]	<b>0.17</b> [6.21]	<b>0.04</b> [2.28]	<b>0.34</b> [8.92]
DLERT	14.81%	<b>-0.25</b> [-19.05]	<b>-0.23</b> [10.88]	<b>0.26</b> [-6.76]	<b>-0.21</b> [-7.05]	<b>-0.22</b> [-9.78]	<b>-0.21</b> [-16.91]	<b>-0.51</b> [-17.75]	<b>-0.30</b> [-11.75]
DLRERL1	-2.21%	<b>0.11</b> [26.02]	<b>0.10</b> [33.00]	<b>0.03</b> [5.61]	<b>0.12</b> [27.81]	<b>0.04</b> [13.30]	<b>0.06</b> [55.75]	-0.01 [-0.27]	<b>0.07</b> [2.08]

TIME		<b>0.001</b>	<b>.001</b>	<b>.002</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	0.001	<b>0.003</b>
		[4.83]	[7.81]	[8.30]	[15.96]	[12.05]	[13.07]	[0.78]	[3.64]
DLNERFY* DLMXY	0.39%	.....	<b>-0.17</b> [-5.62]	.....	.....	.....	<b>-0.36</b> [-28.52]	<b>-1.06</b> [-3.09]	-0.21 [-0.59]
DLNERFY* DLGCV	0.17%	.....	.....	<b>0.73</b> [11.93]	.....	.....	<b>0.63</b> [14.27]	0.42 [1.21]	<b>0.74</b> [2.63]
DLNERFY* DLNDCY	0.11%	.....	.....	.....	<b>-0.54</b> [5.77]	.....	<b>-0.33</b> [-7.62]	0.05 [0.26]	0.16 [0.24]
DLNERFY* DLERT	-0.04%	.....	.....	.....	.....	<b>-0.60</b> [25.60]	0.05 [6.95]	1.03 [2.62]	0.14 [0.49]
<b>Short-term effect of DLNERFY</b>	...	.....	0.03	0.07	0.03	0.02	0.01	0.20	-0.29
<b>Long-run effect of DLNERFY</b>	.....	.....	0.04	0.08	0.04	0.03	0.01	0.02	-0.31
<b>Wald test (p-value)</b>	.....	.....	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

Notes:

1. Definitions of variables and list of countries are given in Appendix Tables 1 and 2 respectively.
2. The numbers in [...] are t-statistics
3. The estimated coefficients in bold italics are significant at the five percent confidence level.
4. Long-run effects are calculated as the estimated short-term effect divided by one minus the coefficient on the lagged real exchange rate variable
5. The notation DL before a variable series corresponds to  $\Delta Log$  in the regression equations 2.1 to 2.3 in the text.

Further, we compute the implied long-run effects associated with our estimates of the derivative of the real exchange rate with respect to foreign capital together with the probability values of a Wald coefficient restriction tests that all of the coefficients on the interaction terms are jointly equal to zero. For example, the reported probability value of the Chi-square distribution, with four degrees of freedom for regression 6 indicates that the four interaction variables as a group have played a significant part in determining the dynamics of the real exchange rate adjustment process in the twenty-four SSA states. But however interesting, these results, and the policy conclusions drawn from them, should be interpreted with caution given the annual time series dimension of our reduced form panel data model. Besides, our explanations in the following paragraphs are based on an informed, but speculative filigree of cause and effect. They may, or may not trace what actually happened. Nevertheless, the subject is an important one and speculation with respect to the real exchange rate effect of capital inflows and associated economic policy conditions is unavoidable.

For brevity, our discussion here will be confined to the comparison of the sign, magnitude and statistical significance of the coefficients on the autonomous total net

capital inflows ( $\beta_1$ ) and its interactions with the external trade ( $\eta_1$ ), government expenditure ( $\eta_2$ ), excess domestic credit ( $\eta_3$ ) and nominal devaluation variables ( $\eta_4$ ) in regressions 2 to 6 in Table 1. The partial regression coefficients on the interaction terms is interpreted as the expected percentage difference between the real exchange rate effect of capital inflows in countries that successfully implement the specific economic policy condition allied to such inflows and in those that did not, with all other explanatory variables held constant. For example, based on the estimated equation in regression 6, the coefficient on the capital inflows-trade interaction variable ( $\eta_1$ ) implies that the expected increase in the real exchange rate resulting from a one-percentage-point increase in the ratio of aggregate net foreign capital inflows to GDP is lower by 0.36 percent a year, on average, in those SSA economies that complied with the trade liberalisation policy conditions which accompanied such inflows than it is in those states that did not, with the mean values of the other independent variables held constant. The interpretation for other correlation coefficients on the interaction of capital with government expenditure ( $\eta_2$ ), excess domestic credit ( $\eta_3$ ) and nominal devaluation variables ( $\eta_4$ ) is precisely the same as it is with external trade ( $\eta_1$ ).

