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ABSTRACT

The study examines the role of foreign capital and remittance inflows in the domestic savings of 63 developing countries for 1971-2010, paying attention to likely differential effects of FDI, portfolio investment, foreign aid and remittance. The conventional homogeneous panel estimates suggest that foreign aid and remittance flows have a significant negative impact on domestic savings. However, these techniques ignore cross section dependence and parameter heterogeneity properties and thus yield biased and inconsistent estimates. When we allow for parameter heterogeneity and cross sectional dependence by employing the Pesaran's (2006) Common Correlated Effects Mean Group estimator technique, only remittances crowd-out savings.

Keywords: Domestic savings, Foreign capital inflows, Foreign Aid.
Models with panel data

JEL Classifications: C23, E21, E22, F21, F35.

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I. Introduction

It is now widely acknowledged in the development literature that capital formation is crucial in the process of economic growth. The process of capital formation in many countries, particularly in the developing world, is however constrained by insufficient domestic capital base. To address the insufficiency of capital and thereby to meet up the conventional two-gaps: investment-savings gap and export-import gap most of these countries rely substantially on the foreign capital. It is perceived that foreign capital helps ease the saving constraint by supplementing domestic savings and helping to ease trade constraint by expanding the capacity of imports of the recipient country. In this way foreign capital inflow (FCI) impacts on the national savings and investment and promote economic growth.

The available empirical evidence of the impacts of FCI on the domestic savings and other economic performance of a recipient country is mixed. While a number of studies have found that FCI supplements domestic savings, others have found that FCI displaces savings.[1] Some studies have failed to find any statistically significant relationship between these two macroeconomic indicators. Griffin (1973) identifies the channels through which increased FCI results in fall in domestic savings.[2] In terms of growth performance of different FCIs the findings are mixed as well.[3] Therefore, earlier studies that attempted to establish the relation

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[1] Papanek (1972) mentions about two sets of plausible savings functions: one set is strongly determined by the government's efforts or policies and investment opportunities, which alone or in conjunction dampens domestic savings as a result of capital inflows; another set substantially depends on the foreign exchange, income of particular groups such as industrialists or exporters which can promote savings as well as investment as a result of FCI.

[2] Griffin (1973) demonstrates that Government savings may drop as a result of i) reduction of taxation, ii) putting less efforts by the Government for mobilizing tax revenue, iii) limited and inelastic tax base, iv) inflationary pressure in the economy, v) more Government consumption expenditure; and the private savings might drop as a result of i) availability of cheap credit facility, and ii) pre-emption of profitable investment opportunities. Along with these, Government savings efforts might also be lower due to more FCI. A schematic representation about the possible channels of FCI impacts on the domestic savings is shown in Figure B.1.

[3] Sikdar (2006) lists the benefits as well as the problems of large FCI. According to him, FCI supplements domestic savings, boosts economic growth, smooths consumption streams, helps lenders to gain higher return and better international portfolio diversification etc. The problems associated with FCI could be appreciation of real exchange rate, accumulation of foreign exchange reserve, widening of current account deficit, higher level of inflation due to monetization, and increasing probability of financial crisis etc.

between FCI and domestic savings, as well as growth failed to reach any consensus. This academic debate is still very prevalent.

FCIs generally consist of foreign direct investment (FDI), portfolio investment, official development assistance (ODA), other commercial loans and investment. We have also incorporated the workers' remittance flow as part of FCIs in this analysis, as remittances have been one of the major international financial resources in many developing countries particularly since 1980s. It is now second largest financial inflow after FDI to the developing countries.

Most of the available empirical studies have examined the impacts of aggregate FCI on domestic savings, but there are reasons to believe that various capital inflows can have differential impacts on the domestic savings of the recipient economy. In particular, Papanek (1972) has demonstrated that deriving any conclusion about the effect of any component of FCI, such as aid, it is needed to analyse separately from other components of FCIs. Chen (1977) also notes that the conventional practice of treating all kinds of FCIs as a single entity yields undesirable results as different types of foreign capitals have different (even opposite) impacts on the domestic savings and economic growth of the recipient country.

The purpose of this study is to examine the differential impacts of foreign capital inflows using a panel dataset for 63 developing countries over the period of 1971-2010. Another important element of this study is that the workers' remittance flow has been brought into the broader spectrum of FCI analyses. Moreover, by using the Pesaran's (2006) Common Correlated Effects Mean Group (CCEMG) estimator technique[4], the study attempts to address two major issues related to long panel data analysis of cross-country domestic savings with respect to FCIs: firstly, the presence of cross-sectional dependence which arises due to the unobserved factors that are very much common to all the countries and secondly, parameter heterogeneity. To the best of our knowledge, though some of the recent cross-country panel studies, particularly in the areas of growth, consumption and savings (e.g., Eberhardt and Teal, 2008, 2009; Cavalcanti *et al.*, 2011; Adema and Pozzi, 2012 etc.), use the CCE approaches, so far there is no literature in the panel data analysis with regard to the impacts of FCI on the domestic savings that considers cross section dependence and parameter heterogeneity aspects in the macro panel structure.

[4] The Pesaran's (2006) CCE approaches have further been developed by Kapetanious *et al*., 2011, Pesaran and Tosetti, 2011 and Chudik *et al.,* 2011.

In the study, the conventional homogeneous panel estimation technique shows that out of all FCIs, ODA and remittance flows have significantly negative effects on the domestic savings. FDI and portfolio flows do not have any statistically significant impact on the domestic savings of the developing countries. The coefficient of aggregate FCI is also significant. However, when we account for parameter heterogeneity and cross sectional dependence by employing a heterogeneous panel model viz, the Pesaran's (2006) CCEMG estimator technique to all disaggregated FCIs, only the coefficient of remittances is significant. Other FCIs including ODA are insignificant. Our results broadly support the Haveelmo hypothesis that large FCI displaces the domestic savings.

The remainder of the paper is structured as follows. Section II sheds light on the empirical literature review on the relationships between various types of FCIs and domestic savings. Section III describes model specification and variable construction. The estimation techniques have been spelt out in section IV. The results are presented and discussed in section V. Section VI summarizes the key findings, makes policy inferences and discusses scope of further research in this subject area.[5]

II. Literature Review

There is a large literature on the relations between the foreign capital inflows and the domestic savings, both at country specific and cross-country levels. The available empirical evidence of the impacts of FCI on the domestic savings is mixed. In this regard, Millikan and Rostow (1957) and Rosentein-Rodan (1961) are forerunners in shaping the ideas about the enlightened role of foreign capital inflow on the domestic capital formation. On the other hand, Haavelmo's (1963) hypothesis on the savings function of a typical developing country is pioneer in terms of basing the academic debate on the negative relationships between foreign capital and domestic savings.[6] A number of studies have been carried out to test this hypothesis.

Chenery and Strout (1966) analyse the process of development with external assistance of 31 less developed countries for the period 1957-67 with the help of a theoretical model assuming savings as a binding constraint of growth and conclude that without aid the growth would be potentially lower. Applying the ordinary least square (OLS) regression method on the

[5] For an overview of trends, patterns and volatility analysis of FCIs and domestic savings in the developing countries see the supplementary Appendix B.

[6] Haavelmo (1963) suggests an investment function where he describes that domestic savings could be negative when the capital inflows are large.

Chenery-Strout cross country dataset for 31 less developed countries for the year 1965 Rahman (1968) comes up in support of Haavelmo's hypothesis. Ahmed (1971) classifies 50 countries into four categories. Using OLS estimation he also finds significantly negative relations between capital inflows and domestic savings for each category of countries. However, by using the same dataset of Chenery-Strout for 50 countries Gupta (1970) concludes that inflows of foreign capital actually intensify the domestic savings efforts.

Chenery and Eckstein (1970) find the negative impacts of additional foreign capital on savings in twelve out of sixteen cases. Griffin and Eno (1970) carry out a study with the data for 32 countries for the period 1962-64. Their findings give a more striking inverse relationship between these two variables of interest. Weisskopf (1972) examines the time series evidence of 44 underdeveloped countries for a different range of time period from 1950 to 1966 with regard to impacts of net foreign capital inflow on savings. Upon application of pooled regression he finds highly significant negative relation between these two variables. However, he also points out that when trade constraint is strong, this relation is more likely to be positive. By using data of 1950s for 34 countries and data of 1960s for 51 countries Papanek (1973) finds negative impacts of both total FCI and three disaggregated FCIs (foreign private investment, foreign aid and other capital inflows) on savings. Applying TSLS method to the data of 36 developing countries for the period 1962-64 Over (1975) comes up with positive impacts of FCI on savings. Grinols and Bhagwati (1976) run simulation exercises for Weisskopf's savings functions for 17 LDCs and find some evidence of potential adverse effects of capital inflows on domestic savings. However, they opine that the positive aspects of FCI should be considered in the judgement of whether it is beneficial or not. By applying 2SLS method to the data of seven Asian countries for the period 1956-1971 Chen (1977) comes up with the results that the relation between the private capital inflow and domestic savings is positive while with official inflow it is negative.

By using annual data for the period 1960-1981 for 20 LDCs Bowles (1987) performs the Granger causality test in his bivariate model. In half of the sample, he does not find any causal relationship, in the sense of Granger, between foreign aid and domestic savings. Edwards (1996) also argues that high foreign savings is associated with lower domestic savings by using data of 36 countries for the period 1970-1992. Gruben and McLeod (1996) use panel VAR analysis as well as Granger causality test for identifying the links between the capital flows and growth along with savings for 18 Asian and Latin American developing

countries over the period of 1971-1994 which suggests that this link exists. They also run the TSLS panel regressions and come up with the results that foreign savings such as FDI or equity flows tend to increase the domestic savings of the countries and the impact of portfolio flow is even more consistent. Other types of capital inflows have mixed and often insignificant results. Reinhart and Talvi (1998) use data from 24 countries in Latin America and Asia for the period 1970-1995 and find a negative correlation between foreign and domestic savings for most of the countries in the sample. Uthoff and Titeman (1998) also find negative relation between external and national savings by applying a number of econometric techniques to the data of 19 Latin American countries for the period 1976-1996. Bosworth and Collins (1999a, b) evaluate the implications of both aggregate financial flows and disaggregated flows on domestic investment, savings and current account for 58 developing countries for the period 1978-1995. The regressions result for the aggregate data shows insignificant relation between FCI and savings. With disaggregated FCIs, there is significantly large positive effect of FDI, negative effect of loans and little negative effect of portfolio investment. Yentürk (1999) also shows that a surge in capital inflows adversely affect domestic savings. Waheed (2004) conducts an evaluation of selected studies on FCI-savings nexus which mostly finds negative relationships between FCI and domestic savings. However, he concludes that the results of previous studies are largely controversial mainly due to methodological problems or data limitations.

With regard to remittances, a bunch of empirical studies argue that remittances make little contribution to savings and investment as remittances are mostly used for consumption purposes of the recipients and are spent primarily on imported consumer goods (Ahlburg, 1991; World Bank, 1993; Glytsos, 1993 etc.). Conversely, several studies (Brown, 1997; Brown and Ahlburg, 1999; Connell and Conway, 2000 etc.) show the positive impact of remittances on savings for a number of countries. Another important feature in the area of remittance research is that the micro-level analyses based on household surveys often give opposite (positive) results to those (negative) based on macroeconomic data.

By using an augmented life-cycle model for the Indian data of 1954–1998 Athukorala and Sen (2002) find statistical support (a bit weak) for the view that remittances crowd-out domestic saving performance. Cáceres and Saca (2006) have studied the remittance transmission mechanism of El Salvador for the 1990s and have shown that increased remittance flow has been accompanied by a sharp decline in domestic savings. Osili (2007)

finds that remittances have the potential to contribute to economic development by reducing poverty and providing savings for capital accumulation in the country of origin. By using network theory[7] Grekou (2009) demonstrates that remittances have an ambiguous effect on savings and investments. Zhu *et al.* (2009) applies the 2SLS and quintile regression methods to a cross-sectional survey data of 1500 households from two Chinese provinces in 2006 and finds that the marginal propensity to save from remittances is well below half of that of other sources of incomes.

Ouattara (2009) examines the saving displacement hypothesis by using system GMM approach to the annual data of 97 aid receiving countries for the period 1973-2001 and finds that aid displaces domestic savings; other financial flows do not have significant effect. Das and Serieux (2010) estimate consumption and investment functions for a panel of 36 developing countries for the period 1980 to 2006 by employing the pooled mean group estimator, where they find that ODA and remittances have significantly positive impact while private flows have significantly negative impact on consumption. Morton *et al.* (2010) find a strong negative relation between remittances and domestic savings for the top twenty remittance recipient countries for the year 2008. By using OLS fixed effects and 2SLS techniques to 37 Sub-Saharan Countries over the period of 1980-2004 Balde (2011) finds that remittances and foreign aid have significantly positive impacts on savings of those countries. Sahoo and Dash (2013) study the impact of financial sector development on the domestic savings of five South Asian countries for the period 1975-2010 where they find that foreign savings depress the domestic savings.

