

Paper no. **02/2010**

## **Remittances and Reverse Flows in Developing Countries**

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### **Abstract**

*This paper departs from the assumption prevalent in existing empirical literature that remittances are used either to increase consumption or to increase investment in developing countries. Instead, the present investigation demonstrates that a significant portion of remittances is no longer available for domestic resource mobilization when they are used for debt servicing, capital flight, or reserve accumulation (reverse flows). Empirical results obtained by employing Pooled Mean Group (PMG) approach on a panel of 36 developing countries over the period 1980 to 2006 finds that a one per cent increase in the rate of remittance flows increased the rate of consumption by roughly 0.8%, and had no statistically discernable effect on the rate of investment. These results also indicate that approximately 20% to 27% of remittance flows have been diverted to finance reverse flows. Moreover, changes in the rate of remittance flows tended to be positively correlated with changes in debt service payment-to-income ratios and the rate of reserve accumulation relative to income.*

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### **JEL Classification**

F 24; E 21; E 22

### **Key Words**

Remittances, reverse flows, consumption, investment

# Remittances and Reverse Flows in Developing Countries<sup>1</sup>

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## I. Introduction

The role of remittances has been of increasing interest to researchers and policymakers over the last decade. This is not surprising in light of the fact that recorded remittance flows to developing countries doubled in the five years after 2000, and continued to increase through 2008 despite the challenges to the global economy in that year. Remittance flows to developing countries reached \$328 billion in 2008—15% higher than the 2007 amount of \$281 billion.<sup>2</sup>

A large part of the motivation for much of the recent research has been the possibility that these large and increasing remittance flows could potentially become an important tool for economic development. A better understanding of the motivation and effect of these flows would make for better policy formulation in finding ways to channel more remittance flows into productive investment.<sup>3</sup> Research questions have thus centred on the allocation of remittance receipts within the domestic economy.<sup>4</sup>

From a macroeconomic perspective, it is widely accepted in the existing literature that remittances generate output growth either by increasing consumption or by increasing investment.<sup>5</sup> Beyond the consumption/investment choice, academicians and policymakers in recent years have been suggesting a third destination of remittances—reverse flows. It has been suggested that remittance flows allow developing countries to maintain adequate foreign reserves<sup>6</sup>, service debt<sup>7</sup> and finance capital flight<sup>8</sup>. Remittances that are used for such reverse flows (i.e., debt amortization, reserve accumulation, or capital flight) are no longer available for consumption or investment, placing a limit on the direct potential growth effect. This last consideration has not been well recognized or researched in the literature.

This paper attempts to bridge the gap in the literature by determining, for a sample of remittance-receiving developing countries, what proportion of remittance flows have historically been diverted to reverse flows. This is done by first estimating the effect of remittance flows on consumption, investment and net exports, and then using the estimated magnitude for these (the remittance coefficients in the relevant equations) to derive estimates of the proportion of remittance flows diverted to reverse flows. This provides an approximation of the extent to which reverse flows may have constrained the effect of remittance flows on investment and consumption propensities and their potential effect on growth through these aggregates.

It should be noted that this study deals with the allocation of remittances only from a macroeconomic perspective. While it is clear that remittances are used only for consumption or savings/investment at the household level, this is not necessarily the case at the macroeconomic level. The transfer of foreign exchange from recipients of remittances to other economic agents (as well as crowding out and crowding in effects) means that the final economy-wide dispensation can be quite different from the microeconomic choices of remittance recipients. The greater the amount of remittance-based foreign exchange used for financing reverse flows, the smaller will be the effect that remittances can have on consumption and investment rates for the macroeconomy. There is no suggestion here that the use of remittances for reverse flows is a purely negative phenomenon. The argument is that the diversion of remittances towards the financing of reverse flows affects the degree to which these flows can generate growth by directly boosting investment and consumption rates.

The rest of the paper is organized as follows. Section 2 presents the theoretical and empirical background of this research. Section 3 uses national income and balance of payments identities to establish the potential choices in the allocation of remittances and the critical role of reverse flows. Section 4 outlines the methodology to be used to derive relevant results. Section 5 presents and analyzes those results, and Section 6 concludes the paper.

## **2. The Allocation of Remittance Flows from a Macroeconomic Perspective: A literature review**

The role of savings in development is a major focus in the field of development economics. Lewis (1954), for example, argues that an underdeveloped country begins the process of development when a voluntary savings rate of 4% to 5% increases to about 12% to 15% of national income. In reality, developing

countries are often unable to generate the rates of domestic savings that are required for funding the levels of investment necessary for generating and sustaining rapid growth.<sup>9</sup>

Theoretically, foreign resource inflows can remove the gap between domestic savings and required investment by providing needed foreign exchange to developing countries.<sup>10</sup> An explicit assumption is that all of foreign assistance is directed towards investment. As opposed to this strong assumption, Rahman (1967) concludes that external resources are likely to be used to increase both consumption and investment if the marginal output-capital ratio is higher than the rate of interest on external borrowing. This is almost certainly true for aid. Griffin and Enos (1970) goes one step further to show that cheap concessional credit are simply used as an alternative to more expensive domestic credit, accommodating lower domestic savings while leaving investment largely unchanged (i.e., foreign aid would mostly cause increased consumption).

Remittances also generate a flow of external resources, and a similar debate regarding the allocation of these resources has taken place in recent years. Stahl and Habib (1989) and Glytsos (1993) show that remittances are mostly used for consumption. Through the Keynesian multiplier mechanism, recipient economies can still benefit in terms of growth if these remittances are used to purchase domestically-produced goods and services. As opposed to this view, Giuliano and Ruiz-Arranz (2006) argue that remittances have been important in generating output growth by increasing investment in countries with less developed financial sectors. Remittances in those countries have provided an alternative means for financing investment and reducing liquidity constraints. Their results suggest that inflow of remittances help alleviate credit constraints in developing countries where credit markets are inefficient or non-existent—thus, contributing to improving the allocation of capital boosting economic growth.

Beyond the consumption/investment choice, policymakers have often suggested that remittance flows to developing countries, by boosting foreign exchange receipts, allow them to maintain adequate foreign reserves<sup>11</sup> service debt<sup>12</sup> or finance capital flight<sup>13</sup>. Remittances that are used to finance reverse flows (i.e., debt amortization, reserve accumulation, or capital flight) are no longer available for consumption or investment. That would appear to place a limit on the potential direct growth effect. This last consideration has not been well recognized or researched in the literature.

Though the issue of potential resource loss from the diversion of external resource flows to reverse flows (in the form of debt servicing, reserve accumulation or capital flight) is noted early in the aid literature, it has largely been ignored until recently. Rahman (1967) observe that the amount of aid available for financing consumption or investment depends on the aid available after financing debt service payments. Loxley and Sackey (2008) emphasize the need for Africans to strategize to reduce future dependence on aid, since aid in the form of concessional loans entail future debt service obligations. Serieux (2010) and Serieux and Das (2009) show that aid that is used to service debt, finance capital flight or accumulate reserves cannot contribute directly to either consumption or domestic investment.

To what extent do the challenges of financing reverse flows apply to remittances as well? Loxley and Sackey (2008) suggest that in the long run some countries need to rely on other financial flows such as workers' remittances to overcome the future debt servicing obligations that come with aid in the form of concessional loans. Though many developing countries carried high debt burdens in an environment of falling aid flows in the 1980s and 1990s, whether this scenario has indeed come to pass is yet to be investigated.