The estimates in regressions 2 to 6 indicate that the coefficient on the autonomous total net inflow variable ( $\beta_1$ ) still bears the theoretically expected positive sign, significant at the five percent confidence level, and that their magnitude was highly sensitive to the associated economic policy conditions. The expected real appreciation effect of aggregate net capital inflows ranged from a low of 0.03 percent in regression 6 to a high of 0.11 percent in regression 5. Therefore, a doubling in the share of total net external transfers in GDP is expected to raise the mean real exchange rate for our group of SSA countries by between 3 and 11 percent a year, depending on the economic conditions attached to such flows. We may note, however, that the absolute value of the coefficient on the independent capital inflow variable in regression 6 was cut by half with the joint addition of the four interaction terms compared to that obtained in the *restricted* regression 1. The inference is that the real appreciation effect of an increase in capital inflows alone was significantly muted in those countries where the set of associated structural adjustment reforms was successfully executed. Such gives added support to the view shared by the originators of the MDGs that the negative macroeconomic implications of an increased assistance flows to poor countries can be contained with appropriate policy tools allied to such external transfers (UNDP, 2005). With the regression equation holding constant the share in GDP of imports plus exports, gross domestic investment and government expenditure, we may surmise from the national accounting identity that this equilibration mechanism would operate through reduced private consumption payments on imports such as food and/or the increase in exports that regularly go with successful structural adjustment programmes.

We now turn to the capital inflow-policy interaction terms. The estimated coefficient ( $\eta_1$ ) on the interaction between the measure of annual changes in net resource inflows and the foreign trade openness variable ( $DLNERFY * DLMXY$ ) bears the expected negative sign in both regressions 2 and 6. This is despite the fact the coefficient on the autonomous foreign capital inflow variable remained significantly positive. Estimates from both regression equations indicated that an increase of one percent of GDP in foreign capital inflows by itself was related a rise in the real exchange rate of around 0.03 percent per annum, on average, for our group of SSA countries as a whole. However, this expected real appreciation effect was cut by 0.36 percent in those economies where trade liberalisation policies allied to such inflows were applied. This

outcome was probably related to the fact that initiatives to reduce trade and exchange rate controls in many SSA countries, particularly in the 1990s, were supported by additional assistance flows from the sponsors of the HIPC Program. Any resulting increase in the availability of imported goods and services in these severely indebted poor countries appears to have significantly contributed to a lowering of domestic inflationary pressure. From a supply perspective, if the relatively cheaper imported machinery, spare parts and other production inputs were used to expand the production of non-tradables, the price of these would fall, implying a real depreciation. Regression 6 shows that this expected real depreciation effect of the interaction between capital inflows and international trade openness is robust with respect to the addition of other economic policy conditions which often accompany increased development assistance to the SSA region.

Likewise the interaction between changes in total net inflows with the measure of domestic credit expansion ( $DLNERFY * DLNDCY$ ) shows a relatively large and statistically significant negative coefficient in both regressions 4 and 6. For example, estimates from regression 6 indicate that the expected real appreciation effect of foreign capital was lower by 0.33 percent in those SSA countries where such inflows financed an expansion of aggregate net domestic credit compared to the 0.03 percent a year reported for our average SSA country where it did not. This outcome is unexpected given that foreign funds which facilitate the expansion of net domestic credit intensify inflationary pressures in the internal market and, other things being equal, leads to an appreciation in the *relative* domestic price of non-tradables. Nevertheless, we may surmise that the estimated negative coefficient on the capital inflow-domestic credit interaction term is related to the fact that financial sector liberalisation policies allied to increased development assistance flows led to a relaxation of credit rationing in the private sector. This is particularly the case in those highly indebted poor countries where private production activities were constrained by insufficient finance prior to the transfer of the external resources. Under these circumstances, an expansion in net domestic credit induced by an increase in capital inflows may well have allowed private enterprises, including small and medium scale firms producing non-tradables, to import raw materials, intermediate goods and services, spare parts and capital machinery hitherto denied to them. Any consequent increase in their capacity utilisation with an associated increase in the supply of goods and services would lower the domestic price of non-tradables in relation to what it was before the problems of domestic credit availability were resolved. Such an expected negative interaction effect of external finance and domestic credit augurs well for aid-supported microfinance initiatives in low-income primary-exporting SSA countries where their impact on the real exchange rate is concerned.