Most of the earlier empirical studies and theoretical analyses on FCI focus solely on foreign aid as it was the lion's share of FCI to the developing countries during that time. Previous studies, however, suffer from a number of methodological problems. Most of the earlier literature mis-specifies the savings functions by not including other relevant variables which may yield biased and inconsistent estimates. A number of studies presume the causal relationship between the FCI and savings, but fail to address the reverse causality issue. Many earlier studies are broadly based on the cross-sectional approach which flouts the time-series and panel properties of the data. Even with time series data analysis some studies ignore the potential presence of unit root which may yield spurious regression (Granger and

[7] Network theory emphasizes the role of networks/social connection in determining migration. The presence of a network with already migrated family members, relatives or friends minimizes both the uncertainty of finding a job and the non-economic costs once arrived at destination (Grekou, 2009).

Newbold, 1974). Some studies apply the panel data techniques by using OLS fixed effects, random effects or instrumental variable estimates. While homogeneous panel data models allow intercept to vary across countries, all other parameters assumed to be same. Therefore, all studies in this area fail to control for country heterogeneity and cross-sectional dependence aspects in the panel regression which may lead to misleading estimates. The present paper addresses these two major concerns by using Pesaran's (2006) CCEMG estimator technique.

III. Model Specification and Data Issue

1. Empirical Model Specification

The analytical framework of the domestic savings function for this study is based on the life cycle model (LCM) (Modigliani and Brumberg, 1954; Modigliani, 1970) with appropriate augmentation by incorporating impetus of various FCIs along with some other relevant factors. Though there have been some augmentation as well as many challenges to the LCM over the time, it still remains an important theory in explaining life-cycle pattern of saving behaviour. A sizeable literature, even in recent time, identifies the life cycle factors as key drivers of saving mobilization (e.g., Attanasio and Brugiavini, 2003; Modigliani and Cao, 2004; Ang, 2009; 2011 etc.). From the Keynesian specification we can deduce that, among other things, savings are related to the level of income. But, LCM depicts that saving is related to the changes in the level of income instead of the actual level of income.[8] Therefore, the LCM suggests positive relationship between the per capita GDP growth rate and the domestic savings as income growth increases the lifetime resources and savings of younger-age population compared to older-age population. This relation is also confirmed by a number of studies (e.g., Sing, 1972; Mikesell and Zinser, 1973; Giovannini, 1983, 1985 etc.). However, the relation between growth and savings is also influenced by the age structure of savers.

The LCM suggests that demographic structure of a society might also have strong relationship with saving behaviour. In this regard, age structure of the population is important which can be reflected by population growth as well as share of young- and older- age dependent population

[8] Though there are some evidence of Keynesian 'absolute income hypothesis' (link between consumption and level of income) (eg., Modiglioni, 1993; Hussein and Thirlwall, 1999 etc.), according to the comprehensive review and extensive evidence of savings and growth of developing countries Modigliani (1992) come up with exactly the same conclusion as in 1954 that both income growth and demographic structure are powerful predictors of savings, with little or no role of the level of income.

as a share of working age population of a society. Taking into account of Modigliani's (1986) notion of 'balanced population growth' we can hypothesize that country with faster population growth is associated with higher level of savings rate. With regard to age dependency of population in a country, the dependent strata (early and late age) of population have negative savings, whereas the working-age population have positive savings. Therefore, the individual age dependency ratio is another important determinant of savings function in the LCM.

Another important determinant of savings suggested by the LCM is the real interest rate. However, the net effect of real interest rate on the savings is unclear in the LCM. A number of evidence supports the high interest elasticity of savings' hypothesis (e.g., Fry, 1980; Fry and Mason, 1981; Giovannini, 1983 etc.). However, some empirical studies find little effect of interest rates on savings (e.g., Giovannini, 1985; Gupta, 1987). Willimson (1968) finds the negative relations between real interest rate and the national savings. Following this line of literature on high interest elasticity of savings we can expect that the real interest rate should have positive coefficient as it is perceived that higher interest rate attracts more savings, and vice versa. However, the positive interest elasticity of savings depends on the relative importance of the inter-temporal substitution effect (present price of consumption relative to the future price with regard to change in interest rate) and income effect (change in interest rate adjusts the income level and hence consumption as well as savings). Thus, if the inter-temporal substitution effect dominates income effect, the increase in interest rate will increase the savings rate and vice versa.

To incorporate our variables of interest viz., the disaggregated FCIs (FDI, portfolio investment, ODA and remittance flow) as well as other relevant determinants of domestic savings we have extended the typical LCM. Both theory and evidence suggest that the disaggregated FCIs can have either positive or negative or even insignificant impact on the domestic savings.

Quite a sizeable number of studies (e.g., Van de Stadt *et al.*, 1985; Abel, 1990; Caroll and Weil, 1994; Deaton and Paxson, 1994 etc.) empirically show that consumption does not adjust immediately and hence habit formation play an important role in current and future consumption as well as in savings. Mikesell and Zinser (1973) also argue that savings function is highly dependent on the past saving behavior. Therefore, we use the dynamic

panel savings model[9] by incorporating the lagged dependent variable to account for persistence in savings as an effect of underlying consumption habits.

Income streams are very volatile and uncertain for most households of the developing countries. Therefore, in argument of precautionary motive inflation can be thought as one of proxies for extent of macroeconomic stability as well as economic uncertainty and we can expect negative relation with domestic savings. Deaton (1977) argues that savings may rise with anticipated inflation.

Theoretically we don't need to consider any specific determinant of the Government's savings as Ricardian equivalence[10] demonstrates that higher Government savings crowd out private savings in full amount. However, several empirical evidence (Haque and Montiel, 1989; Corbo and Schmidt-Habbel, 1991) does not find the evidence of complete Ricardian equivalence in the developing country context. Taking the fact into consideration and controlling for government policy we also include Government consumption expenditure variable in our model as one of the important determinants of domestic savings.

Thus, following the augmented LCM on savings function our cross-country domestic savings equation in terms of the different FCIs along with other control variables can be written as:

$$ds_{it} = \alpha_0 + \alpha_1 ds_{i,t-1} + \alpha_2 FCIs_{it} + \alpha_3 OCVs_{it} + \mu_i + \lambda_t + \varepsilon_{it}, \text{ for } i = 1, 2, \ldots, N; \; t = 1, 2, \ldots, T \quad (1)$$

In specific form:

$$ds_{it} = \beta_0 + \beta_1 ds_{i,t-1} + \beta_2 fdi_{it} + \beta_3 port_{it} + \beta_4 oda_{it} + \beta_5 rem_{it} + \beta_6 pcgdpg_{it} + \beta_7 popg_{it} + \beta_8 interestrate_{it} + \beta_9 inf_{it} + \beta_{10} govcon_{it} + \beta_{11} depratio_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

In the above equations ds_{it} refers to the domestic savings as percentage of GDP. The first regressor is the lagged dependent variable which means domestic savings are expected to depend on its own lag, $ds_{i,t-1}$ with $0 < \beta_1 < 1$. The third term on the right hand side of Eq.1 indicates the various components of the foreign capital inflows: foreign direct investment

[9] A number of studies (e.g., Bond, 2002; Chong and Gradstein, 2008 etc.) argue in favour of the dynamic panel model in macro panel analysis as it introduces some dynamism in the model such that the lagged variable controls for the impact of past behaviour of the dependent variable with potential persistent series and it minimizes the possible simultaneity or reverse causation problems.

[10] The proposition is also known as the Barro-Ricardo equivalence. It says that any immediate tax cut by the Government is perceived by the private actors as an increase in taxes in future and therefore, they will increase their current savings to cushion their future tax burden and vice versa. So, the fall in Government savings is fully offset by the rise in private savings and thus there is no impact on the total savings (see also Barro, 1979).

(fdi_{it}), portfolio investment ($port_{it}$), official development assistance (oda_{it}), and remittances (rem_{it}) - all are normalized in terms of GDP. The $OCVs_{it}$ represents other control variables of domestic savings, viz., per capita GDP growth rate($pcgdpg_{it}$), population growth rate ($popg_{it}$), real interest rate ($interestrate_{it}$), inflation (inf_{it}), government consumption expenditure ($govcon_{it}$) and age dependency ratio ($depratio_{it}$). The last three terms on the right-hand side represent unobserved country fixed effects (μ_i), time specific effects (λ_t), and the idiosyncratic error term (ε_{it}), respectively.

2. Sources of Data and Construction of Variables

The study considers 63 developing countries (list of the countries is given in Appendix) for the period 1971-2010 based on the data availability for at least $T = 20$ so that we can use the CCEMG estimator approach. It is an unbalanced macro panel analysis. The main sources of data for this study are the World Development Indicators (WDI) and Global Development Finance (GDF) of the World Bank, International Monetary Fund and UNCTAD database. Some country-specific data sources have also been explored for having some of the missing data. The data on net FDI flow and net portfolio investment flow are collected largely from Balance of Payments (BOP) file of IMF. All FCIs are then normalized in terms of GDP. The domestic savings are calculated as GDP less final consumption expenditure (total consumption). It is measured as the residual from the national accounts statistics in most of the developing countries. Consequently, the measures of domestic savings are associated with large error and omissions. Therefore, the domestic savings data are a bit poorly represented. The portfolio data are very limited with these sources. However, some portfolio data have been derived from the private capital inflow data series of GDF. The remittance data are just official flow of remittances. A large amount of remittance flows through unofficial channels as well as in kinds. So, it is under-reported. The actual workers' remittance flows are much higher. However, there is no other source which can give us with a comprehensive remittance flow data for a long panel like this one. Due to lack of long data series for real interest rate, we derive the real interest rate variable by subtracting inflation rate from the nominal deposit interest rate.[11] The data on Government consumption and population growth rate are from the

[11] Due to large variations in inflation and interest rate data we use winsorization technique at the top and bottom of 5% of these distributions to address the possible outlier problem. Winsorization converts the non-missing vales of a variable in such a way so that the highest and lowest vales are replaced by the next value counting inwards from the extremes; other values remain same.

WDI database. The definition and construction of variables along with the sources of data are given in more details at Table A.1.

IV. Estimation Method

The ordinary least squares (OLS) estimator as well as fixed effects model encounters a number of econometric issues with the large macro panel dataset. As in the dynamic panel data model country-specific effects are most likely correlated with the lagged dependent variable, possible endogeneity of independent variables gives rise to inconsistent estimates (Caselli *et al.*, 1996). The simple OLS fixed effects estimators also ignore the parameter heterogeneity and cross-section dependence across the countries. Though dynamic panel setup minimizes the reverse causality, it cannot fully eliminate the possibility of reverse causality and thus endogeneity problem in the savings specification. As FCIs influence the savings of a country, some types of FCIs might be dependent on the domestic savings as well.[12] It is also likely that the per capita GDP growth affects domestic savings and inversely domestic savings might affect the GDP growth in an economy through the channel of capital accumulation. Thus, regressors might be correlated with the error terms. However, Caroll and Weil (1994) find in their study that GDP growth Granger causes savings, not vice versa. To address the endogeneity problem, **dynamic version of** the Generalised Method of Moment (GMM) estimation, developed by Arellano and Bover (1995) and Blundell and Bond (1998), is used in this study as preferred technique under homogeneous panel analysis. However, 'instrument proliferation' might be a problem with the long time series data. By applying Monte Carlo simulation to the SGMM results Roodman (2009) shows that the symptoms of instruments proliferation tend to become noticeable when $T > 15$. Therefore, GMM approach would not be strong enough in our annual panel analysis. Another drawback of the GMM is that like OLS fixed effects it also assumes identical savings structure for each country which ignores the parameter heterogeneity issue of cross-country panel data analysis. In a panel model, if any explanatory variable is serially correlated itself, the parameter heterogeneity is also associated with serial correlation in the error terms. Consequently, the resulting estimates will be inconsistent, even if GMM is used (Durlauf *et al.*, 2005). The assumption of parameter homogeneity across the countries in all homogeneous

[12] Theory and earlier evidence suggest that foreign capital inflow (foreign savings) can influence the domestic savings of a country. Conversely various FCIs like FDI, portfolio, ODA and remittance might depend on domestic savings. Having a good base of savings in a country may attract more FDI or portfolio investment. ODA sometimes flows to saving deficient countries. Expatriate workers might send more money when their dependents staying in the origin countries are lack of savings etc. These factors may cause reverse causality problem in our domestic savings function.

panel estimations, therefore, yield misleading outcome. A number of macro panel data analyses (Pesaran and Smith, 1995; Pesaran *et al.*, 1999; Haque *et al.*, 1999; Eberhardt and Teal, 2008 & 2009) argue that if the parameter heterogeneity is ignored the regression model will lead to inconsistent estimates and inferences drawn on the basis of those estimates will be misleading.