The macroeconomic literature on the use of remittances is concerned primarily with the ultimate effect of remittance flows on growth. Thus, the debate on the allocation of remittances at the macroeconomic level is focused on the same question that preoccupies the microeconomic literature—whether remittance flows are used to increase consumption or investment. The nature of the growth effect is presumed to be determined by that choice. Stahl and Arnold (1986) and Stahl and Habib (1989) show that remittances are mostly used for consumption and affected growth positively via the consumption multiplier. Brown (1994), Ziesemer (2006) and Giuliano and Ruiz-Arranz (2006) argue that remittances promote growth by promoting investment.

At the macroeconomic level, the relationship between the allocation of remittances and growth is far more complex than a simple story of investment or consumption. Remittances represent a transfer of foreign purchasing power from external agents to agents in the domestic economy. When the foreign currency—in which it is denominated—is exchanged for domestic currency, purchasing power is transferred from remittance recipients to other domestic agents (via financial institution, the monetary authority or directly). The degree to which this potential increase in purchasing power is translated into a real increase in absorption (and not simply increase in the domestic money supply) will depend on the proportion of purchasing power

abroad that is actually utilized to purchase goods and services. Remittance flows result in a one to one increase in absorption (and, therefore, consumption and investment propensities) only if all remittance flows are used to increase imports (expand the trade deficit). If some of this purchasing power is used to finance reverse flows (reserve accumulation, debt service or capital flight), the effect on investment and consumption ratios is less than that would be suggested by the size of remittance flows. Therefore, although remittances are private flows and the microeconomic allocation of remittances is privately determined, the final economy-wide (macroeconomic) allocation is affected by decisions about how to allocate the implied foreign exchange receipts.

As noted earlier, it is clear that policymakers from many developing countries see remittance flows as a potential resource for maintaining healthy reserves at their central banks. It is also very likely that remittance flows make it easier to finance capital flight because much of it enters the country through informal channels. Brown (1992a; 1992b) asserts that because of the pervasive presence of informal markets, a significant amount of migrants' remittances in Sudan disappears through informal channels. Thus, it seems likely that reverse flows are an important part of the allocation of remittance flows. In the last three sections of this paper, an attempt will be made to determine the level of its importance. Preceding this empirical analysis, it is necessary to clarify the accounting relationships on which the macroeconomic allocation issue is predicated.

### 3. Basic Accounting and Allocation of Remittances

The basic national income identity tells us total output is composed of consumption, investment and net exports. From this identity, a simple derivation (Derivation B1 in Appendix B) shows that the negative of the net export ratio (the trade deficit) effect of remittances  $\left(-\frac{\partial nx}{\partial rem}\right)$  is identical to the sum of its investment rate effect  $\left(\frac{\partial i}{\partial rem}\right)$  and the consumption rate effect  $\left(\frac{\partial c}{\partial rem}\right)$ . Remittances affect the rates of investment and consumption to the extent that they enable the widening of the trade deficit (increase import) relative to output. The intuition is that remittance flows can only expand consumption or investment, relative to output, when the foreign purchasing power inherent in remittance flows is utilized for one of these purposes. The existing literature, which works on the presumption that remittances are simply allocated between consumption and investment rates, implicitly assume that all remittance flows are eventually used to expand

the trade deficit. The proportion of remittances that is used to expand the trade deficit will depend on the proportion that is used to finance reverse flows.

As Derivation B2 (Appendix B) indicates, whenever remittances are used to finance reverse flows, they are no longer available for expanding the trade deficit or increasing investment or consumption rates directly. In this derivation, the current account balance (*CU*) and the capital account balance (*CA*) are disaggregated into their respective components. Remittance flows are transfers; the differential of net transfers with respect to remittance flows is one. The foreign exchange provided by remittance flows can be used to finance interest payments on foreign debt (part of net foreign income), principal payments on foreign debt and reserve accumulation (part of net official flows) and capital flight (part of net private flows). The derivative of all of these flows with respect to remittance flows is potentially non-zero. Since these flows are outward (and therefore negative), they compete with net exports for the scarce resource provided by remittance flows. The larger the effect of remittances on these (reverse) flows, the smaller is the net export effect. Given the relationship between the trade deficit and consumption and investment ratios, this also implies that the allocation of remittance flows is fully summarized by its consumption, investment and reverse flow effects (when these are measured relative to output) (Derivation B3).

## 4. Methodology

### 4.1 Estimation Issues

While it is possible, at least theoretically, to estimate the direct effects of remittances on each of the major types of reverse flows (debt service flows, reserve accumulation and capital flight), there are no generally established (i.e., theoretically based) behavioural models for debt service flows and reserve accumulation. Though there are behavioural models for capital flight, time series data for that aggregate is not generally available. As the previous section indicates, accounting identities allow us to estimate the proportion of remittance flows directed to reverse flows because it is the residual after the effect of remittance flows on consumption and investment has been taken into account. It is also the residual once the effect of remittance flows on net exports has been accounted for. Two ways of approximating the degree to which remittance flows are diverted to reverse flows are presented. This paper will attempt to derive both of these estimates.

To that end, consumption, investment and trade balance equations will be estimated and from these estimates the implied share of reverse flows (in the allocation of remittances) will be derived.

The dataset employed for this research covers 36 countries<sup>14</sup> for the period 1980 to 2006. Since the panel dataset can be categorized as having a large T and large N, the likelihood of non-stationarity of some of the variables becomes an issue. A primary focus of this paper is the long-run relationship between remittances and consumption, investment and the trade balance. These challenges (estimating long-run relationships across a large group of countries and over an extended period of time) can be appropriately addressed using the Pooled Mean Group (PMG) approach of Pesaran *et al.* (1999). This is an error-correction approach specifically designed for panel data with large T and large N, where non-stationarity is a concern.

The PMG approach estimates a single, cointegrating, long-run equation for the full panel but panel-specific short-run equations. This procedure requires an assumption of homogeneity of the long-run coefficients across panels (countries). This approach is restrictive relative to the Mean Group (MG) approach which allows for individual (panel-specific) long and short-run relationships. Pesaran *et al.* (1999) argues that the high degree of sensitivity of MG estimates to outliers, measurement errors and omitted variables at the panel level make the PMG approach preferable, even if the assumption of homogeneity of long-run coefficients may not be valid. Our estimation results suggest that the significant efficiency gains in the PMG approach over the MG approach in this context justifies this additional assumption.

To determine the level of integration of the (dependent and potential explanatory) variables, we employed Hadri's panel stationarity test<sup>15</sup> to relevant variables. The null hypothesis of full panel stationarity is rejected for all but one variable—the innovation in export growth (See Table 1). In effect, all but one of these variables appears to be mostly non-stationary at the panel level. Applying the same tests to the first differences of these variables leads to non-rejection of the null of stationarity. We can, therefore, conclude that these variables are mostly integrated of order one [I(1)]—meaning that a long-run cointegrating relationship may exist among the levels of these variables (with the exception of the innovation in export growth which would be related to short-run adjustments). The first difference of the dependency ratio at the overall panel level is found to be non-stationary. A more detailed examination of the unit root test (KPSS test<sup>16</sup>) of this variable at the panel (country) level is applied. Results from this test suggest that the first difference of the

dependency ratio could be considered as a stationary variable since the null of stationarity is not rejected for 27 out of 36 countries.