The partial correlation coefficient on the capital inflow-government expenditure interaction variable ( $DLNERFY * DLGKY$ ) has the anticipated positive coefficient, despite the real depreciation effect of minus 0.15 obtained for the public expenditure variable ( $DLGKY$ ) alone. The relatively large real appreciation effect of more than 0.50 reported for this interaction variable demonstrates the importance of fiscal discipline in protecting the *relative* domestic price changes from the inflationary pressures created by large net capital inflows. Our point estimates in regressions 3 and 6 suggest that for a given one percent of GDP increase in capital inflows, expected real exchange rate appreciation is higher by between 0.63 to 0.73 percent a year in countries where such inflows financed a growing budget deficit than in those where it did not. This outcome may be explained by the fact that a rise in public expenditure funded by greater foreign development assistance will normally raise the proportion of spending on public service

provision including health, education, water and sanitation not to mention the military and police. This will add to the demand for labour, including teachers, nurses, doctors, repair workers and other non-tradable components of aggregate production and it will raise its cost *vis-à-vis* those of foreign products which are highly elastic in their supply. However, to the degree that the supply of non-traded goods and services increases with the improvement in local infrastructure and human capital, any such potential rise in their prices could be mitigated or even reversed in the long-term.

In line with our definition for the bilateral real exchange rate measure outlined in section 1, a significant negative coefficient was obtained in regression 5 for the autonomous nominal devaluation variable and for its interaction with changes in the share in GDP of total net resource inflows ( $DLNERFY * DLERT$ ). The relatively large real depreciation effect observed for this interaction term reflects the general observation that much of the capital inflow to SSA countries, particularly since the early 1990s, occurred at a time when most governments decisively reformed their exchange rate regimes. Estimates in regression 5 indicate that the expected real appreciation pressures in those countries where capital inflows were associated with nominal devaluation as the only policy condition were lower by 0.60 percent than in our typical SSA state where they were not. However, in regression 6, which accounts for the interaction effects of our other three policy reform conditions, the sign for the coefficient on the capital inflow–nominal devaluation variable reverts to a positive 0.05. It would seem that discretionary local currency depreciation as part of an adjustment reform package imposed by international donors has, on average, led to a greater real appreciation in the compliant recipient countries. A plausible explanation is related to the fact that nominal devaluation would usually lead to an increase in export earnings. A corresponding rise in aggregate demand expenditures therefrom will typically exacerbate the inflationary pressures on non-tradables which are inelastic in their supply, at least in the short term. Then too, the quantity of imports will also rise with the additions in external flows resulting from enhanced export receipts and the initial transfer of foreign capital. The increased availability of imported goods and services could remove the previous scarcity premia on them and hence lower their domestic prices compared to what they were before the nominal depreciation. The positive coefficient on the capital inflow–nominal devaluation interaction term leads us to suppose that any such resulting fall in the scarcity premium price of imports in the domestic market more than offset the impact of earlier devaluation on the unit price of these imports *cif*. The overall result could then be a net rise in the bilateral real exchange rate.

The extended regressions 2 through 6 were differentiated with respect to the capital inflow term ( $DLNERFY$ ) and mean values are applied to the relevant interaction variables. The resulting derivative indicates that an increase in total net external transfers by one percent of GDP is expected to lead to a real appreciation of between 0.01 percent to 0.08 a year for our group of twenty-four SSA economies as a whole in the long term. This would be in spite of the significant negative coefficient on the interaction of capital inflow with trade openness and the net domestic credit variables. The implied overall positive effect in regression 6 is nevertheless slight, with a doubling in the mean ratio of total net capital inflows to GDP leading on average to a mere 1 percent increase in the real exchange rate. This outcome suggests that the substantial foreign capital inflows projected by the donor agencies as necessary for reaching the MDGs in SSA by 2015 need not exert the considerable Dutch-disease effect which would harm the export sector and lower domestic savings therefrom.