Another problem with the long panel is the cross-sectional dependence. The usual assumption about the cross-country domestic savings equation is that residuals are uncorrelated across countries. However, countries that are trading partners, closely integrated financially or share geographic proximity are likely to be subject to common shocks, which leads to cross-section correlation in errors. Due to the presence of cross-sectional dependencies OLS fixed effects estimates give us little efficiency gains over estimating each cross-sectional unit's time series individually and statistical inferences might not be correct (De Long and Summers, 1991; and Phillips and Sul, 2007). Moscone and Tosetti (2010) point out that when the data are cross sectionally dependent, the conventional estimates are inefficient and estimated standard error are biased. In the same line of argument GMM estimates are also inconsistent because the moment conditions used by GMM are violated as $N \to \infty$ for fixed T (Sarafidis and Robertson, 2009). Westerlund and Edgerton (2008, p.666) note that:

> …important problem is that the first generation of tests has been unable to handle cross-sectional dependence. When studying macroeconomic and financial data…, cross-sectional dependencies are likely to be the rule rather than the exception, because of strong inter-economy linkages.

A sizeable number of panel data studies have also identified significant cross-sectional dependence problem in the error terms (Robertson and Symons, 2000; Anselin and Moreno 2003; Pesaran, 2004; Hoyos and Sarafides, 2006). Kapetanios *et al.* (2011) argue that when the errors of a panel regression are cross-sectionally correlated, then standard estimation techniques do not necessarily provide consistent estimates. Baltagi (2008) points out that cross-sectional dependence is a problem with macro-panel data with long time series (20-30 years). Pesaran's (2006) Monte Carlo simulation results also show substantial bias and size distortions in case of ignoring cross section dependence. By using CCE approaches Cavalcanti *et al.* (2011) have come up just with the opposite to what majority of studies found about the resource curse paradox.

To address the issues of parameter heterogeneity and cross-section dependence, we apply the Pesaran's (2006) CCEMG estimator technique. In case of allowing for parameter heterogeneity

the CCEMG approach assumes that the slope coefficients are random with independent and identically distributed (IID) deviations from their respective averages. So, the parameter vector of the slope coefficients of the regressions $\beta_j = (\beta_{j1,}\, \beta_{j2} \ldots \beta_{jn})'$ is allowed to be heterogeneous across the countries in our CCEMG framework. The main idea of the common correlated effect estimation is that it filters the individual specific regressors with the help of cross-section aggregates and as $N \rightarrow \infty$ the differential effects of unobserved common factors get eliminated (Pesaran, 2006). Several Monte Carlo simulation experiments (Pesaran, 2006; Coakley *et al.*, 2006; Kapetanios *et al.*, 2011; Pesaran and Tosetti, 2011) and related literature (Everhardt and Teal, 2010; Moscone and Tosetti, 2010) show that the CCE approaches provide robust estimates and inference even with following data characteristics: i) small cross sectional dimension; ii) variables having non-stationarity properties, iii) variables are cointegarted or not; iv) data possess structural break; and v) data experience unobserved common factors along with the business cycle fluctuations. The multifactor CCE approaches also tackle the endogeneity issue that arises due to the presence of common factors as well as minimize the reverse causation because of dynamic panel. Chudik and Pesaran (2013) demonstrate through Monte Carlo experiments that CCE type estimates augmented with sufficient lags and cross section averages perform well even in the case of dynamic panels with weakly exogenous regressors. Our model specification in Eq. 2 can now be expressed with the multifactor error structure as follows:

$$ds_{it} = \beta_0 + \beta_1 ds_{i,t-1} + \beta_2 fdi_{it} + \beta_3 port_{it} + \beta_4 oda_{it} + \beta_5 rem_{it} + \beta_6 pcgdpg_{it} + \beta_7 popg_{it} + \beta_8 interestrate_{it} + \beta_9 inf_{it} + \beta_{10} govcon_{it} + \beta_{11} depratio_{it} + e_{it}$$
$$e_{it} = \mu_i + \Psi'_i f_t + \varepsilon_{it} \qquad (3)$$

Where f_t is $m \times 1$ vector of unobserved common effects with country-specific factor loadings Ψ' and ε_{it} are individual country-specific idiosyncratic errors assumed to be independently distributed.[13] So, CCEMG estimator can be expressed as:

$$\hat{\beta}_{j,CCEMG} = N^{-1} \sum_{i=1}^{N} \hat{\beta}_{ij} \qquad (4)$$

Another advantage with the CCE approaches is that country-specific fixed effects or heterogeneous trend components absorb any omitted variables that are either constant and evolve smoothly over time (Cavalcanti *et al.*, 2011). However, the CCE approach is not

[13] The CCEMG estimator is a simple average of the individual country CCE estimator $\hat{\beta}_{ij}$. The approach can be used by simply applying OLS to the auxiliary regression in augmenting the observed regressors by cross-section (weighed) averages of the dependent variables and individual specific regressors (Pesaran, 2006).

without limitations.[14] Nonetheless, CCE approach asymptotically eliminates both weak and strong forms of cross sectional dependence in large panel series. It gives reasonably efficient outcome particularly for relatively large N and T. Pesaran's (2006) Monte Carlo experiment yields that the roots mean squared errors (RMSE) of the CCEMG is 28.5 per cent higher than that of other mean groups estimations. The heterogeneous parameter models are also more effective estimation techniques compared to the homogeneous counterparts in case of unbalanced dataset due to the averaging of estimates (Eberhardt and Teal, 2010).

Diagnostic Tests: Several diagnostic tests have been performed to our panel dataset with a view to having justification for adopting the heterogeneous panel approach. These include cross section dependence tests, panel unit root tests, Hausman model specification tests and standard F tests. To test the cross-sectional dependence in our panel data we apply Pesaran's (2004) cross-sectional dependence (CD) test. It provides the average of pairwise correlations of the OLS residuals of individual country specific regressions.[15] A number of other methods (Bai and Ng, 2002, 2004; Moscone and Tosetti, 2009, 2010) are also used in the literature in identifying the cross section dependence in a data series, but none perform better than Pesaran's CD test (Everhardt, 2011). Several panel unit root tests (e.g., Levin-Lin-Chu test, Harris-Tzavalis test, Breitung test, Im-Pesaran-Shin test, Fisher-type tests, Hadri LM stationarity test, Maddala and Wu test) have been advanced to find out the unit root properties of the panel data. However, these first generation panel unit root tests fail to account for cross sectional dependence properties. Therefore, these are not effective in identifying stationarity behaviour of the variables that are cross-sectionally correlated. Baltagi *et al.* (2007) argue that the first generation panel unit root tests which can't control for cross sectional dependence are generally subject to considerable size distortions and hence the tests tend to over-reject. Then the second generation panel unit root tests, advanced by Pesaran (2007) and Pesaran, Smith and Yamagata (2009, 2013), come into being to identify the unit root properties allowing for

[14] Some major drawbacks associated with CCE approaches are: i) individual country-specific regressors and common factors are assumed as exogenous in this estimation procedure which may be subject to some endogeneity bias; ii) CCE pooled version estimators may yield asymptotic bias in case of dynamic homogeneous panel models (Everaert and Groote, 2012); and iii) though Pesaran (2006) claims that CCE estimators have satisfactory small sample properties, this approach is not effective for a panel data analysis with small T. Pesaran's (2006) Monte Carlo simulation also indicates that the efficiency of CCE estimation requires at least $T = 20$.

[15] The formula for Pesaran's (2004) CD(ρ) test for unbalanced panel can be derived as:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \sqrt{T_{ij}}\hat{\rho}_{ij}\right)$$

With $\hat{\rho}_{ij}$ being the correlation coefficient of the regression residuals between *i*th and *j*th cross-section units and T_{ij}=# ($T_i \cup T_j$). Under the null hypothesis of no cross-sectional dependence $CD \sim N(0, 1)$ for $T_i > k+1$, $T_{ij} > 3$, and sufficiently large *N*. For more detail see also Pesaran (2004).

cross section dependence. This paper examines the unit root properties of the variables by using both first generation and second generation tests for comparative analysis. The Hausman model specification tests have also been performed to ascertain whether our dataset are well-suited with homogenous or heterogeneous techniques. We also carry out the *F* tests of our estimations following Pedroni (2007), Pesaran & Yamagata (2008) and Eberhardt & Teal (2010).[16]

V. Econometric Results Analysis

At the outset of our econometric analysis, we perform the pairwise and partial correlation analyses of the variables along with the volatility.[17] The Pesaran's (2004) CD tests show that cross section correlations of individual variables are statistically significant in most of the cases. To identify the stationarity properties of our variables we use one first generation panel unit root test (Maddala and Wu (1999) (MW)) and one second generation unit root test (Pesaran's (2007) CIPS test) for a comparative analysis. As mentioned earlier, the first generation unit root tests fail to control for CD properties of the variables. The first generation panel unit root tests provide with the information that no variable has unit root. However, the second generation tests identify remittances, population growth rate, government consumption and dependency ratio variables as non-stationary, mainly due to the presence of cross section association among the unobserved common factors.[18] Therefore, there is no econometric problem if we employ the conventional homogeneous panel approaches to our level data considering the first generation unit root tests. However, as CD is prevalent in our data series and the second generation panel unit root tests provide us with some non-stationary variables, without controlling for CD our homogeneous model would yield spurious regression. On the

[16]They propose the following formula for *F*:
$F = \left(\frac{RSS_{hom} - RSS_{hetro}}{RSS_{hetro}}\right)\left(\frac{df_D}{df_N}\right)$
$F \sim (df_N, df_D)$
Where, $df_N = k \times (n-1)\ and\ \ df_D = N(\bar{T} - k - 1)$.
Here, RSS_{hom} and RSS_{hetro} are the sums of the squared residuals of the corresponding homogeneous and heterogeneous regression models, respectively obtained under the null ($\beta_i = \beta$) and the alternative hypothesis. The k and n indicate the number of parameters in each regression specification and number of cross sectional units, respectively. The *F* is distributed with $k \times (n-1)$ and $N(\bar{T} - k - 1)$ degrees of freedom.

[17] The correlation analysis shows that except portfolio investment the correlation between domestic savings and aggregate FCI as well as other disaggregated FCIs are negative (Table B.4). However, the partial and semi-partial correlations of domestic savings with disaggregated FCIs demonstrate that only remittance and ODA inflows have significant negative associations (Table B.5). The volatility measures indicate the largest volatility in the portfolio inflow (the coefficient of variation is 559.12). The remittance inflow seems to be more volatile than FDI and ODA here. The coefficients of variation of remittance, FDI and ODA inflows are 224.26, 173.61 and 148.07, respectively (descriptive statistics are shown in Table B.6).

[18] The results of CD and panel unit root tests are reported in Appendix B (Table B.7 and B.8, respectively).

other hand, even with the non-stationary properties of some variables the heterogeneous panel model can be used without flaws. Coakley *et al.* (2006) point out that if the process of underlying cross section factors is non-stationary, the individual regressions will be spurious but pooling or averaging across individual estimates still provide consistent estimation. Kapetanios *et al.* (2011) run several Monte Carlo simulation experiments and conclude that CCE estimates in general provide the same results irrespective of the order of integration of the data observed.

As the preferred homogeneous technique, we have applied SGMM.[19] This two-step SGMM estimation also include the Arellano-Bond test for autocorrelation of $A(1)$ and $A(2)$ as well as Hansen's over-identifying restrictions (J) tests. Regression model is analysed within the framework of two major specifications: one with aggregate FCI and another with different components of FCIs along with other relevant control variables. In the SGMM specification, coefficient of total FCI variable is negatively significant even at 1 per cent level (Table 1). In the set of specifications of disaggregated FCIs, coefficients of ODA and remittances are negatively significant, whereas coefficients of FDI and portfolio inflows are not significant even at 10 per cent level. The regression yields the same results when we incorporate all components of FCIs in a single regression specification. Among other control variables, per capita GDP growth has significantly positive impacts on domestic savings in all cases, interest rate has significantly negative relation in most of the specifications. The coefficient of lagged dependent variable is also highly significant. Coefficients of other variables are mostly insignificant. Though $A(2)$ and J tests indicate a good fit of our model, SGMM is not suitable for long time series panel data study like this one (see, Roodman, 2009). However, the most striking feature in all regression specifications is that the CD tests are highly significant. This means we reject the null hypothesis of cross-section independence. Thus the CD tests provide us with the information that our macro panel data models experience a substantial cross-sectional dependence which might give us biased and inconsistent estimates if we do not take it into account in our regression model.