**Table 1: Stationarity Tests for Relevant Variables**

| Variable                                      | Hadri Panel Stationarity Test<br>(null of stationarity) |            |
|---|---|------------|
|   | Level   | Difference |
| Consumption/GDP                               | 45.79***  | -2.85      |
| Per Capita Income (Atlas)                     | 80.98***  | 1.46       |
| Dependency Ratio                              | 89.93***  | 69.57***   |
| Innovation in Export Growth                   | -2.81   | -          |
| Private Capital Flows/GDP                     | 18.67***  | -3.71      |
| ODA/GDP                                       | 18.70***  | -4.97      |
| Remittances/GDP                               | 48.10***  | 0.62       |
| Investment/GDP                                | 38.01***  | -1.72      |
| Total External Debt /GDP                      | 35.69***  | 0.84       |
| Rate of Inflation                             | 18.15***  | -4.98      |
| Per Capita Income (Constant)                  | 89.09***  | 0.93       |
| Index of Real Exchange Rate                   | 40.82***  | -2.20      |
| Trade Balance/GDP                             | 35.13***  | -2.85      |
| Index of OECD income to Domestic Income Ratio | 41.57***  | 1.14       |
| Index of Relative Price                       | 34.76***  | -2.41      |
| Reserves/GDP                                  | 52.72***  | 1.25       |

Note: \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively.

## ***4.2 The Behavioural Equations***

### ***4.2.1 The Consumption Function***

The consumption function estimated in this study is a combination of the life-cycle/permanent income hypothesis and the subsistence income model. While the permanent income model and the life-cycle model provide invaluable insights into consumption behaviour in both developed and developing countries by arguing that individuals attempt to smooth consumption over their lifetime<sup>17</sup>, these models do not suggest a role for per capita income in the determination of consumption. That variable has been shown to have a strong relationship with the rate of savings (and, therefore, consumption) in developing countries.<sup>18</sup> The subsistence income model does provide a justification for including per capita income in the equation for consumption. The thesis argues that below a certain level of income the need to use all income to meet

basic subsistence levels of consumption constrains or precludes savings.<sup>19</sup> In low- and middle-income countries, as per capita income goes up and some households are released from this (subsistence consumption) constraint, the rate of consumption falls as the savings rate increases. Given that all of the countries in this sample are low- or middle-income countries, it is appropriate to include (the log of) per capita income in the long-run equation (and its rate of growth in the short-run equation).

According to this specification, the ratio of consumption to income has a long-run (equilibrium) relationship with per capita income, the dependency ratio, the private capital flows to GDP ratio, the foreign aid or official development assistance (ODA) to GDP ratio, and the remittance flow to GDP ratio (Table 2). The innovation in export growth as a proxy for transitory income is presumed to affect short-run consumption decisions and is part of the short-run dynamics within the error correction framework. This variable is measured as the difference between the current rate of export growth and the average export growth rate of the previous three years.

**Table 2: The Determinants of the Rate of Consumption**

| Variables                              | Relevance  | Expected Sign of Coefficient |
|--|--|------------------------------|
| Log of per capita income <sup>20</sup> | Related to the proportion of the population above subsistence  | Negative                     |
| Innovation in exports growth           | Increase in perceived transitory income  | Negative                     |
| The dependency ratio                   | Effect on population structure on consumption  | Positive                     |
| Remittances/GDP                        | Increased access to resources beyond that derived from domestic output with limited or no future repayment burdens | To be determined             |
| Private capital flows/GDP              | Increased access to private resources with significant future repayment burdens                                    | Positive                     |
| ODA/GDP                                | Increased access to resources beyond that derived from domestic output with limited future repayment burdens       | Positive                     |

#### ***4.2.2 The Investment Function***

The specification for the investment equation is motivated by the flexible accelerator model of investment. A modified version of this model is presented in this essay to accommodate the impact of remittances on the investment rate. Total external debt to GDP ratio and per capita income are assumed to affect the desired capital stock. Remittances to GDP ratio, private capital to GDP ratio and ODA to GDP ratio are

assumed to affect the rate at which the gap between desired and actual capital stock is bridged. The rate of inflation and the real exchange rate index are assumed to affect both the desired capital stock as well as the rate at which actual capital stock reaches its desired level. All variables are presumed to enter the long-run (cointegrating) equation in levels and the short-run equation in first-difference form.

**Table 3: Determinants of the Rate of Investment**

| Variables                   | Relevance  | Expected Sign of Coefficient |
|-----------------------------|--|------------------------------|
| Total external debt/GDP     | Import compression and debt-related disincentive effects   | Negative                     |
| Log of rate of inflation    | Proxy for macroeconomic instability  | Negative                     |
| Per capita income           | Affects profitability and, therefore, the rate of return on capital                                | Positive                     |
| Index of real exchange rate | A depreciation (increase in the index) improves the competitiveness of domestically produced goods | Positive                     |
| Remittances/GDP             | Increased access to resources beyond that derived from domestic output                             | Zero or positive             |
| Private capital flows/GDP   | Direct contributions of commercial credit for investment   | Positive                     |
| ODA/GDP                     | Increased access to resources beyond that derived from domestic output                             | Zero or Positive             |

#### *4.2.3 The Net Export Function*

The net export or the trade balance equation employed in this paper is a combination of the gross export equation and the import equation. The traditional import equation employed in the developed country context suggests that imports are determined by domestic output and relative prices. However, the underlying presumption that the market for imports (and foreign exchange) clear is not very tenable in developing countries and, not surprisingly, this simple model has not performed well for developing countries.<sup>21</sup> Hemphil (1974) suggests an approach that assumes foreign exchange is rationed and imports are constrained by foreign exchange availability. Availability of foreign exchange reserves becomes explicit determinant of imports in Hemphil's model. This model has performed better for developing countries. Moran (1989) proposes a more generalized version where imports are determined by the price and income variables as well as the foreign exchange variables. In our present study, this generalized import equation by Moran is combined with the traditional export equation (which suggests that exports are determined by the income of export-destination countries and the real exchange rate) to estimate the net exports or trade balance equation.

Table 4 explains the variables that enter the net exports equation. The dependent variable is net exports (or the trade balance) relative to GDP (rather than simply the value of net exports). The relevant foreign income variable is the ratio of foreign income to domestic income rather than the level of that variable. The index of OECD income to domestic income is used to capture the impact of foreign income. The index of relative prices is calculated as the ratio of the export price index of advanced economies and the domestic price index of each country. The determinants of foreign exchange availability are foreign exchange reserves to GDP ratio, remittances to GDP ratio, private capital flows to GDP ratio, and ODA to GDP ratio. All variables enter the long-run equation in levels and the short-run equation in differenced form.

**Table 4: Determinants of Net exports**

| <b>Variables</b>                     | <b>Relevant Effect</b>                               | <b>Expected Sign of Coefficient</b> |
|--------------------------------------|--|-------------------------------------|
| OECD income to domestic income index | Affects the demand for net exports                   | Positive                            |
| Index of relative prices             | Affects the demand for imports and supply of exports | Positive                            |
| Foreign exchange reserves/GDP        | Influences the feasible supply of imports            | Negative                            |
| Remittances/GDP                      | Influences the feasible supply of imports            | Negative                            |
| Private capital flows/GDP            | Influences the feasible supply of imports            | Negative                            |
| ODA/GDP                              | Influences the feasible supply of imports            | Negative                            |

### **4.3 Data Issues**

It has already been noted that the models specified above would be estimated using a panel dataset for 36 developing countries from all regions of the world and covering the period 1980 to 2006. During 1980-2006, average remittance flows as a percentage of GDP for these countries were in the range of approximately half of one per cent to ten per cent. Other labour-exporting countries that were possible candidates to be incorporated in our dataset included Jordan and Lesotho. The average ratio of remittance flows to GDP for Jordan and Lesotho over the specified period was close to 20% and 53% respectively. We presume that countries with such high receipts may behave differently from those with low receipts. The relevant tests indicate that the coefficients are not similar to the coefficients of our general equations.

The data sources for the variables used in this investigation were: the Global Development Finance and the World Development Indicators by the World Bank; the International Financial Statistics by the International

Monetary Fund; UNDATA by the United Nations; and OECD Online Library of Statistical Database by the OECD.