## 5. The Extended Real Exchange Rate Regression Model: A Robustness

### Test

The results of our extended real exchange rate model presented in regressions 1 to 6 in Table 1 may be sensitive to the choice of countries included in the econometric analysis. To address this problem, regression 6 which represents the complete real exchange rate model given in equation 2.3 was re-estimated for two sub-samples of our SSA economies using the 3SLS method. The first sub-sample consisted of the eleven “good and potentially emerging” SSA economies listed in Column 2 of Appendix Table 1 and the second comprised the sample of thirteen unreformed SSA countries presented in Column 3. This classification is based on the Commission for Africa (2000) categorisation of SSA states on the basis of a composite indicator constructed from a set of five macroeconomic and structural policy variables, seven variables for economic performance and two indicators of internal and external conflict. It is interesting to note that more than half of the potentially emerging SSA countries belong to the CFA zone. The main findings of our estimation results in regression 7 for the emerging SSA countries and in regression 8 for the unreformed states may be summarised as follows:

*First*, the effect of the annual change in the ratio to GDP of autonomous foreign capital inflows on the real exchange rate is sensitive to our choice of country. Although the estimated coefficient on the capital inflow variable ( $\beta_1$ ) in regression 7 is still positive, its size is greater than reported in regression 6 and it is no longer significant at the conventional five percent level. By contrast, the expected impact of an inflow of external capital alone on the real exchange rate in regression 8 is now negative and its absolute value is almost ten times higher than the partial correlation coefficient in regression 6. An increase of one-percentage-point in the ratio of foreign capital inflows to GDP by itself is expected to lower the real exchange rate by 0.31 percent in the group of unreformed countries, instead of the 0.03 percent appreciation estimated earlier in regression 6 for our full sample of twenty-four economies.

Possible explanations for why net inflows of foreign capital do not raise domestic price levels *vis-à-vis* those for foreign imports as much as was supposed under the basic Dutch-disease theory may include the fact that such external assistance flows are positively related to capital flight Ndikumana and Boyce (2003). They found that roughly 80 cents of every dollar of net official development aid inflows for their sample of thirty SSA countries flowed back as capital flight in the same year. Then too, some lines of official development assistance may be left in foreign reserves and spent on imports and debt service payments directly without ever entering the country concerned. They may never be exchanged for domestic currency in the interim between the granting of foreign aid and its expenditure on imports and debt service. Certainly, an UNCTAD publication in 2000 commented that around 38 percent of net international capital transfers to the SSA region was absorbed by various offsetting financial transactions such as the additions to foreign exchange reserves intended as a safeguard against a sudden discontinuation of capital inflows and speculative attacks on their currencies. Such can help avoid nominal exchange rate appreciation and is likely to lead to a lower than otherwise increase in the domestic money supply and concomitant inflationary pressures.

In addition, the unexpected negative reaction of the real exchange rate to increased capital inflows suggests that an acute shortage of foreign exchange characterised economic activity in these unreformed states over the twenty-four years of our empirical study. Thus, by making more real resources available, an augmentation of inflows may

well have enhanced capacity utilisation with an associated increase in the supply of output therefrom, which, in turn, lessened domestic inflationary pressures. But if a boost in external funding to these countries in the future is to be accompanied by a substantial increase in their marginal propensities to import, then it will also be necessary for them to achieve a corresponding rise in export earnings to pay for these expenditures. From this perspective, it is clear that more generous international development assistance for unreformed African economies cannot by itself compensate for the lack of good economic policy and institutional change which will be conducive to their export expansion.

*Second*, the direction of the effect of the policy interaction variables is unchanged in regressions 6 to 8, although the magnitude and statistical significance of the coefficients differ substantially across the sample of reforming and unreformed SSA economies. For example, the partial correlation coefficients on the capital inflow-government expenditure interaction term is statistically insignificant for the group of good and emerging SSA states in regression 7 compared to the significant figure of plus 0.74 obtained for the unreformed economies in regression 8. The greater real appreciation effect of foreign capital inflows with an associated increase in public sector spending is a demonstration that governments in the unreformed SSA states channelled their demands towards non-tradables because of the scarcity and consequent high price of foreign goods and services. This finding contradicts the claim which is often made that aid to African economies was often tied to imports from the donor countries.

*Third*, the significant negative interaction effect of capital inflows with an accompanying trade liberalisation policy for the reforming states in regression 7 is a little more than unity compared to the 0.36 reported for our sample of SSA states as a whole in regression 6. This again emphasises the positive role played by increased imports in promoting competition and channeling aggregate demand expenditures away from non-traded items. The removal of trade controls also diverts productive resources away from rent-seeking activities and augments real investment in, and the production of goods which embody imported components.