<<Table 1 about here>>

As preferred estimation technique we apply the Pesaran's (2006) CCEMG estimator technique to our cross-country panel data series as a means of controlling for parameter heterogeneity

[19] All regressors are considered as endogenous variables and second lag length of these variables has been used as internal instruments in the SGMM.

and cross section dependence along with allowing for non-stationary properties. The results of CCEMG estimation (Table 2) show that only remittance inflow has significantly negative impacts on the domestic savings of the developing countries when we control for all disaggregated FCIs. Unlike the homogeneous approach (SGMM) ODA coefficient is insignificant. And per capita GDP growth rate does have significantly positive effect on the domestic savings. The significant coefficient of lagged domestic savings in five specifications indicates the process of savings formation behaviour in the economies i.e., current saving is positively dependent on past savings and the significant negative coefficient of government consumption doesn't support the hypothesis of complete Ricardian equivalence. Coefficient of inflation is significant in a number of regressions. Though coefficient of portfolio investment is significant in individual specification like earlier specifications with SGMM, coefficients of FDI and portfolio under CCEMG remain insignificant in the final specification. Moreover, in the CCEMG the coefficients of lagged dependent variables are much lower while the coefficients of remittances are much higher compared to those of SGMM.

<<Table 2 about here>>

The performed CD tests to all the specifications under CCEMG framework show that we fail to reject the null hypothesis of cross section independence in all cases even at 10 per cent level of significance. The Hausman model specification tests (detailed results are in Table A.2) between different sets of homogeneous and heterogeneous approaches strongly indicate that the parameter homogeneity is rejected in this dataset and CCEMG is better approach even than other heterogeneous techniques. The computed *F*-statistics (Table A.3) also reject the parameter homogeneity even at 1% level of significance. Therefore, it is evident from the above analysis that the CCEMG framework addresses the cross section dependence issue along with allowing parameter heterogeneity and provides us with the unbiased and consistent estimates.

Robustness Checks: We also perform a number of robustness checks to our heterogeneous models. We employ two heterogeneous panel approaches to our macro dataset: 1) Pesaran's (2006) Common Correlated Effects Pooled (CCEP) estimator and 2) the Augmented Mean Group (AMG) estimation technique (developed by Bond and Eberhardt, 2009 and Eberhardt and Teal, 2010). Both techniques are supposed to account for cross-section dependence. The AMG controls for CD by including a common dynamic process in the coefficients of cross sectional unit regressions. Though CCEP allows the slope coefficients of the common effects

(whether observed or not) to differ across cross section units, main parameters are assumed to be same. The cross sectional group-specific AMG estimates which are averaged across the panel can be expressed as under:

$$\hat{\beta}_{j,AMG} = N^{-1} \sum_{i=1}^{N} \hat{\beta}_{ij} \quad (5)$$

Bond and Everhardt (2009) compare the performance of AMG and CCEMG techniques through Monte Carlo simulations and they find robust results in case of both estimation approaches.

The CCEP results show that aggregate FCI, individual FDI and ODA coefficients are significant. However, when we include all disaggregated FCIs, the coefficients of ODA and remittances become significant like SGMM estimator (Table A.4). The coefficients of lagged domestic savings, per capita GDP growth, inflation, Government consumption and dependency ratio are also significant here. Everhardt (2011) demonstrates that in case of CCEP estimator bootstrapping can give robust t ratios. However, bootstrapping procedures can't be done here due to insufficient number of observations. Therefore, the t ratios might be unreliable. Some of the regressions do not pass the CD test even. Additionally, CCEP doesn't control for full heterogeneity. The F test results also give very small critical values. The AMG technique provides with the results that coefficients of aggregate FCI, individual ODA and remittances are significant (Table A.5). However, when we incorporate all types of FCIs together only remittance flow has significantly negative impact on domestic savings like CCEMG. Among other control variables, the coefficients of lagged domestic savings, per capita GDP growth and the government consumption are significant in all specifications. However, the CD tests mostly reject the null hypothesis of cross sectional independence. It is evident from CCEP and AMG estimations that coefficients of remittances are much higher in CCEMG compared to those of these estimations.

To check further robustness of our results, finally, we perform the residual-based panel cointegration tests for the CCEMG model. We use both pesaran's (2007) cross-sectionally Augmented Dickey-Fuller (CADF) test as well as the IPS test developed by Im, Pesaran and Shin (2003) to the residuals ($\hat{e}_{it}$) of the CCEMG estimations. To find the panel cointegration test results, we have to examine whether the residuals ($\hat{e}_{it}$) possess the unit root or not. The set of augmented Dickey-Fuller regressions can be written of the following form:

$$\Delta e_{it} = \theta_i e_{i,t-1} + Z'_{it}\tau_t + \sum_{j=1}^{k} \pi_{ij} \Delta e_{i,t-j} + \epsilon_{it} \quad (6)$$

Here, Δ is the first difference operator, θ is panel-specific and indexed by i. Im *et al.*(2003) also assume that white noise disturbance term ϵ_{it} is independently distributed normal for all i and t and have heterogeneous variance, ${\sigma_i}^2$ across the panels. The CADF tests controls for cross section correlation. The null hypothesis of panel unit root is defined as: $\theta_i = 0$ for all i. In other words, all panels contain the unit roots. The CADF and IPS panel cointegration test results are reported in Table 3 which reject the null hypothesis of no cointegration for all specifications of CCEMG estimation even at 1% level of significance (with augmentation orders, $\rho = 0,1,2\ and\ 3$) except last specification with order 3. Therefore, the panel cointegartion tests strongly confirm the presence of statistically significant cointegrating relationships among the domestic savings, various FCIs and other control variables in our model. This cointegration test results are important particularly with regard to endogeneity issue as the asymptotic theory for regressions with integrated processes, developed by Phillips and Daurlaf (1986), mathematically proves that linear regression amongst the cointegarting variables eliminates the simultaneous equations bias or measurement error bias, at least asymptotically, for integrated processes.

<<Table 3 about here>>

From specification 6 of CCEMG estimation (last column of Table 2) we see that the estimated coefficient of remittance inflow is -1.215 and significant at 1 per cent level, *ceteris paribus*, which means that one percentage point increase in remittance inflow (as % of GDP) crowds out the domestic savings by about 1.215 percentage point. One percentage point increase in per capita GDP growth increases the domestic savings by 0.106 percentage point. In addition, one percentage point increase in Government consumption expenditure is associated with 0.41 percentage point reduction in domestic savings, *ceteris paribus*. Other coefficients are insignificant. It is also evident that almost all coefficients except coefficient of remittances are lower in specification 6. Overall, our findings are opposite to that of a bunch of studies in this area (e.g., Gupta, 1970; Over, 1975; Gruben and Mcleod, 1996; Balde 2011). Moreover, most of these studies are with limited coverage in terms of time and data; cross-sectional in nature, flawed regression specification and methodological problems which have been addressed in our study.

Our study broadly supports the Haavelmo's hypothesis regarding negative relation between FCIs and domestic savings when we include the remittances as one of the component of FCI. However, the hypothesis just considers the foreign aid as FCI which does not have significant relation with domestic savings in the CCEMG framework. Moreover, by disaggregating FCIs we observe the differential impacts of FCIs on domestic savings. Only remittance inflow contributes to the displacement of domestic savings when we control for parameter heterogeneity and cross sectional dependence properties of data. Other inflows do not have any statistically significant impacts on the domestic savings of developing countries under study. The negative relationship between remittances and domestic savings indicate the degree of substitutability between FCI and domestic savings. It also reveals that a chunk of FCIs are used for consumption purposes. Increased FCIs might increase the Government consumption expenditure without increasing any tax efforts. And in case of remittance flow in particular, the households, the ultimate users of it, might think the remittances as social insurance to the family meaning without remittances they might do the precautionary savings, but whenever they have remittances they might feel secured and use the money as consumption purposes. This effect is in line with the buffer-stock savings model (Deaton, 1991, Browning and Lusardi, 1996). Another possible reason is that the demonstration effect[20] might work among the remittance recipient families and thus increase the consumption level as income grows. OECD (2006) notes that one of the main reasons of negative effect of remittances on economic performance is moral hazard problem as the remittances take place under asymmetric information and economic uncertainty.

Some other hypotheses of consumption such as the random walk hypothesis (Hall, 1978), liquidity or borrowing constraints proposition (Campbell and Mankiw, 1989; Zeldes, 1989 and Shea, 1995) and durable goods expenditure effect also give us thoughtful insights in explaining the reduction of savings due to increase in FCI.[21] The random walk hypothesis tells us that an unexpected change in income usually change the agents' (e.g., households) expectation about the present value of future or lifetime income stream and thereby their consumption pattern goes up and down. The liquidity constraints hypothesis tells us that some agents are subject to liquidity constraints and temporary change in income might cause larger change in consumption. Zeldes (1989) finds strong evidence of liquidity constraints among the low income households. And relaxing this constraint might reduce the savings (Schmidt-Hubbel *et.*

[20] Emulation of consumption patterns of higher income-groups by the lower income-groups.

[21] See also Romer (2006) for further details.

al., 1992; and Jappelli and Pagano, 1994). Another explanation for the overall changes in consumption due to increase in remittance income might be associated with the more expenditures on durable goods. These theories tell us why consumption increases (savings fall) due to increase in income in terms of remittance inflow. Portfolio flow is negligible in most of the countries for a long time under study.

From the analysis above, three broad conclusions can be drawn: i) remittance flow should be considered as an integral part of any analysis of foreign capital flows particularly in the context of developing countries; ii) drawing any conclusion or policy decision about the effects of FCIs on the basis of aggregate FCI is misleading as various types of FCIs have differential impacts on the recipient economy; and iii) in large macro panel data analysis it is crucial to control for parameter heterogeneity and cross-sectional dependence, otherwise model might be biased and inconsistent.

VI. Concluding Remarks and Scope of Further Research

The present study applies the Pesaran's (2006) CCEMG estimator technique to the annual panel data of 63 developing countries for the period 1971-2010 to examine the effects of different FCIs on the domestic savings. The findings suggest that only remittance flow displaces domestic savings in the developing countries while other flows don't have statistically significant impacts in crowding-out or crowding-in domestic savings when we control for parameter heterogeneity and cross sectional dependence properties of large macro panel dataset. There is also evidence that ignoring parameter heterogeneity and cross section dependence of the long macro panel structure potentially yields biased and misleading estimates. The robustness of the CCEMG results is supported by battery of robustness checks.

It is also evident from the study that the foreign capital inflows are not unmixed blessings. The relevant Government should prioritize the various types of foreign capital flows in welcoming those in the country considering the net benefits of each flow in terms of domestic savings, investment, economic growth and other impacts so that the development trap due to large FCIs can be avoided. The policy should be designed in such a way that these capital inflows complement, rather than compete with, domestic savings. The foreign exchange proceeds should be used more on imports of capital goods rather than imports of consumption goods. Prudent fiscal and expenditure policies are required to reap benefit of FCI. Continuous income growth needs to be ensured to have sustained increase in domestic savings. Interest rate does

not seem to be good policy instrument for savings mobilization. Overall, the findings of the study provide general guidelines for assessing the differential impacts of FCIs on the domestic savings of a developing country.

The findings of a cross-country analysis of this nature should not, however, be taken as rule of thumb in designing policies in the individual country context. Even when data limitations and methodological issues are ignored, cross-country studies are only a means of testing the validity of generalizations. In order to having informed policy making in the individual country context, it is necessary to undertake country-specific case-studies to supplement cross-country analysis to obtain a comprehensive account of the underlying growth process and the related social, political, and institutional aspects. With respect to CCE approaches further research is needed about how these techniques can be used efficiently for short panel analysis. In other words, improvement on the small sample properties of CCE approaches for the heterogeneous panel data models deserve further exploration.