## 5. Results and Analysis

Results from the PMG estimates of consumption, investment and net exports functions are presented in Tables C1, C2 and C3 of Appendix C. To check the consistency of PMG estimates, we tested it against the MG estimates. These results are also presented in the same tables. While theoretically, MG estimates are always consistent, as suggested by Pesaran *et al.* (1999), they are very sensitive to outliers and errors-in-variables and, thus, the coefficients from MG estimates are often large and insignificant. The presumed consistency of the MG estimator allows us to test for the consistency of the PMG estimator by employing the Hausman Test (which tests the null hypothesis that the MG and PMG coefficients are not systematically different against the alternative that they are). If the null is not rejected, the PMG estimator can be presumed consistent. Pesaran *et al.* (1999) note this test is weak; but this must be juxtaposed against the extreme sensitivity of the MG estimator (to extreme values and measurement errors). They suggest that the PMG estimator may provide better estimates of mean (long-run) coefficient values even when the underlying assumption of common coefficients is not valid. This allows for a great deal more comfort with the results of the Hausman Tests, which is one of the factors used in choosing the final specification (in terms of the number of short-run lags).<sup>22</sup>

The PMG estimators of the consumption equation (Appendix C, Table C1) indicate that most of the long-run variables (i.e., dependency ratio, non-concessional capital flows to GDP ratio, ODA to GDP ratio, and remittances to GDP ratio) have significant impact on the rate of consumption. The coefficient for private capital flows (i.e., the non-concessional capital flows to GDP ratio) is surprisingly negative and significant. Moreover, this result is robust to changes in the (short- or long-run) specifications of the consumption equation.<sup>23</sup> Thus, on average, non-concessional capital flows in these developing countries displace consumption and increase the domestic savings rate.

The error-correction term from the PMG estimator is strongly significant but most of the (differenced) variables in the short-run equation are not significant. The exceptions are the constant term (which averages the country-specific fixed effects) and the innovation in export growth. The negative coefficient for the

innovation in export growth supports the presumption of the Permanent Income Hypothesis that short-run consumption rates are strongly and negatively responsive to changes in transitory income (as savings rates increase).

The coefficient for remittances to GDP ratio, our main variable of interest, is 0.80. It is significantly positive (at better than 1% level) suggesting that, on average, each additional dollar of increased remittances is used to increase consumption by 80 cents. In a similar manner, a positive and significant ODA-to-GDP ratio coefficient (0.65) suggests that approximately 65% of official assistance is used to increase consumption. It should be noted that although the signs of ODA/GDP and Remittance/GDP coefficients are persistently positive regardless of the specification, the magnitude of these coefficients are quite sensitive to the equation specification (in terms of the number of lags in the short-run equation). Our confidence in this result will have to rest in part on the results for the net export equation which indirectly includes the consumption effect.

To determine whether non-market financial flows (i.e., ODA and remittances) have similar effects on the consumption rate, we employed the Wald Test. This test does not reject the null hypothesis that these two coefficients are indistinguishable. This result suggests that, on average, remittances and ODA had similar effects on the rate of consumption in this set of developing countries during the period from 1980 to 2006.

The PMG estimates of the investment rate equation are presented in Table C2. These results are robust to changes in the specifications of the equation. The long-run PMG coefficient estimates suggest that the investment rate is influenced negatively by the debt-to-GDP ratio and the rate of inflation, and positively by the index of the real exchange rate and non-concessional capital flows. Coefficients for both the ODA-to-GDP ratio and remittances-to-GDP ratio are found to be insignificant. Implications are that over the long run, changes in the ODA/GDP ratio and the remittances/GDP ratio have no significant impact on the investment rate in these countries.

It is clear from the above results that, on average, any increase in foreign aid and remittances (as a percentage of GDP) in these 36 developing countries lead to significant and large increases in the rate of consumption but no substantial change in the investment rates. This result (that remittances are used mostly for consumption in developing countries) is similar to the results reported by Stahl and Arnold (1986) and Stahl and Habib (1989).

The general results from the estimation of the net export equation are presented in Table C3. Results obtained from the long-run estimation indicate that the trade balance has a negative and statistically significant relationship with the (lagged) foreign reserves/GDP ratio, the ODA/GDP ratio and the remittances/GDP ratio, and a positive and significant relationship with the index of foreign income to domestic income (calculated as OECD income/domestic income ratio) as anticipated. The coefficient for the index of relative price is found to be significant but did not have the expected sign. This result is likely an indication of an inelastic response to import prices<sup>24</sup>, which causes import expenditure to move with the price of imports causing the trade balance to deteriorate (hence the negative sign).

The negative coefficient for remittances/GDP ratio suggests that an increase in the flow of remittances tends to cause a deterioration of the trade balance. An increase in remittances as a share of GDP results in increased purchases of foreign goods and services (at least in relative terms). The coefficient of negative 0.73 does not suggest a one-to-one relationship between the remittances/GDP ratio and net exports/GDP ratio. Instead, it suggests that a one dollar increase in the flow of remittances tends to expand the trade deficit by only 73 cents. Similarly, a negative (-0.70) ODA/GDP ratio suggests that, on an average, a one dollar increase in the amount of foreign aid flowing to these countries increases their trade deficit by 70 cents. These results are supported by the Wald Tests (Table C3), which strongly reject the null hypothesis that these coefficients are indistinguishable from minus one.

The actual amount of remittances that is diverted to reverse flows is derived and presented in Table C4. When the reverse flow effect is estimated as a residual after the consumption and investment effects have been accounted for, the estimated value is 0.20. When the reverse flow effect is calculated as a residual after the net exports effect has been accounted for, the estimated value is also 0.27. To find out if these two coefficients can be treated as estimates of a common (true) value, we again employ the Wald test (Table C4). This test does not reject the null hypothesis that the difference between these two estimates is zero. It can be argued based on the above analysis that a positive (non-zero) proportion of remittances is used to finance reverse flows and that this proportion is in the neighbourhood of 20% to 27% for these 36 developing countries (over the period of 1980 to 2006). It can also be argued that the proportion of ODA and remittance flows directed to reverse flows are very similar (i.e., not statistically different) for this group of countries.

When countries are disaggregated according to their average level of debt service to GDP ratio<sup>25</sup>, results from the net export equation (presented in Table C5, Appendix C) suggest that the only dummy which is positive and significant (at 10% level) in the short-run equation is the dummy for countries with high level of average debt service to GDP ratio. Dummies for medium and low level of average debt service to GDP ratio are insignificant. The significantly positive coefficient for this dummy suggests that movements in the trade balance tend to be more biased in favour of a surplus (or smaller deficit) than is the case for the other countries. This result lends support to the hypothesis that, in countries with high debt service payments relative to income, the short-term response of the trade balance is biased in favour of a surplus even when changes in foreign and domestic income, relative prices and foreign exchange availability and deviation from long-term equilibrium conditions are taken into account. This behaviour is consistent with pressures imposed by debt service obligations.

Estimated correlation coefficients for the first difference of the remittances-GDP ratio and the first difference of the debt service-GDP ratio (for individual countries) are presented in Table C6. Notably, only eleven out of the 36 countries had correlation coefficients that were negative. More importantly, of the seven correlation coefficient estimates that were significant (at least at the 10 per cent level) all were positive. This suggests that for some countries, an increase in remittance flows is (statistically) correlated with an increase in debt service payments while the opposite is never true. The country type, in terms of debt service burden, does not seem to matter. This type of result is consistent with the situation where many countries use remittance flows to finance debt service payments, as suggested above.