*Fourth*, the expected real appreciation effect of foreign capital inflows is higher by 1.03 in those "good and emerging" countries that experienced a nominal devaluation of their local currencies compared to the average of 0.05 reported for our typical SSA state in regression 6. The almost one-to-one relationship observed in the better functioning economies corresponds to the strict application of the bilateral real exchange rate formula, suggesting that compliance with nominal exchange rate management policy conditions by SSA countries will be an important instrument for correcting misalignment in their real currency rates in the short-term. It would appear that a fulfilment of our four selected structural adjustment conditions would be important in enhancing economic incentives and improving the allocation of resources across different sectors of the economy. Another characteristic of countries with a good economic environment is the lack of the premium between prices and marginal costs which typically arises from distorting trade controls and inflexible exchange rate systems.

Overall, the econometric results reported in regressions 7 and 8 suggest, rather surprisingly, that the effect of complying concurrently with our four designated economic policy conditions is to appreciate the relative price of no-tradables. The derivative of the real rate with respect to an increase of a one-percentage-point in capital inflows to GDP ratio is plus 0.20 percent over the short to long-term horizon for the African Commission's sample of "good and potentially emerging" SSA economies. The comparable figure for the unreformed SSA economies is minus 0.29 in the short term, rising somewhat to 0.31 over the longer term.

## 6. Conclusions and Policy Recommendations

The impact of foreign capital inflows on the real exchange rates of underdeveloped economies has been widely investigated in a number of recent studies. This paper has contributed to this literature by addressing the problem of the omitted variable bias inherent in many of these earlier empirical findings. It has extended the basic real exchange rate regression model to include four foreign capital inflow-economic policy interaction terms as additional control variables. While effective management of the real exchange rate on its own is not sufficient for achieving a high and sustained improvement in living standards, it is an important determinant of growth in export earnings and domestic savings therefrom. On the whole, the main findings of our extended 3SLS regressions may be summarised as follows:

*First*, there is evidence that an autonomous increase in external assistance flows will appreciate the real exchange rate in our twenty-four primary-commodity exporting SSA states taken together. The result of an extended model that considered simultaneously four interaction variables revealed that a one-percentage-point increase in the ratio to GDP of aggregate net capital inflow by itself raises their mean real exchange rate by 0.03 percent a year. This finding is consistent with the supposition by Adenauer and Vagassky (1998) of a significant positive relationship between net official foreign aid inflows and real exchange rate behaviour for four CFA Franc countries, Burkina Faso, Côte d'Ivoire, Senegal and Togo, from 1980 to 1993. In the case of our twenty-four SSA states, however, this positive effect was counterbalanced when the transfer of foreign currency was accompanied by policies to liberalise international trade controls and relax credit rationing in the private sector.

*Second*, the estimated impact of capital inflows on *relative* domestic prices was sensitive to sample selection and the choice of additional policy-related interaction terms used as control variables. For example, an inflow of exogenous external finance very significantly appreciated the real exchange rate in a group of reforming SSA states as opposed to the real depreciation reported for the unreformed economies. A partial explanation for the unexpected real rate depreciation may have arisen from a diversion of demand away from non-tradables and towards the foreign goods and services which are now more widely available and also highly elastic in their supply. Besides, investment good imports increase capacity utilisation and associated aggregate production where spare parts and material inputs have hitherto been unavailable. Then too, capital inflows, such as foreign direct investment, improve access to embodied and disembodied technology and so enhance the efficiency of domestic productive resources. These interrelationships may have been imperfectly captured by the policy-related variables employed in our econometric analysis and a real rate depreciation would then appear to have been induced by a rise in the availability of foreign funds.

*Third*, the feasibility of the proposed Millennium Development Goals in our unreformed SSA states, in particular depends to a great extent on the ability of their governments to persist with the implementation of appropriate fiscal policy prescriptions allied to capital inflows. Such budgetary adjustments may relate to the re-structuring and downsizing of the civil service, de-regulation of prices, privatisation and cuts in public enterprise subsidies. Fiscal imbalances can also be corrected by implementing policies to raise revenue receipts. A key area for action is to reduce the evasion and avoidance of sales and income taxes, to broaden the tax base and to improve its administration. Besides, many SSA states are characterised by a proliferation of tax rates and exemptions. A potential source of increased revenue for the government therefore is to rationalise the tax system and to introduce value added taxes to replace the more distortionary sales

taxes on a range of products. Donors, for their part, should support the efforts of SSA governments to collect business and corporate taxes from foreign multinationals and their employees operating in their countries, many of which are headquartered in the donor countries.

It is the foregoing features of the macro-economic disequilibrium adjustment mechanism, and not the simply Dutch-disease hypothesis, that should be the main focus of any theory on the impact of foreign capital inflows on real exchange rate behaviour in Sub-Saharan Africa.

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