Tables:

Table 1: System GMM (SGMM) Estimation: Differential Impacts of FCIs on Domestic Savings

Independent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
ds (t-1)	0.807***	0.801***	0.863***	0.764***	0.798***	0.618***
	(14.65)	(19.27)	(14.96)	(18.06)	(20.34)	(9.18)
Total FCI	-0.181***					
	(4.22)					
FDI		-0.003				-0.022
		(0.05)				(0.346)
Portfolio Investment			0.047			-0.037
			(0.362)			(0.226)
ODA				-0.194***		-0.192***
				(4.257)		(3.241)
Remittances					-0.172***	-0.200**
					(4.017)	(2.439)
Per capita GDP Growth	0.276***	0.259***	0.245***	0.261***	0.289***	0.249***
	(3.799)	(3.275)	(2.916)	(4.314)	(3.673)	(3.912)
Population Growth	0.243	0.335*	0.315	0.282	0.247	0.057
	(1.499)	(1.672)	(1.485)	(1.638)	(1.148)	(0.270)
Interest Rate	-0.092**	-0.0947**	-0.105***	-0.095**	-0.073**	-0.059
	(2.336)	(2.118)	(2.734)	(2.637)	(2.337)	(1.486)
Inflation	0.015	0.020	0.005	0.019	0.045**	0.035
	(0.522)	(0.789)	(0.199)	(0.916)	(2.338)	(1.016)
Government	-0.086	-0.015	-0.071	-0.084	0.057	-0.066
Consumption	(0.959)	(0.143)	(0.721)	(0.811)	(0.935)	(0.481)
Dependency Ratio	-0.041*	-0.049**	-0.026	-0.017	-0.062***	-0.037
	(1.839)	(2.113)	(1.410)	(0.719)	(2.991)	(0.925)
Observations	1,782	1,925	1,832	1,907	1,849	1,782
N	63	63	63	63	63	63
T [Min, $\bar{T}$, Max]	[20, 28.3 37]	[20, 30.6 39]	[20, 29.1 37]	[20, 30.3 39]	[20, 29.4 37]	[20, 28.3 37]
$AR(2)$ test (p-value)	0.709	0.481	0.718	0.626	0.504	0.806
Hansen J test (p-value)	0.285	0.251	0.299	0.392	0.22	0.176
No. of instruments	61	62	61	63	61	59
CD Test Statistic	6.26	5.94	6.98	6.04	5.90	4.54
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\lvert\overline{\boldsymbol{\rho}}\rvert$	0.188	0.18	0.184	0.186	0.184	0.218

Notes: *** , **, and * denote the level of statistical significance at 1, 5, and 10 per cent. Numbers in parentheses are the absolute values of the robust t-ratio. CD test refers to the Pesaran's (2004) test for cross-section dependence under the null hypothesis of cross-section independence where $\lvert\overline{\boldsymbol{\rho}}\rvert$ gives the average value of absolute correlation coefficients.

Table 2: Common Correlated Effects Mean Group (CCEMG) Estimation: Differential Impacts of FCIs on Domestic Savings

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
ds (t-1)	0.224***	0.170***	0.203***	0.247***	0.150***	0.0432
	(4.397)	(4.002)	(5.138)	(5.921)	(3.285)	(0.676)
Total FCI	-0.063					
	(1.078)					
FDI		0.114				0.130
		(1.625)				(1.175)
Portfolio			-0.350***			-0.031
Investment			(2.985)			(0.175)
ODA				-0.188		-0.086
				(1.585)		(0.656)
Remittances					-0.693**	-1.215***
					(2.055)	(3.170)
Per capita GDP	0.151***	0.161***	0.130***	0.167***	0.167***	0.106**
Growth	(4.069)	(3.922)	(3.197)	(4.311)	(4.170)	(1.94)
Population Growth	3.196***	-1.641	1.646	-1.634	-0.681	-0.863
	(2.856)	(0.872)	(1.233)	(1.120)	(0.624)	(0.897)
Interest Rate	0.034	0.02	0.021	0.05	-0.048	0.08
	(0.655)	(0.370)	(0.363)	(0.822)	(0.712)	(0.769)
Inflation	0.119**	0.135***	0.099*	0.113**	0.017	0.118
	(2.103)	(2.673)	(1.739)	(2.307)	(0.228)	(1.157)
Government	-0.501***	-0.500***	-0.413***	-0.497***	-0.584***	-0.410***
Consumption	(4.727)	(4.248)	(3.686)	(4.412)	(5.622)	(2.789)
Dependency Ratio	-0.088	0.013	0.051	-0.175	-0.076	-0.285
	(0.507)	(0.079)	(0.357)	(1.062)	(0.379)	(0.941)
Country Specific Effects	Yes	Yes	Yes	Yes	Yes	Yes
Common Factors	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,782	1,925	1,832	1,907	1,849	1,782
N	63	63	63	63	63	63
T [Min, $\bar{T}$, Max]	[20, 28.3 37]	[20, 30.6 39]	[20, 29.1 37]	[20, 30.3 39]	[20, 29.3 37]	[20, 28.3 37]
CD Test Statistic	-1.32	0.85	-1.58	0.07	0.52	1.62
(p-value)	(0.187)	(0.393)	(0.113)	(0.942)	(0.601)	(0.104)
$\lvert\overline{\boldsymbol{\rho}}\rvert$	0.205	0.188	0.195	0.185	0.193	0.218

Notes: *** , **, and * denote the level of statistical significance at 1, 5, and 10 per cent. Numbers in parentheses are the absolute values of the robust z-ratio. CD test refers to the Pesaran's (2004) test for cross-section dependence under the null hypothesis of cross-section independence where $\lvert\overline{\boldsymbol{\rho}}\rvert$ gives the average value of absolute correlation coefficients.

Table 3: Residual-based Panel Cointegration Tests of CCEMG Model

Reg.	CADF test				IPS test			
	ADF(0)	ADF(1)	ADF(2)	ADF(3)	ADF(0)	ADF(1)	ADF(2)	ADF(3)
1	-34.04***	-22.17***	-16.68***	-8.14***	-45.48***	-27.96***	-22.11***	-16.04***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	-33.94***	-24.95***	-16.65***	-11.22***	-45.16***	-31.60***	-23.3***	-17.76***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	-33.89***	-21.95***	-16.68***	-9.63***	-45.42***	-29.63***	-23.39***	-17.37***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
4	-33.31***	-23.67***	-16.42***	-11.08***	-43.16***	-30.25***	-22.16***	-17.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
5	-34.37***	-24.34***	-17.55***	-11.00***	-46.21***	-30.29***	-23.43***	-17.42***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
6	-16.85***	-10.97***	-4.47***	-0.49	na	na	na	na
	(0.00)	(0.00)	(0.00)	(0.688)				

Notes: The CADF test provides standardized z-t-bar statistic, whereas IPS test provides w-t-bar statistic with the standardized *p*-values (in the parentheses). *** , **, and * denote the level of statistical significance at 1, 5, and 10 per cent. Na=not available because of insufficient number of time periods to compute w-t-bar. The underlying regression specifications used here are as same as Table 2.

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Appendix A:

Table A.1: Definition and Construction of Variables

Variable	Definition and Construction	Source
Gross Domestic Savings	Gross domestic savings (as % of GDP). It is calculated as GDP minus final consumption expenditure (total consumption)	WDI and GDF African development Bank African Development Fund
Total FCI	Summation of FDI, Portfolio flow, ODA and Remittances (As % of GDP)	Author's calculation with data from WDI and GDF; and Balance of Payments Statistics of International Monetary Fund
FDI, net	Net FDI flow in the country (Bop, current US$) (As % of GDP)	Author's calculation with data from WDI and GDF; and Balance of Payments Statistics of International Monetary Fund
Portfolio Investment, net	Portfolio Investment (excludes financial derivatives), Net (Bop, current US$) (As % of GDP)	Author's calculation with data from WDI and GDF; UnctadStat, UNCTAD; and some country-specific data sources along with the Balance of Payments Statistics of International Monetary Fund
ODA	Official development assistance both loans and grants (As % of GDP)	Author's calculation with data from WDI and GDF, OECD and UNCTAD
Remittances	Current US$ (as % of GDP) Workers' remittances and compensation of employees comprise current transfers by migrant workers and wages and salaries earned by non-resident workers.	WDI and GDF; UnctadStat, UNCTAD; and some country-specific data sources
Per Capita GDP Growth	Growth rate of real per capita GDP (annual %)	WDI and GDF
Population Growth Rate	Average annual growth (in %)	WDI and GDF
Real Interest Rate	Real interest rate (%) is derived from the deposit interest rate by subtracting the inflation rate of corresponding year from that rate. Winsorization technique is used at the top and bottom of 5%.	WDI and GDF, IMF, and some country-specific sources like Reserve Bank of India, Trading Economy.Com, National Bank of Ethiopia, Reserve Bank of Fiji and Central Bank of Tunisia, CAPAL
Inflation	(GDP Deflator) (Annual %) It is measured by the annual growth rate of the GDP deflator that shows the rate of price change in the economy as a whole. Winsorization technique is used at the top and bottom of 5%.	WDI and GDF
Government Consumption	Government consumption expenditure as a share of GDP (in %)	WDI
Dependency Ratio	(% of working-age population) The ratio of dependents (people younger than 15 or older than 64) to the working-age population (those ages 15-64).	WDI

Table A.2: Hausman Model Specification Tests

Fixed Vs. POLS		SGMM Vs. Fixed		CCEMG Vs. SGMM		AMG Vs. SGMM		CCEMG Vs. CCEP		CCEMG Vs. AMG	
χ^2 statistic	p-value	χ^2 statistic	p-value	χ^2 statistic	p-value	χ^2 statistic	p-value	χ^2 statistic	p-value	χ^2 statistic	p-value
292.18	0.00	17.06	0.106	108.67	0.00	211.52	0.00	24.47	0.01	18.66	0.06

Note: The null hypothesis of the test is difference in coefficients not systematic. The underlying model for this test is the complete model specification of Eq.2.

Table A.3: Parameter Heterogeneity: *F* Test

Reg. Specification	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CCEMG						
F	9.45	7.02	8.52	7.14	7.21	18.22
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Distribution	*F*(558, 1152.9)	*F*(558, 1297.8)	*F*(558, 1203.3)	*F*(558, 1278.9)	*F*(558, 1215.9)	*F*(558, 1215.9)
CCEP						
F	1.01	0.83	0.87	0.91	0.83	0.87
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Distribution	*F*(558, 1152.9)	*F*(558, 1297.8)	*F*(558, 1203.3)	*F*(558, 1278.9)	*F*(558, 1215.9)	*F*(558, 1215.9)
AMG						
F	2.61	2.44	2.50	2.53	2.50	2.65
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Distribution	*F*(558, 1152.9)	*F*(558, 1297.8)	*F*(558, 1203.3)	*F*(558, 1278.9)	*F*(558, 1215.9)	*F*(558, 1215.9)

Note: The *F* statistic is constructed on the basis of models of Table 2 in comparison with fixed effects models as homogeneous technique. The null hypothesis is parameter homogeneity.

Table A.4: Common Correlated Effects Pooled (CCEP) Estimation: Differential Impacts of FCIs on Domestic Savings

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
ds (t-1)	0.356***	0.367***	0.385***	0.358***	0.319***	0.277***
	(14.38)	(16.00)	(15.53)	(15.84)	(12.94)	(10.23)
Total FCI	-0.161***					
	(5.939)					
FDI		0.099**				0.023
		(2.373)				(0.464)
Portfolio			-0.012			-0.019
Investment			(0.053)			(0.071)
ODA				-0.242***		-0.211***
				(6.369)		(4.923)
Remittances					-0.101	-0.214**
					(1.351)	(2.365)
Per capita GDP	0.189***	0.214***	0.207***	0.202***	0.193***	0.155***
Growth	(7.123)	(8.104)	(7.684)	(7.732)	(7.300)	(5.553)
Population Growth	0.191	0.189	0.203	0.196	0.290	-0.295
	(0.731)	(0.738)	(0.800)	(0.762)	(1.032)	(0.969)
Interest Rate	0.017	0.003	0.01	0.001	0.024	0.046
	(0.656)	(0.133)	(0.360)	(0.376)	(0.855)	(1.645)
Inflation	0.116***	0.128***	0.111***	0.121***	0.129***	0.133***
	(5.264)	(5.830)	(5.077)	(5.537)	(5.370)	(5.385)
Government	-0.592***	-0.444***	-0.525***	-0.459***	-0.633***	-0.582***
Consumption	(9.159)	(7.330)	(8.235)	(7.784)	(9.385)	(7.624)
Dependency Ratio	-0.277***	-0.173**	-0.305***	-0.262***	-0.254***	-0.377***
	(2.971)	(1.987)	(3.426)	(3.095)	(2.725)	(3.674)
Country Specific Effects	Yes	Yes	Yes	Yes	Yes	Yes
Common Factors	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,782	1,925	1,832	1,907	1,849	1,782
N	63	63	63	63	63	63
T [Min, $\bar{T}$, Max]	[20, 28.3 37]	[20, 30.6 39]	[20, 29.1 37]	[20, 30.3 39]	[20, 29.3 37]	[20, 28.3 37]
R^2	0.830	0.801	0.811	0.810	0.816	0.867
CD Test Statistic	-1.65	-1.65	-1.84	-2.47	-1.39	-0.47
(p-value)	(0.098)	(0.098)	(0.066)	(0.014)	(0.164)	(0.637)
$\lvert\overline{\rho}\rvert$	0.221	0.221	0.217	0.204	0.209	0.23

Notes: *** , **, and * denote the level of statistical significance at 1, 5, and 10 per cent. Numbers in parentheses are the absolute values of the t-ratio. CD test refers to the Pesaran's (2004) test for cross-section dependence under the null hypothesis of cross-section independence where $\lvert\overline{\rho}\rvert$ gives the average value of absolute correlation coefficients.