We further examine the reverse flow-remittance relationship by disaggregating countries according to the rate of growth in the foreign reserves to GDP ratio and adding dummy variables for these groups to the short-run trade balance equation.<sup>26</sup> The results are reported in Table C7. None of the dummies for country groups were found to be significant. This suggests that reserve accumulation is not consistent with any additional bias in favour of trade surpluses once changes in domestic and foreign income, relative price, foreign exchange availability and deviation from long-run equilibrium have been taken into account. This may be due to the fact that unlike debt service obligations reserve accumulation is more discretionary.

The estimated correlation coefficients (presented in Table C8) for changes in the remittances/GDP ratio and change in the reserves/GDP ratio are overwhelmingly positive (27 out of 36), and of the 14 that are

statistically significant (at the 10% level or better) only one is negative. Of the 14 significant coefficients, 12 are for countries that demonstrated high or medium rates of reserve accumulation during the sample period (1976 to 2006).<sup>27</sup> These results are consistent with the situation where countries divert remittance receipts to reverse flows such as reserve accumulation.

## 6. Conclusion

The relatively rapid rise in remittance flows in developing countries in recent years indicates that these flows have the potential to become an important tool for economic development. A better understanding of the macroeconomic effect of remittances can help policymakers to develop policies and design institutions that ensure that these external resources are used optimally given country objectives. To date, research questions have generally centred on the allocation of remittance receipts within the domestic economy.<sup>28</sup> While the existing economic literature suggests that remittance flows are either used to increase consumption or investment, policymakers have often argued that a significant portion of remittance flows to developing countries are used to service debt, increase foreign exchange reserves and finance capital flight. Remittance flows that are diverted to these 'reverse flows' cannot contribute to increased consumption or investment within the domestic economy (at least not directly). Consumption and investment do not necessarily constitute the summation of the allocation of remittances. It is likely that part of remittance flows are diverted to reverse flows and never add to the domestic rates of consumption or investment.

This paper first sought to demonstrate the relationship between remittance flows and consumption, investment and reverse flows (at the macroeconomic level) by utilizing some basic national accounting and balance of payment identities. By also estimating consumption, investment and trade balance equations, estimates of the marginal effect of remittances on reverse flows were derived.

The marginal effects of remittance flows on the rate of consumption, investment and net exports for 36 developing countries (over the period of 1980 to 2006) were found to be 80%, 0% and 73% respectively. In effect, a one percentage increase in the rate of remittance flows increased the rate of consumption by roughly 0.8%, expanded the trade balance/GDP ratio by roughly 0.73% and had no statistically discernable effect on the rate of investment. These results suggest that approximately 20% to 27% of remittance flows have been diverted to finance reverse flows. The hypothesis that this proportion is zero was very strongly

rejected. Changes in the rate of remittance flows tended to be positively correlated with changes in debt service payment-to-income ratios and the rate of reserve accumulation relative to income. Many of the correlation estimates were also statistically significant. For this group of countries, the summary distribution of remittances at the macroeconomic level was not only dominated by consumption but also included reverse flows. This investigation also found that the proportion of remittance flows used to finance reverse flows was not very different (statistically speaking) from the proportion of aid flows used for the same purpose.

## Appendices

### *Appendix A*

**Table A1: List of the Countries in the Sample**

| <b>Number</b> | <b>Country</b>     | <b>Region</b>                   |
|---------------|--------------------|---------------------------------|
| 1             | Algeria            | Middle East and North Africa    |
| 2             | Bangladesh         | South Asia                      |
| 3             | Benin              | Sub-Saharan Africa              |
| 4             | Botswana           | Sub-Saharan Africa              |
| 5             | Burkina Fuso       | Sub-Saharan Africa              |
| 6             | Colombia           | Latin America and the Caribbean |
| 7             | Costa Rica         | Latin America and the Caribbean |
| 8             | Cote d'Ivoire      | Sub-Saharan Africa              |
| 9             | Dominican Republic | Latin America and the Caribbean |
| 10            | Egypt, Arab Rep.   | Middle East and North Africa    |
| 11            | El Salvador        | Latin America and the Caribbean |
| 12            | Fiji               | East Asia and Pacific           |
| 13            | Gambia, The        | Sub-Saharan Africa              |
| 14            | Guatemala          | Latin America and the Caribbean |
| 15            | Haiti              | Latin America and the Caribbean |
| 16            | Honduras           | Latin America and the Caribbean |
| 17            | India              | South Asia                      |
| 18            | Indonesia          | East Asia and Pacific           |
| 19            | Jamaica            | Latin America and the Caribbean |
| 20            | Kenya              | Sub-Saharan Africa              |
| 21            | Malaysia           | East Asia and Pacific           |
| 22            | Mali               | Sub-Saharan Africa              |
| 23            | Mexico             | Latin America and the Caribbean |
| 24            | Morocco            | Middle East and North Africa    |
| 25            | Niger              | Sub-Saharan Africa              |
| 26            | Nigeria            | Sub-Saharan Africa              |
| 27            | Pakistan           | South Asia                      |
| 28            | Panama             | Latin America and the Caribbean |
| 29            | Philippines        | East Asia and Pacific           |
| 30            | Rwanda             | Sub-Saharan Africa              |
| 31            | Senegal            | Sub-Saharan Africa              |
| 32            | Sri Lanka          | South Asia                      |
| 33            | Swaziland          | Sub-Saharan Africa              |
| 34            | Thailand           | East Asia and Pacific           |
| 35            | Togo               | Sub-Saharan Africa              |
| 36            | Tunisia            | Middle East and North Africa    |

## *Appendix B*

### Derivation B1

$$\begin{aligned}
 Y &\equiv C + I + NX \\
 \Rightarrow 1 &= c + i + nx \\
 \Rightarrow 1 - nx &\equiv i + c \\
 \Rightarrow -\frac{\partial nx}{\partial rem} &\equiv \frac{\partial i}{\partial rem} + \frac{\partial c}{\partial rem}
 \end{aligned}$$

where,  $Y$  = Gross Domestic Product (GDP)  
 $C$  = Consumption;  $c$  = Consumption/GDP  
 $I$  = Investment;  $i$  = Investment/GDP  
 $NX$  = Net Exports;  $nx$  = Net Exports/GDP  
 $rem$  = Remittances/GDP

### Derivation B2

$$\begin{aligned}
 CU &\equiv -CA \\
 \Rightarrow nx + ntr + nfi &\equiv -nf_o - nfp \\
 \Rightarrow -nx &\equiv ntr + nfi + nf_o + nfp \\
 \Rightarrow -\frac{\partial nx}{\partial rem} &\equiv 1 - \frac{\partial nfi}{\partial rem} - \frac{\partial nf_o}{\partial rem} - \frac{\partial nfp}{\partial rem} \\
 \Rightarrow -\frac{\partial nx}{\partial rem} &\equiv 1 - \left( \frac{\partial nfi}{\partial rem} + \frac{\partial nf_o}{\partial rem} + \frac{\partial nfp}{\partial rem} \right) \\
 \Rightarrow -\frac{\partial nx}{\partial rem} &\equiv 1 - \frac{\partial rf}{\partial rem}
 \end{aligned}$$

where,  $CU$  = Current Account Balance  
 $CA$  = Capital Account Balance  
 $ntr$  = Net Transfers/GDP  
 $nfi$  = Net Foreign Income/GDP  
 $nf_o$  = Net Official Flows/GDP  
 $nfp$  = Net Private Flows/GDP  
 $rf$  = Reverse Flows/GDP

### Derivation B3

From Derivation 1 and Derivation 2,

$$\begin{aligned}
 \frac{\partial i}{\partial rem} + \frac{\partial c}{\partial rem} &\equiv 1 - \frac{\partial rf}{\partial rem} \\
 \Rightarrow \frac{\partial i}{\partial rem} + \frac{\partial c}{\partial rem} + \frac{\partial rf}{\partial rem} &\equiv 1
 \end{aligned}$$

## Appendix C

Table C1: MG and PMG Estimates of the Consumption Equation (1980-2006)

| Dependent Variable: The Consumption Rate         |                       |                      |
|--|-----------------------|----------------------|
| Explanatory Variables                            | Mean Group            | Pooled Mean Group    |
|  | Long-Run Coefficients |                      |
| Log of Per Capita Income                         | 0.054<br>(0.64)       | -0.011<br>(-1.55)    |
| Dependency Ratio                                 | 0.473<br>(0.89)       | 0.157***<br>(3.93)   |
| Private Capital Flows/GDP                        | -1.484<br>(-1.22)     | -0.265***<br>(-2.97) |
| ODA/GDP  | 33.295<br>(1.25)      | 0.653***<br>(12.59)  |
| Remittances/GDP                                  | 1.930<br>(0.77)       | 0.802***<br>(8.32)   |
| Short-Run Coefficients                           |                       |                      |
| Error Correction Coefficient                     | -0.748**<br>(-9.61)   | -0.338***<br>(-6.36) |
| $\Delta$ Log of Per Capita Income                | 0.035<br>(1.01)       | 0.000<br>(0.02)      |
| $\Delta$ Dependency Ratio                        | -1.706<br>(-0.51)     | -0.015<br>(-0.02)    |
| Innovation in Export Growth                      | -0.032*<br>(-1.94)    | -0.041***<br>(-3.43) |
| $\Delta$ Innovation in Export Growth             | 0.005<br>(0.64)       | 0.010<br>(1.39)      |
| $\Delta$ Private Capital Flows/GDP               | 0.086<br>(0.65)       | 0.087<br>(1.62)      |
| $\Delta$ Private Capital Flows/GDP (Lagged)      | 0.046<br>(0.46)       | 0.069<br>(1.67)      |
| $\Delta$ ODA/GDP                                 | -0.932<br>(-0.67)     | 0.440<br>(1.11)      |
| $\Delta$ ODA/GDP (Lagged)                        | -0.068<br>(-0.08)     | -0.131<br>(-0.27)    |
| $\Delta$ Remittances/GDP                         | -0.485<br>(-0.52)     | -0.125<br>(-0.33)    |
| $\Delta$ Remittances/GDP (Lagged)                | 0.529<br>(0.65)       | 0.198<br>(0.59)      |
| Constant   | 0.766**<br>(2.14)     | 0.233***<br>(6.16)   |
| <b>Number of Observations</b>                    | 954                   | 954                  |
| <b>Hausman Test:</b>                             | $\chi^2$ Coefficient  | 1.67                 |
| H0: Common coefficients (MG and PMG)             | Tail Probability      | 0.893                |
| <b>Wald Test:</b>                                | $\chi^2$ Coefficient  | 1.69                 |
| H0: Equality of remittances and ODA coefficients | Tail Probability      | 0.193                |

Notes: \*\*\*, \*\* and \* Indicate significance at the 1%, 5% and 10% level respectively. Figures in brackets are z-statistics.

Table C2: MG and PMG Estimates of the Investment Equation (1980-2006)

| Dependent Variable: Investment/GDP                          |                       |                      |
|---|-----------------------|----------------------|
| Explanatory Variables                                       | Mean Group            | Pooled Mean Group    |
|   | Long-Run Coefficients |                      |
| Total External Debt/GDP                                     | -0.149***<br>(-2.81)  | -0.051***<br>(-5.15) |
| Log of Inflation Rate                                       | -0.227<br>(-1.49)     | -0.169***<br>(8.45)  |
| Real Exchange Rate Index                                    | 0.115*<br>(1.82)      | 0.039**<br>(4.85)    |
| Private Capital Flows/GDP                                   | 0.439**<br>(2.22)     | 0.363***<br>(5.94)   |
| ODA/GDP   | -5.306<br>(-0.68)     | -0.032<br>(-1.00)    |
| Remittances/GDP   | 0.429<br>(0.48)       | 0.026<br>(0.77)      |
| Short-Run Coefficients                                      |                       |                      |
| Error Correction Coefficient                                | -0.708***<br>(-10.59) | -0.323***<br>(-7.03) |
| $\Delta$ Total External Debt/GDP                            | 0.114<br>(1.43)       | 0.031<br>(0.72)      |
| $\Delta$ Log of Per Capita Income (Lagged)                  | 0.204***<br>(2.88)    | 0.210***<br>(4.21)   |
| $\Delta$ Log of Per Capita Income (Second Lagged)           | 0.097<br>(1.45)       | -0.010<br>(-0.23)    |
| $\Delta$ Log of Inflation Rate                              | -0.018<br>(-0.41)     | -0.027<br>(-1.11)    |
| $\Delta$ Real Exchange Rate Index                           | -0.013<br>(-0.36)     | -0.012<br>(-0.48)    |
| $\Delta$ Private Capital Flows/GDP                          | -0.195***<br>(-2.64)  | -0.032<br>(-0.65)    |
| $\Delta$ ODA/GDP  | -0.867<br>(-0.97)     | 0.102<br>(0.33)      |
| $\Delta$ Remittances/GDP                                    | -0.299<br>(-0.47)     | 0.590<br>(1.31)      |
| $\Delta$ Remittances/GDP (Lagged)                           | -0.337<br>(-0.69)     | 0.439*<br>(1.68)     |
| Constant  | 0.142***<br>(4.32)    | 0.059***<br>(6.98)   |
| Number of Observations                                      | 961                   | 961                  |
| <b>Hausman Test:</b><br>H0:Common coefficients (MG and PMG) | $\chi^2$ Coefficient  | 6.04                 |
|   | Tail Probability      | 0.419                |

Notes: \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively. Figures in brackets are z-statistics.

**Table C3: MG and PMG Estimates of the Net Export Equation (1980-2006)**

| <b>Dependent Variable: The Trade Balance/GDP</b>          |                              |                          |
|---|------------------------------|--------------------------|
| <b>Explanatory Variables</b>                              | <b>Mean Group</b>            | <b>Pooled Mean Group</b> |
|   | <b>Long-Run Coefficients</b> |                          |
| OECD Income-Domestic Income Ratio Index                   | 0.019<br>(0.21)              | 0.054***<br>(4.84)       |
| Index of Relative Prices                                  | 0.156<br>(0.80)              | -0.038***<br>(-4.55)     |
| Foreign Reserves/GDP (Lagged)                             | -0.343*<br>(-1.93)           | -0.225***<br>(-3.95)     |
| Private Capital Flows/GDP                                 | -0.431<br>(-1.10)            | -0.031<br>(-0.44)        |
| ODA/GDP   | -11.425<br>(-1.10)           | -0.703***<br>(-6.38)     |
| Remittances/GDP   | -0.771<br>(-0.46)            | -0.730***<br>(-11.78)    |
| Error Correction Coefficient                              | -0.909***<br>(-13.48)        | -0.319***<br>(-7.59)     |
| $\Delta$ OECD Income-Domestic Income Ratio Index          | 0.054<br>(1.15)              | 0.088**<br>(2.12)        |
| $\Delta$ OECD Income-Domestic Income Ratio Index (Lagged) | -0.004<br>(-0.14)            | 0.018<br>(0.49)          |
| $\Delta$ Index of Relative Prices                         | 0.025<br>(1.09)              | -0.001<br>(-0.06)        |
| $\Delta$ Foreign Reserves/GDP (Lagged)                    | 0.150<br>(1.58)              | -0.167**<br>(-2.01)      |
| $\Delta$ Foreign Reserves/GDP (Second Lagged)             | 0.006<br>(0.10)              | -0.030<br>(-0.67)        |
| $\Delta$ Private Capital Flows/GDP                        | -0.113<br>(-0.78)            | -0.222***<br>(-3.58)     |
| $\Delta$ Private Capital Flows/GDP (Lagged)               | -0.117<br>(-1.19)            | -0.151**<br>(-1.99)      |
| $\Delta$ Private Capital Flows/GDP (Second Lagged)        | -0.028<br>(-0.47)            | -0.023<br>(-0.44)        |
| $\Delta$ ODA/GDP  | 0.206<br>(0.23)              | -1.052<br>(-1.05)        |
| $\Delta$ Remittances/GDP                                  | -0.644<br>(-1.01)            | -0.204<br>(-0.78)        |
| Constant  | -0.005<br>(-0.17)            | 0.005<br>(1.45)          |
| Number of Observations                                    | 962                          | 962                      |
| <b>Hausman Test:</b>                                      | $\chi^2$ Coefficient         | 10.37                    |
| H0: Similar Coefficient Estimates (MG and PMG)            | Tail Probability             | 0.110                    |
| <b>Wald Test:</b>   | $\chi^2$ Coefficient         | 18.91***                 |
| (Remittance/GDP coefficient = -1)                         | Tail Probability             | 0.000                    |
| <b>Wald Test:</b>   | $\chi^2$ Coefficient         | 7.28**                   |
| (ODA/GDP coefficient = -1)                                | Tail Probability             | 0.007                    |