Table A.5: Augmented Mean Group (AMG) Estimation: Differential Impacts of FCIs on Domestic Savings

Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
ds (t-1)	0.321***	0.343***	0.354***	0.362***	0.315***	0.253***
	(9.139)	(10.08)	(9.472)	(11.62)	(8.574)	(6.547)
Total FCI	-0.084**					
	(2.168)					
FDI		-0.01				0.0436
		(0.155)				(0.613)
Portfolio Investment			0.02			-0.0732
			(0.102)			(0.409)
ODA				-0.258***		-0.123
				(2.86)		(1.095)
Remittances					-0.375**	-0.357**
					(1.95)	(2.181)
Per capita GDP Growth	0.143***	0.128***	0.129***	0.125***	0.135***	0.105***
	(4.293)	(3.906)	(3.406)	(3.987)	(4.469)	(3.015)
Population Growth	0.596	0.015	0.498	0.191	0.907	0.976
	(0.693)	(0.0174)	(0.567)	(0.246)	(1.297)	(1.249)
Interest Rate	-0.01	-0.019	-0.03	-0.004	-0.01	-0.019
	(0.236)	(0.492)	(0.797)	(0.119)	(0.212)	(0.445)
Inflation	0.071*	0.061*	0.043	0.043	0.053	0.034
	(1.742)	(1.821)	(1.242)	(1.346)	(1.251)	(0.854)
Government Consumption	-0.388***	-0.414***	-0.389***	-0.334***	-0.520***	-0.589***
	(4.166)	(4.110)	(3.757)	(3.247)	(4.910)	(5.232)
Dependency Ratio	0.064	-0.017	0.034	-0.044	-0.019	0.114
	(0.864)	(0.226)	(0.442)	(0.598)	(0.260)	(1.179)
Country Specific Effects	Yes	Yes	Yes	Yes	Yes	Yes
Common Factors	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,782	1,925	1,832	1,907	1,849	1,782
N	63	63	63	63	63	63
T [Min, $\bar{T}$, Max]	[20, 28.3 37]	[20, 30.6 39]	[20, 29.1 37]	[20, 30.3 39]	[20, 29.3 37]	[20, 28.3 37]
CD Test Statistic	2.30	2.19	1.19	1.68	4.04	1.95
(p-value)	(0.021)	(0.029)	(0.235)	(0.093)	(0.00)	(0.052)
$\lvert\overline{\rho}\rvert$	0.173	0.163	0.169	0.164	0.168	0.176

Notes: *** , **, and * denote the level of statistical significance at 1, 5, and 10 per cent. Numbers in parentheses are the absolute values of the robust t-ratio. CD test refers to the Pesaran's (2004) test for cross-section dependence under the null hypothesis of cross-section independence where $\lvert\overline{\rho}\rvert$ gives the average value of absolute correlation coefficients.

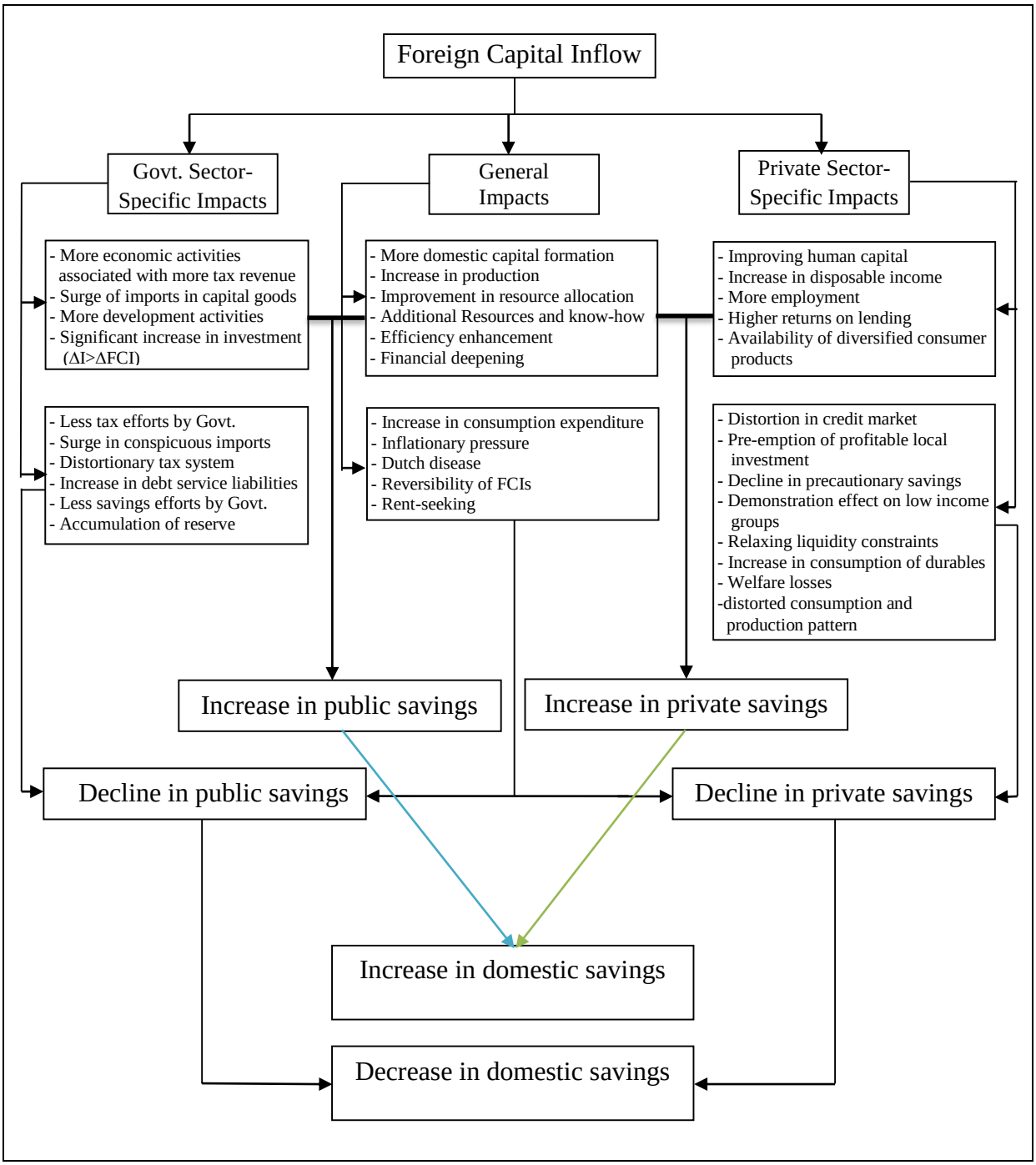
Table A.6: List of Developing Countries in the Sample

Country Name			
Algeria	Costa Rica	Jamaica	Peru
Argentina	Cote d'Ivoire	Jordan	Philippines
Bangladesh	Dominican Republic	Lesotho	Rwanda
Barbados*	Ecuador	Madagascar	Senegal
Belize	Egypt, Arab Rep.	Malaysia	Sierra Leone
Benin	El Salvador	Mali	South Africa
Bolivia	Ethiopia	Malta*	Sri Lanka
Botswana	Fiji	Mauritania	Swaziland
Brazil	Gabon	Mauritius	Syrian Arab Republic
Burkina Faso	Ghana	Mexico	Tanzania
Cameroon	Guatemala	Morocco	Thailand
Cape Verde	Guinea-Bissau	Nicaragua	Togo
Chile*	Honduras	Oman	Turkey
China	India	Pakistan	Venezuela, RB Zimbabwe
Colombia	Indonesia	Panama	
Congo, Rep.	Israel*	Paraguay	

* These countries have been graduated from the status of Developing countries very recently.

Supplementary Appendix B:

Figure B.1: Schematic Representation: Channels through which FCIs might impact on Domestic Savings



- **Trends, Patterns and Volatility of Various FCIs and Domestic Savings in the Developing Countries**

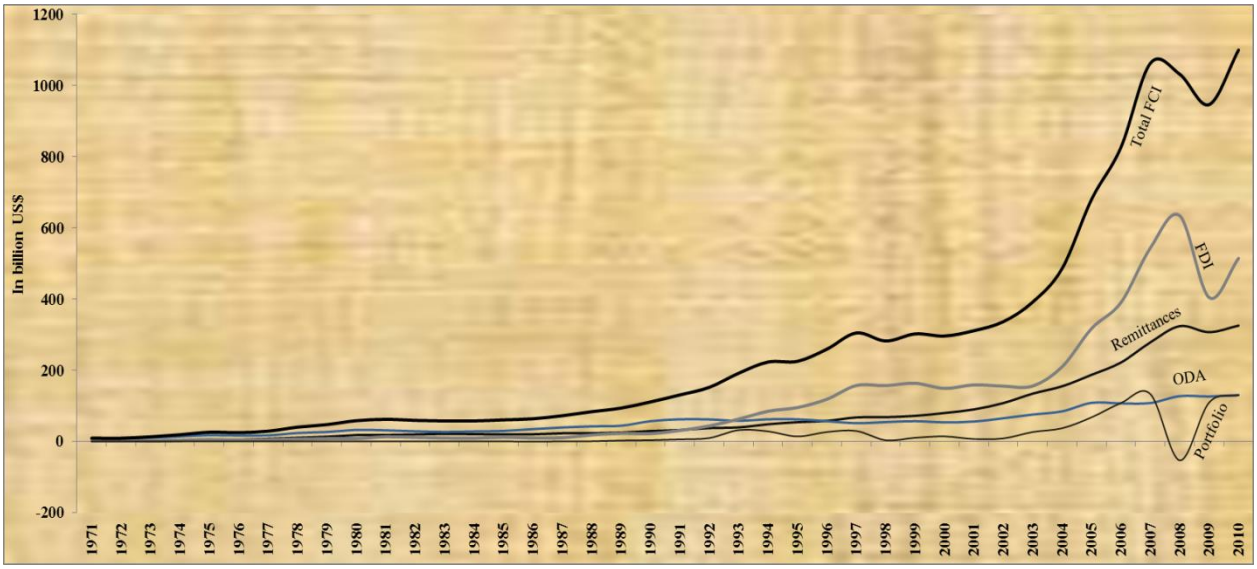
(a) FCIs

Until about first half of 1990s the ODA was the major inflow to the developing countries. In the year of 1992, total ODA inflow to the developing countries was US$ 61.59 billion, whereas FDI, remittance and portfolio inflows were US$ 43.38 billion, US$ 37.37 billion and US$ 9.41 billion, respectively. Since then overall flows of all sorts of foreign capitals (including remittances) have been increasing very rapidly and FDI being in the dominant role. One of the catalytic forces of increased flow of FCI since then is the impact of abolition of barriers of capital mobility worldwide along with large mobility of cheap labour from developing countries to the developed and emerging countries.