Notes: \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively. Figures in brackets are z-statistics.

**Table C4: Estimates of Marginal Allocation of Remittances to Reverse Flows (1980-2006)**

| <b>The Marginal Allocation of Total Remittances to</b> |                      |       |
|--|----------------------|-------|
| <b>Variables</b>                                       | <b>Coefficient</b>   |       |
| Consumption  | 0.80                 |       |
| Investment   | Insignificant        |       |
| Reverse Flows<br>[1 - (Consumption + Investment)]      | 0.20                 |       |
| The Trade Deficit                                      | 0.73                 |       |
| Reverse Flows<br>[1 - Trade Deficit]                   | 0.27                 |       |
| <b>Wald Test:</b>                                      | $\chi^2$ Coefficient | 1.26  |
| H0: Equality of Coefficient Estimates                  | Tail Probability     | 0.262 |

**Table C5: PMG Estimates of the Net Export Equation with Debt Service Dummies (1980-2006)**

| <b>Dependent Variable: The Trade Balance/GDP</b>          |                               |
|---|-------------------------------|
| <b>Explanatory Variables</b>                              | <b>Long-Run Coefficients</b>  |
| OECD Income-Domestic Income Ratio Index                   | 0.054***<br>(4.84)            |
| Index of Relative Prices                                  | -0.038***<br>(-4.55)          |
| Foreign Reserves/GDP (Lagged)                             | -0.225***<br>(-3.95)          |
| Private Capital Flows/GDP                                 | -0.031<br>(-0.44)             |
| ODA/GDP   | -0.703***<br>(-6.38)          |
| Remittances/GDP   | -0.730***<br>(-11.78)         |
|   | <b>Short-Run Coefficients</b> |
| Error Correction Coefficient                              | -0.319***<br>(-7.59)          |
| $\Delta$ OECD Income-Domestic Income Ratio Index          | 0.088**<br>(2.12)             |
| $\Delta$ OECD Income-Domestic Income Ratio Index (Lagged) | 0.018<br>(0.49)               |
| $\Delta$ Index of Relative Prices                         | -0.001<br>(-0.06)             |
| $\Delta$ Foreign Reserves/GDP (Lagged)                    | -0.167**<br>(-2.01)           |
|   | <b>Long-Run Coefficients</b>  |
| $\Delta$ Foreign Reserves/GDP (Second Lagged)             | -0.030<br>(-0.67)             |
| $\Delta$ Private Capital Flows/GDP                        | -0.222***<br>(-3.58)          |
| $\Delta$ Private Capital Flows/GDP (Lagged)               | -0.151**<br>(-1.99)           |
| $\Delta$ Private Capital Flows/GDP (Second Lagged)        | -0.023<br>(-0.44)             |
| $\Delta$ ODA/GDP  | -1.052<br>(-1.05)             |
| $\Delta$ Remittances/GDP                                  | -0.204<br>(-0.78)             |
| Dummy for Countries with High Debt Service Payments       | 0.002*<br>(1.67)              |
| Dummy for Countries with Medium Debt Service Payments     | 0.002<br>(1.25)               |
| Dummy for Countries with Low Debt Service Payments        | -0.000<br>(-0.02)             |
| Number of Observations                                    | 962                           |

Notes: \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively. Figures in brackets are z-statistics.

**Table C6: Correlation Coefficients between Remittances/GDP and Debt Service Payments/GDP (1976 -2006)**

| Country            | Type According to Average Debt Service Payments | Correlation Coefficient | Significance Level |
|--------------------|---|-------------------------|--------------------|
| Algeria            | High  | 0.26                    |                    |
| Bangladesh         | Low   | 0.00                    |                    |
| Benin              | Low   | 0.06                    |                    |
| Botswana           | Low   | -0.24                   |                    |
| Burkina Fuso       | Low   | 0.30                    | *                  |
| Colombia           | Medium  | 0.52                    | ***                |
| Costa Rica         | Medium  | -0.01                   |                    |
| Cote d'Ivoire      | High  | 0.34                    | *                  |
| Dominican Republic | Medium  | 0.48                    | ***                |
| Egypt, Arab Rep.   | Medium  | 0.06                    |                    |
| El Salvador        | Medium  | 0.18                    |                    |
| Fiji               | Medium  | -0.02                   |                    |
| Gambia, The        | Medium  | 0.19                    |                    |
| Guatemala          | Low   | -0.06                   |                    |
| Haiti              | Low   | 0.25                    |                    |
| Honduras           | Medium  | -0.04                   |                    |
| India              | Low   | 0.07                    |                    |
| Indonesia          | Medium  | 0.32                    |                    |
| Jamaica            | High  | 0.18                    |                    |
| Kenya              | Medium  | 0.06                    |                    |
| Malaysia           | Medium  | 0.14                    |                    |
| Mali               | Medium  | 0.51                    | ***                |
| Mexico             | Medium  | 0.16                    |                    |
| Morocco            | Medium  | 0.02                    |                    |
| Niger              | Medium  | -0.03                   |                    |
| Nigeria            | Medium  | -0.31                   |                    |
| Pakistan           | Medium  | 0.33                    | *                  |
| Panama             | High  | -0.01                   |                    |
| Philippines        | Medium  | -0.09                   |                    |
| Rwanda             | Low   | 0.35                    | *                  |
| Senegal            | Medium  | -0.01                   |                    |
| Sri Lanka          | Medium  | 0.15                    |                    |
| Swaziland          | Medium  | 0.29                    |                    |
| Thailand           | Medium  | -0.06                   |                    |
| Togo               | Medium  | 0.11                    |                    |
| Tunisia            | Medium  | 0.23                    |                    |

- Notes: 1) A country is considered high (low) type when the average value of debt service to GDP is higher (lower) than the absolute value. Any country otherwise is medium.
- 2) \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively.

**Table C7: PMG Estimates of the Net Export Equation with Reserve Growth Dummies (1980-2006)**

| <b>Dependent Variable: The Trade Balance/GDP</b>          |                               |
|---|-------------------------------|
| <b>Explanatory Variables</b>                              | <b>Long-Run Coefficients</b>  |
| OECD Income-Domestic Income Ratio Index                   | 0.054***<br>(4.84)            |
| Index of Relative Prices                                  | -0.038***<br>(-4.55)          |
| Foreign Reserves/GDP (Lagged)                             | -0.225***<br>(-3.95)          |
| Private Capital Flows/GDP                                 | -0.031<br>(-0.44)             |
| ODA/GDP   | -0.703***<br>(-6.38)          |
| Remittances/GDP   | -0.730***<br>(-11.78)         |
|   | <b>Short-Run Coefficients</b> |
| Error Correction Coefficient                              | -0.319***<br>(-7.59)          |
| $\Delta$ OECD Income-Domestic Income Ratio Index          | 0.088**<br>(2.12)             |
| $\Delta$ OECD Income-Domestic Income Ratio Index (Lagged) | 0.018<br>(0.49)               |
| $\Delta$ Index of Relative Prices                         | -0.001<br>(-0.06)             |
| $\Delta$ Foreign Reserves/GDP (Lagged)                    | -0.167**<br>(-2.01)           |
| $\Delta$ Foreign Reserves/GDP (Second Lagged)             | -0.030<br>(-0.67)             |
| $\Delta$ Private Capital Flows/GDP                        | -0.222***<br>(-3.58)          |
| $\Delta$ Private Capital Flows/GDP (Lagged)               | -0.151**<br>(-1.99)           |
| $\Delta$ Private Capital Flows/GDP (Second Lagged)        | -0.023<br>(-0.44)             |
| $\Delta$ ODA/GDP  | -1.052<br>(-1.05)             |
| $\Delta$ Remittances/GDP                                  | -0.204<br>(-0.78)             |
| Dummy for Countries with High Growth in Reserves/GDP      | 0.001<br>(0.84)               |
| Dummy for Countries with Medium Growth in Reserves/GDP    | 0.002<br>(0.89)               |
| Dummy for Countries with Low Growth in Reserves/GDP       | 0.002<br>(0.81)               |
| Number of Observations                                    | 962                           |

Notes: \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively. Figures in brackets are z-statistics.

**Table C8: Correlation Coefficients between Remittances/GDP and Growth of Reserves/GDP (1976-2006)**

| Country            | Rate of Growth in Reserves | Correlation Coefficient | Significance Level |
|--------------------|----------------------------|-------------------------|--------------------|
| Algeria            | Medium                     | 0.18                    |                    |
| Bangladesh         | Medium                     | 0.34                    | *                  |
| Benin              | High                       | 0.33                    | *                  |
| Botswana           | Low                        | -0.17                   |                    |
| Burkina Faso       | Medium                     | 0.19                    |                    |
| Colombia           | Low                        | 0.38                    | **                 |
| Costa Rica         | Medium                     | 0.18                    |                    |
| Cote d'Ivoire      | High                       | 0.12                    |                    |
| Dominican Republic | High                       | 0.03                    |                    |
| Egypt, Arab Rep.   | Medium                     | 0.40                    | **                 |
| El Salvador        | Medium                     | 0.03                    |                    |
| Fiji               | Low                        | -0.07                   |                    |
| Gambia, The        | High                       | -0.40                   | **                 |
| Guatemala          | Medium                     | 0.03                    |                    |
| Haiti              | High                       | -0.09                   |                    |
| Honduras           | Medium                     | 0.31                    | *                  |
| India              | Medium                     | 0.23                    |                    |
| Indonesia          | Medium                     | 0.38                    | *                  |
| Jamaica            | Medium                     | 0.49                    | **                 |
| Kenya              | High                       | -0.17                   |                    |
| Malaysia           | Medium                     | 0.09                    |                    |
| Mali               | Medium                     | -0.06                   |                    |
| Mexico             | High                       | 0.33                    | *                  |
| Morocco            | Medium                     | 0.39                    | **                 |
| Niger              | Medium                     | 0.08                    |                    |
| Nigeria            | Medium                     | 0.33                    | *                  |
| Pakistan           | Medium                     | 0.58                    | ***                |
| Panama             | Medium                     | 0.14                    |                    |
| Philippines        | Medium                     | -0.29                   |                    |
| Rwanda             | Medium                     | 0.18                    |                    |
| Senegal            | Low                        | 0.29                    |                    |
| Sri Lanka          | Low                        | -0.21                   |                    |
| Swaziland          | Low                        | 0.35                    | **                 |
| Thailand           | Medium                     | -0.22                   |                    |
| Togo               | Medium                     | 0.11                    |                    |
| Tunisia            | Medium                     | 0.38                    | **                 |

Notes: 1) A country is considered high (low) type when the average value of debt service to GDP is higher (lower) than the absolute value. Any country otherwise is medium.

2) \*\*\*, \*\* and \* Indicates significance at the 1%, 5% and 10% level respectively.

## Notes

- <sup>1</sup> The authors are grateful to John Loxley, Radhika Desai and Dane Rowlands for their valuable comments.
- <sup>2</sup> See Ratha *et al.* (2009).
- <sup>3</sup> See Chami *et al.* (2003).
- <sup>4</sup> See Adams, Jr. (1991: 695).
- <sup>5</sup> See Stahl and Habib (1989); Glytsos (1993); Giuliano and Ruiz-Arranz (2006).
- <sup>6</sup> See Bdnews24 (2009a); Bdnews24 (2009b); Bdnews24 (2009c); Amjad (2004), Joshi and Sanyal (2004).
- <sup>7</sup> See Ratha (2007).
- <sup>8</sup> See Brown (1992a; 1992b).
- <sup>9</sup> See McGuire (1994).
- <sup>10</sup> See Chenery and Strout (1966).
- <sup>11</sup> See Bdnews24 (2009b); Bdnews24 (2009c); Amjad (2004); Joshi and Sanyal (2004).
- <sup>12</sup> See Ratha (2007).
- <sup>13</sup> See Brown (1992a; 1992b).
- <sup>14</sup> See Table A1 (in Appendix A) for the list of countries.
- <sup>15</sup> See Hadri (2002).
- <sup>16</sup> This test was suggested by Kwiatkowski *et al.* (1992).
- <sup>17</sup> See Friedman (1957); Modigliani and Brumberg (1954).
- <sup>18</sup> See Schmidt-Hebbel and Servén (1997).
- <sup>19</sup> See Ogaki *et al.* (1996).
- <sup>20</sup> Per capita income (in \$US) is logged to reflect the presumption that the relationship is non-linear.
- <sup>21</sup> See Mirakhor and Montiel (1987); Moran (1989).
- <sup>22</sup> The other factor used is the significance of lagged differenced variables. Additional lags are not added to differenced variables in the short-run equation if the last lag of that variable is not statistically significant (at the 10 per cent level or better) and the Hausman Test does not reject the null of consistent estimates. However, in some cases, the adding of a lag to the differenced variable cause a failure to converge in the likelihood estimate (i.e., the error correction model fails). In this case, no additional lags are added even if the contemporaneous differenced variable (or the first lag) is significant.
- <sup>23</sup> We experimented with different specifications such as more parsimonious long-run equations (such as removing the dependency variable), modification of the definitions of some variables (defining private flows separately from public flows) and changing the number of lags in the short-run equation.
- <sup>24</sup> As reported by Oteng-Abayie and Frimpong (2008) for Ghana, for example.
- <sup>25</sup> Dummies represent the average of the absolute value of the deviation. These dummies enter in the short-run net exports equation. We are thus able to demonstrate if these dummies have different intercepts in the net exports equation.
- <sup>26</sup> Three dummies are used (based on the average of the absolute value of the deviation) to represent countries with high, medium and low reserves to GDP ratio. These dummies enter in the short-run net exports equation so that we can examine if these dummies have different intercepts in the net exports equation.
- <sup>27</sup> The sample period for the correlations is longer than the sample period for the regressions because there are fewer restrictions from data availability.
- <sup>28</sup> Adams, Jr., (1991: 695).

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