After the mid-nineties remittance flow surpassed the ODA flow. The remittance flow is now three times higher than the ODA flow to the developing countries and in most developing countries this is the main source of foreign exchange. According to the World Bank's Migration and Development Brief (2012), the global official remittance flow in 2011 was estimated at US$483 billion, of which US$ 372 billion went to the developing countries indicating an increase of 12.1 per cent over 2010. It is expected in the World Bank report that remittance flow to developing countries will rise at 7-8 per cent annually to reach US$ 467 billion in 2014. The portfolio flow has also been in rising trend with some ups and downs since mid-nineties. Before the global financial crisis there was huge surge of almost all capital inflows to the developing countries. In 2007, total FCI to the developing countries reached at the historical highest peak amounting US$ 1062 billion, of which FDI, remittance, ODA and portfolio inflows were US$ 543.19 billion, US$ 278.12 billion, US$ 107.75 billion, and US$ 132.94 billion, respectively. The remittance flow was increasing steadily until 2008. However, there was a huge reversal of portfolio investment with more than fifty billion outflow in 2008 from developing countries to the developed world. After experiencing long-time increase of overall FCI, the developing countries were having a downturn in FCI in 2009 due to the impacts of recent global financial crisis (GFC). All types of FCIs except portfolio investment to the developing countries dampened down in this year. However, in 2010 the overall inflow is again in surge. As per the World Development Indicators (WDI) and the Global Development Finance (GDF) database record, the developing countries attracted the total (net) foreign capital inflows (including remittances) to the tune of US$ 10524.86 billion during 1971-2010 of which net FDI, ODA, portfolio and remittance flow were US$ 4720.48 billion, US$ 2094.95 billion, US$ 4720.48 billion and US$ 750.20 billion, respectively. The historical

trends and patterns of different types of FCIs to the developing countries covering period of 1971-2010 are shown in Figure B.2. Figure B.3 shows the FCI trends on the basis of share of GDP of developing countries which is almost akin to the trend of absolute flow of FCIs. Total FCI to GDP was only 1.6% in 1971 which increased to 3.1% in 1988 and further increased to 8.18% in 2007 and then decelerated for next three years due to the impact of GFC. In 2010, FCI to GDP was 5.91%. Out of which, FDI, portfolio, ODA and remittances were 2.78%, 0.7%, 0.7%, and 1.75%, respectively.

Figure B.2: Trends of various FCIs to the Developing Countries (1971-2010)



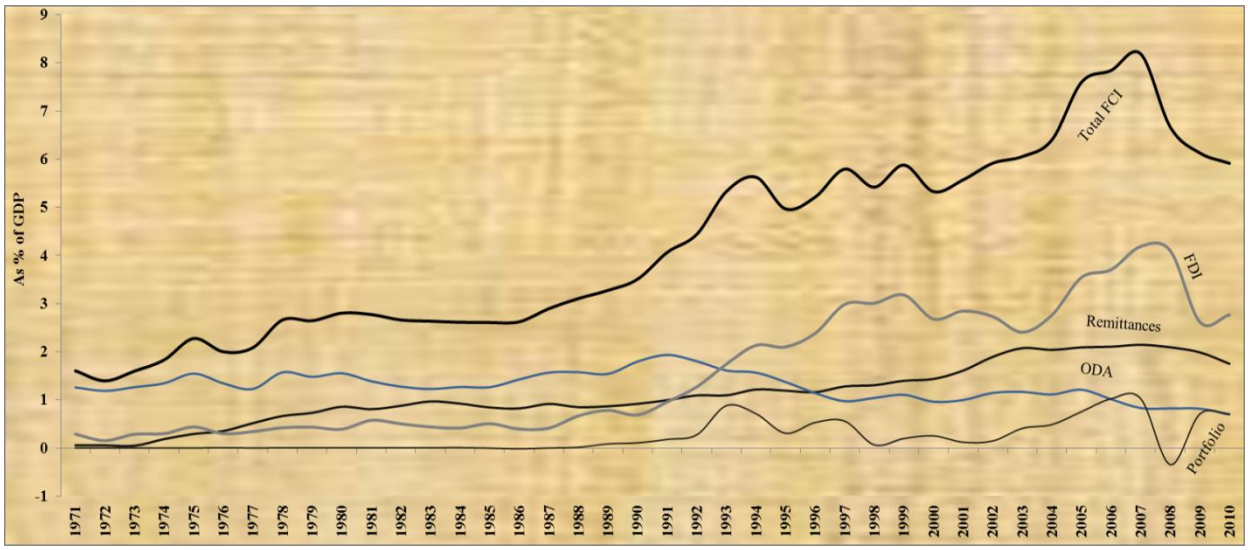
Source: WDI-GDF database, 2012.

Though the different types of FCIs to the developing countries have increased by manifolds in recent years, volatilities of some types of FCIs particularly the portfolio inflows are major concern for macroeconomic stability of the recipient countries. If we consider the volatility measures of different types of FCIs we will see that ODA flow was least volatile among all kinds of FCIs during 1971-2010 (Table B.3). The coefficient of variation of ODA flow to developing countries is 64.79. The remittance flow also experienced less volatility during that time compared to FDI and portfolio investment flows. The coefficient of variation of remittance inflow is 127.56. The highest volatility is associated with the portfolio investment flow with the coefficient of variation of 204.74. FDI flow experienced the second largest volatility after portfolio investment flow to the developing countries during 1971-2010 (with the coefficient of variation of 140.64).

Examining the relative importance of various FCIs across different categories of developing countries would be another worthwhile exercise for the study. The following Table B.1 shows the detailed disaggregated information of FCIs to the upper middle income-, lower middle

income-, and low income- developing countries. It is evident from the Table B.3 that ODA is the least volatile and the portfolio investment flow is the most volatile FCI to all categories of countries with remittance and the FDI flows being in between.

Figure B.3: Trends of various FCIs to the Developing Countries (as % of GDP)



Source: WDI-GDF database, 2012.

The upper middle income countries attracted a total amount of US$ 6080.88 billion (around 58% of total FCI to the developing countries) FCI during 1971-2010. Out of which FDI flow was largest (US$ 3848.03 billion) and remittance flow was the second largest (US$ 1342.36 billion). However, the surge in remittances during last decade was highest (291.98%) among all FCIs compared to the decade of 1990s. The increase in FDI and portfolio investment inflows was also substantial in the last decade (205.34% and 176.29%, respectively). However, there was a strong growth of overall FCI during the decade of 90s (480.14% higher than the decade of 80s), particularly because of certain massive increase of portfolio and FDI flows.

The overall FCI to the lower middle income countries was also significant during 1971-2010 amounting to US$ 3189.17 billion. The relative share of FDI, ODA, portfolio and remittance flows were 24.44%, 24.52%, 5.74% and 45.30%, respectively. Remittance income was the most dominant inflow in these countries. These countries experienced about 234.47% progression of overall FCI during last decade as compared to the decade of 1990s with the increase of portfolio and FDI flows being 602.49% and 376.45%, respectively.

The low income countries received around US$782.26 billion of FCIs during the same time period with ODA being the major source (66.05%) of total FCIs. However, the remittance flow has been increasing significantly in recent time. The growth of remittance income in this

cluster of countries was about 450% during last decade as compared to the decade of 90s. The FDI flow has also been increasing significantly since 80s. However, overall the low income countries are more dependent on ODA and remittance flows as a means of bridging the saving-investment and overall foreign exchange gaps.

Table B.1: Relative Importance of Various FCIs among different categories of Developing Countries (1971-2010)

Various FCIs (In billion US$)	1971-80	1981-90	Change (In %)	1991-00	Change (In %)	2001-10	Change (In %)	Total (1971-2010)	Yearly Average
Upper Middle Income Countries									
FDI	31.38	100.87	221.5	916.72	808.79	2799.07	205.34	3848.03 (63.28%)	96.20
Portfolio Investment	0.07	6.01	8384	148.99	2379.7	411.64	176.29	566.71 (9.32%)	14.17
ODA	25.04	59.73	138.51	118.68	98.676	120.32	1.3868	323.77 (5.32%)	8.09
Remittances	22.3	80.96	263.04	251.86	211.11	987.24	291.98	1342.36 (22.08%)	33.56
Total FCI	78.79	247.57	214.21	1436.24	480.14	4318.27	200.66	6080.88 (100%)	152.02
Lower Middle Income Countries									
FDI	8.96	31.66	253.49	128.21	304.95	610.84	376.45	779.66 (24.44%)	19.49
Portfolio Investment	0.03	0.09	185.48	22.78	24945	160.05	602.49	182.96 (5.74%)	4.57
ODA	83.46	141.67	69.738	206.75	45.942	350.04	69.306	781.91 (24.52%)	19.55
Remittances	33.25	124.49	274.47	278.80	123.95	1008.1	261.58	1444.64 (45.30%)	36.12
Total FCI	125.69	297.91	137.01	636.54	113.67	2129.02	234.47	3189.17 (100%)	79.73
Low Income Countries									
FDI	3.04	3.47	13.941	15.23	339.55	71.05	366.36	92.79 (11.86%)	2.32
Portfolio Investment	0.07	0.03	-64.52	0.13	408.88	0.31	141.64	0.54 (0.07%)	0.014
ODA	34.06	93.13	173.43	128.03	37.476	261.48	104.23	516.70 (66.05%)	12.92
Remittances	2.89	11.98	314.78	24.23	102.25	133.12	449.35	172.23 (22.02%)	4.31
Total FCI	40.06	108.6	171.08	166.56	53.368	404.67	142.95	782.26 (100%)	19.56
All Developing Countries									
FDI	43.37	136	213.55	1060.16	679.54	3480.95	228.34	4720.48 (45.04%)	118.01
Portfolio Investment	0.17	6.12	3414.8	171.90	2706.7	572	232.75	750.20 (7.13%)	18.76
ODA	171.55	359.29	109.44	577.62	60.765	986.48	70.784	2094.95 (19.9%)	52.37
Remittances	58.43	217.43	272.1	554.9	155.21	2128.46	283.58	2959.22 (28.12%)	73.98
Total FCI	273.53	718.85	162.8	2364.58	228.94	7167.90	203.14	10524.86 (100%)	263.12

Source: Author's compilation and estimates with the data from the WDI-GDF database, 2012.

(b) Domestic Savings

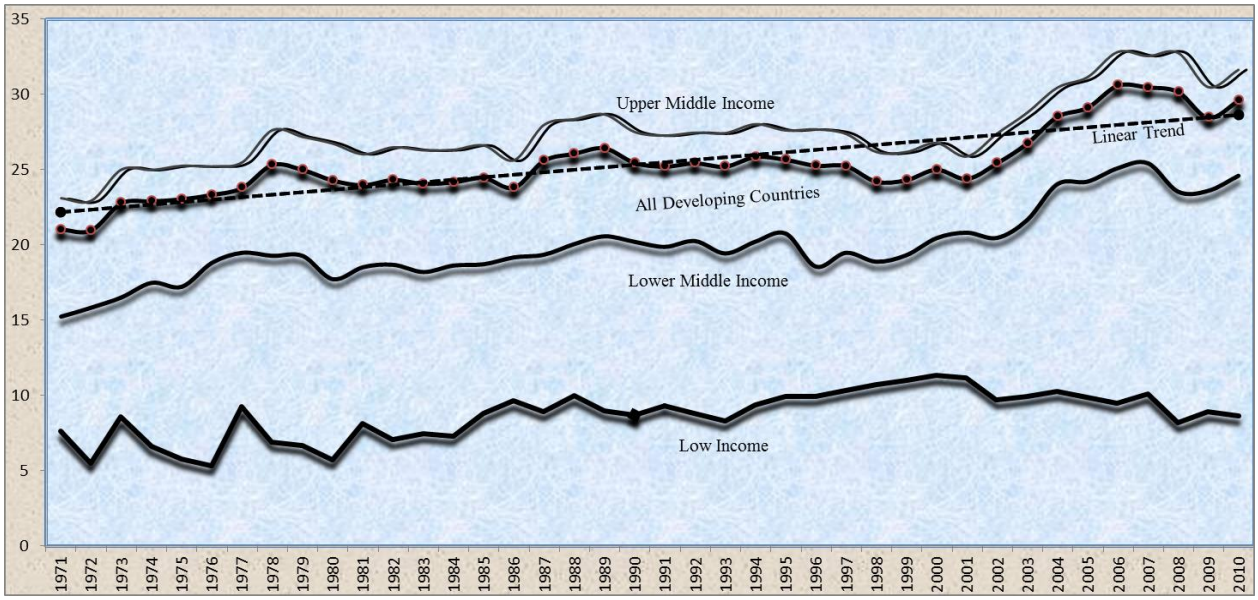
As mentioned earlier, the saving plays an important role in the growth process of a country. The mobilization of domestic savings is very crucial for the developing countries in particular. The overall trend of domestic savings (as % of GDP) has been growing in the developing countries over the last forty years (1971-2010). The average domestic savings to GDP ratio was 25.41 during that period (Table B.2). The average domestic savings rate which was 23.27 per cent in the decade of 1971-80 has increased to 28.37 per cent in 2000-2010 in all developing countries. The volatility of domestic savings was also very low (only 9 per cent) at that time. However, there is a great variation in domestic savings formation among the different categories of developing countries. Interestingly, the savings rate itself indicates the development stages of the developing countries. The higher is the savings rate of a country, generally higher the income level a country has. The rate of domestic savings in the low income countries is very low. The average savings rate of upper middle-, lower middle-, and low- income countries was 27.4, 25.89, and 8.70, respectively. Though the savings rate has been increasing in all countries, there was a decline in savings rate in the low income countries during the decade of 2000-10. The volatility of savings formation is also very high (more than double) in the low income countries compared to that of the middle income counterparts. The following Figure B.4 portrays a comparative view on the domestic savings trend among the developing countries. The linear trend line shows a steady upward trend of average domestic savings in the developing countries.

Table B.2: Domestic Savings Dynamics among different categories of Developing Countries (1971-2010)

Categories of Countries	1971-80	1981-90	Change (in % point)	1990-00	Change (in % point)	2001-10	Change (in % point)	1971-2010 (Average)	CV
Upper Middle Income	25.36	27.00	1.64	27.21	0.21	30.40	3.19	27.49	8.51
Lower Middle Income	23.72	25.33	1.61	25.62	0.29	28.90	3.28	25.89	6.12
All Middle Income	17.73	19.26	1.53	19.77	0.51	23.39	3.62	20.03	11.63
Low Income	6.79	8.49	1.70	9.90	1.41	9.63	-0.27	8.70	27.63
All Developing Countries	23.27	24.86	1.59	25.17	0.31	28.37	3.20	25.41	9.00

Note: CV means coefficient of variation (in %).
Source: Author's compilation and estimates with the data from the WDI-GDF database, 2012.

Figure B.4: Trends of Gross Domestic Savings (as % of GDP) in the Developing Countries (1971-2010)



Source: The data source of the figure is WDI-GDF database, 2012.

Table B.3: Volatility of the various FCIs among different categories of Developing Countries (1971-2010)

Types of Developing Countries	Indicators	Mean (in billion USD)	Standard Deviation	Coefficient of Variation (In %)
Upper Middle Income Countries	FDI	96.20	131.68	136.88
	Portfolio Investment	14.17	27.46	193.83
	ODA	8.09	4.30	53.11
	Remittances	33.56	43.51	129.65
	Total FCI	152.02	195.88	128.85
Lower Middle Income Countries	FDI	19.49	32.04	164.37
	Portfolio Investment	4.57	11.94	261.08
	ODA	19.55	11.90	60.89
	Remittances	36.12	44.69	123.73
	Total FCI	79.73	94.23	118.19
Low Income Countries	FDI	2.32	3.40	146.5
	Portfolio Investment	0.014	0.04	301.93
	ODA	12.92	9.75	75.45
	Remittances	4.32	6.44	149.67
	Total FCI	19.56	19.25	98.42
All Developing Countries	FDI	118.01	165.97	140.64
	Portfolio Investment	18.76	38.40	204.74
	ODA	52.37	33.93	64.79
	Remittances	73.98	94.37	127.56
	Total FCI	263.12	317.33	120.6

Source: Author's compilation and estimates with the data from the WDI-GDF database, 2012.

Table B.4: Pairwise Simple Correlation Coefficients

Var.	ds	ds(t-1)	fci	fdi	port	oda	rem	pcgdpg	popg	interest rate	inf	gov con	dep ratio
ds	1.00												
ds(t-1)	0.95	1.00											
fci	-0.73	-0.73	1.00										
fdi	-0.08	-0.08	0.34	1.00									
port	0.09	0.08	-0.04	0.03	1.00								
oda	-0.53	-0.53	0.71	-0.05	-0.10	1.00							
rem	-0.64	-0.64	0.80	0.21	-0.05	0.22	1.00						
pcgdpg	0.15	0.08	0.00	0.14	0.09	-0.09	0.03	1.00					
popg	-0.05	-0.06	0.02	-0.12	-0.06	0.15	-0.07	-0.10	1.00				
interest rate	0.01	0.05	-0.08	0.07	0.06	-0.18	0.01	0.07	0.00	1.00			
inf	0.03	0.00	-0.05	-0.15	-0.03	0.07	-0.09	-0.14	-0.02	-0.63	1.00		
govcon	-0.16	-0.16	0.28	0.20	0.04	0.07	0.30	-0.02	0.06	0.10	-0.20	1.00	
dep ratio	-0.39	-0.39	0.31	-0.19	-0.15	0.49	0.11	-0.21	0.58	-0.12	0.01	0.06	1.00

Note: fci=fdi+port+oda+rem.

Table B.5: Partial and Semi-partial Correlations of Domestic Savings with

Variables	**Partial Corr.**	**Semi-partial Corr.**	**(Partial Corr.)^2**	**(Semi-partial Corr.)^2**	**Significance Level**
ds *(t*-1)	0.8849	0.5429	0.783	0.2948	0
fdi	-0.0161	-0.0046	0.0003	0	0.4989
port	0.0015	0.0004	0	0	0.9512
oda	-0.1511	-0.0437	0.0228	0.0019	0
rem	-0.1847	-0.0537	0.0341	0.0029	0
pcgdpg	0.2677	0.0794	0.0717	0.0063	0
popg	0.0917	0.0263	0.0084	0.0007	0.0001
Interest rate	-0.1395	-0.0403	0.0195	0.0016	0
inf	0.0166	0.0047	0.0003	0	0.4846
govcon	0.0272	0.0078	0.0007	0.0001	0.2528
dep. ratio	-0.0689	-0.0197	0.0048	0.0004	0.0037

Table B.6: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max	CV
ds	2448	15.67	15.45	-86.45	84.31	98.61
ds (t-1)	2387	15.67	15.44	-86.45	84.31	98.53
fci	2033	12.04	14.50	-10.15	127.29	120.46
fdi	2447	1.97	3.42	-28.62	37.27	173.61
port	2160	0.10	0.56	-5.42	6.77	559.12
oda	2438	5.74	8.50	-0.68	94.44	148.07
rem	2115	4.11	9.21	0.00	96.94	224.26
pcgdpg	2468	1.86	5.11	-47.29	37.12	275.31
popg	2520	2.17	1.00	-7.53	11.18	46.25
interestrate	1958	0.52	13.67	-23.66	14.49	712.62
inf	2468	12.84	14.94	-1.45	60.92	116.31
govcon	2438	14.42	6.37	2.05	64.39	44.19
depratio	2520	79.27	16.34	38.21	111.26	20.62

Note: fci=fdi+port+oda+rem and CV= coefficient of variation (in %).

Table B.7: Cross-Section Correlation in the Data: Pesaran (2004) CD Tests

Variable	CD-test	p-value	**Correlation($\overline{\rho}$)**	**Absolute Correlation($\|\overline{\rho}\|$)**
ds	2.58	0.01	0.011	0.354
fci	18.55	0.000	0.076	0.36
fdi	60.48	0.000	0.253	0.333
port	Na	-	-	-
oda	47.75	0.000	0.202	0.401
rem	Na	-	-	-
pcgdpg	20.56	0.000	0.084	0.19
popg	90.64	0.000	0.373	0.590
interestrate	23.32	0.000	0.099	0.226
inf	40.61	0.000	0.176	0.256
govcon	1.64	0.101	0.007	0.392
depratio	185.91	0.000	0.814	0.855

Notes: Under the null hypothesis of cross-section independence CD~N(0,1). CD test statistics for 'port' and 'rem' variables are unavailable due to strongly unbalanced data series. fci=fdi+port+oda+rem.

Table B.8: Maddala and Wu (1999) (MW) and Pesaran's (2007) (CIPS)) Panel Unit Root Tests

Variable	lags	1st Generation: MW test				2nd Generation: CIPS test			
		with intercept		with intercept & trend		with intercept		with intercept & trend	
		χ^2 statistic	p-value	χ^2 statistic	p-value	Zt-bar	p-value	Zt-bar	p-value
ds	0	247.385	0.000	275.338	0.000	-4.917	0.000	-2.625	0.004
	1	186.018	0.000	190.610	0.000	-2.558	0.005	1.004	0.842
	2	154.512	0.043	149.690	0.074	-0.394	0.347	3.557	1.000
	3	191.284	0.000	177.099	0.002	0.864	0.806	5.275	1.000
ds (t-1)	0	295.093	0.000	326.848	0.000	-4.136	0.000	-2.335	0.010
	1	222.993	0.000	241.170	0.000	-2.815	0.002	0.760	0.776
	2	181.163	0.001	190.097	0.000	-0.124	0.451	3.943	1.000
	3	218.812	0.000	212.097	0.000	-0.339	0.367	4.442	1.000
fci	0	298.902	0.000	393.472	0.000	-5.545	0.000	-5.503	0.000
	1	193.647	0.000	194.014	0.000	-2.034	0.021	-0.115	0.454
	2	187.610	0.000	214.989	0.000	-1.764	0.039	0.790	0.785
	3	164.829	0.012	139.387	0.196	0.952	0.829	3.974	1.000
	0	417.441	0.000	428.222	0.000	-14.083	0.000	-10.230	0.000
fdi	1	234.353	0.000	265.593	0.000	-7.453	0.000	-3.335	0.000
	2	165.942	0.010	181.683	0.001	-3.308	0.000	0.953	0.830
	3	158.135	0.028	154.635	0.042	-3.756	0.000	-0.065	0.474
	0	1151.159	0.000	1058.210	0.000	-12.711	0.000	-11.477	0.000
port	1	640.743	0.000	546.121	0.000	-3.387	0.000	-0.559	0.288
	2	562.926	0.000	484.003	0.000	-1.043	0.148	0.806	0.790
	3	359.366	0.000	319.032	0.000	2.651	0.996	4.791	1.000
	0	307.105	0.000	339.324	0.000	-4.668	0.000	-6.175	0.000
oda	1	227.427	0.000	231.557	0.000	-2.859	0.002	-3.214	0.001
	2	212.840	0.000	205.136	0.000	-0.168	0.433	-0.895	0.185
	3	176.377	0.002	173.337	0.003	0.823	0.795	1.256	0.896
	0	147.210	0.095	165.790	0.010	**0.616**	**0.731**	**-1.434**	**0.076**
rem	1	160.933	0.019	211.815	0.000	1.222	0.889	-2.075	0.019
	2	207.112	0.000	183.400	0.001	2.710	0.997	-1.589	0.056
	3	102.807	0.936	133.513	0.306	5.385	1.000	0.442	0.671
	0	1225.759	0.000	1075.892	0.000	-20.210	0.000	-18.258	0.000
pcgdpg	1	769.543	0.000	660.354	0.000	-14.709	0.000	-12.369	0.000
	2	465.013	0.000	374.472	0.000	-8.458	0.000	-5.957	0.000
	3	411.492	0.000	340.845	0.000	-6.766	0.000	-4.845	0.000
popg	0	302.217	0.000	277.969	0.000	**2.198**	**0.986**	**6.977**	**1.000**
	1	623.464	0.000	1286.519	0.000	-19.872	0.000	-20.382	0.000
	2	101.112	0.950	147.299	0.094	-0.192	0.424	2.308	0.989
	3	117.565	0.692	221.766	0.000	-2.451	0.007	-0.114	0.455
interestrate	0	902.563	0.000	790.626	0.000	-17.991	0.000	-16.803	0.000
	1	572.009	0.000	489.619	0.000	-10.344	0.000	-8.893	0.000
	2	352.971	0.000	271.467	0.000	-5.849	0.000	-3.359	0.000
	3	334.401	0.000	258.328	0.000	-4.494	0.000	-3.104	0.001
inf	0	947.615	0.000	902.131	0.000	-16.702	0.000	-14.361	0.000
	1	564.661	0.000	557.392	0.000	-10.281	0.000	-7.800	0.000
	2	392.580	0.000	355.936	0.000	-7.377	0.000	-4.224	0.000
	3	326.723	0.000	295.703	0.000	-7.452	0.000	-4.356	0.000
govcon	0	171.793	0.004	170.424	0.005	**-0.628**	**0.265**	**-0.528**	**0.299**
	1	170.045	0.005	159.769	0.023	-0.931	0.176	-1.243	0.107
	2	161.226	0.019	122.769	0.565	-0.156	0.438	0.652	0.743
	3	163.410	0.014	136.645	0.244	1.148	0.875	1.071	0.858
depratioall	0	514.365	0.000	473.684	0.000	**0.512**	**0.696**	**7.179**	**1.000**
	1	945.444	0.000	1852.141	0.000	-20.423	0.000	-14.541	0.000
	2	307.572	0.000	279.239	0.000	0.638	0.738	7.217	1.000
	3	458.656	0.000	788.094	0.000	-6.393	0.000	0.030	0.512

Note: The null hypothesis for MW and CIPS tests is that the series are I(1). However, the MW test assumes cross section independence, whereas later test assumes cross section dependence. Lags indicate the lag augmentation in the Dickey Fuller regression specifications. fci=fdi+port+oda+rem.

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