Foreign Capital and Economic Growth in Emerging Markets: Are Foreign Aid and Foreign Direct Investment substitutes?*

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Abstract

This paper studies the short-run and long-run effects of foreign aid and foreign direct investment on economic growth in emerging markets. Upon applying the so-called Pooled Mean Group estimator to an unbalanced panel for 94 countries over the period 1960-2012, we find a positive and significant long-run relationship between these two types of foreign capital and growth. We then enquire which type of foreign flow is more effective to stimulate economic growth, and find that that both effects are not statistically different in various dynamic specifications and robustness checks. This finding may account for a possible substitutability relationship between foreign aid and foreign direct investment in the long-run. An implication is that what matters for growth in emerging markets is the aggregate amount of foreign capital, rather than its composition.

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1 Introduction

In the last four decades, the participation of foreign capital flows on GDP have increased notoriously in emerging markets. On average, in 1970 such flows represented less than 1 percent of GDP, whereas in 2012 they represented around 5 percent, a fivefold increase. In some instances, notably in South Asia's economies, the participation of foreign capital flows increased to about 8 percent of GDP in 2012 (see Figure 1).

Considering the notion that these flows can serve as an important source of capital accumulation, the question about the importance of external capital's flows in promoting economic growth in developing countries has generated a long-lasting debate. Most of the extant studies present three common characteristics. Firstly, they do not differentiate short-run from long-run effects, and so tend to report average effects that hide the possibly complex and dynamic association between Foreign Aid (AID) or Foreign Direct Investment (FDI) and economic growth. Secondly, most of the literature is devoted to analyze the contemporaneous effects of AID or FDI on economic growth, despite the fact that most of the projects financed with these flows can take a long time to mature and, thus, to influence growth (i.e., education, infrastructure). This without mentioning the common problem on interpretation that a contemporaneous and potentially endogenous relationship between FDI and AID on the GDP might bring. Thirdly, almost all previous studies focuses on evaluating *separately* the impact of AID and FDI on growth.

The separation between AID and FDI in these studies is due, presumably, to the idea that both types of capital respond to different motivations and so are expected to present different dynamics and heterogenous effects across countries. Often, FDI flows are thought of as coming from the private sector, driven by a clear profit maximization motive; on the other hand, AID flows are viewed as coming from the foreign public sector or governments, in pursue of a geopolitical agenda, or simply in the form of charity. The descriptive statistics of the sample of countries we use in our empirical analysis point out to these differences. It can be observed in Table 4 that in the case of AID the participation on GDP is clearly more concentrated in lower income countries: in the period from 1960 to 2012 it represented, on average, 12% of GDP, whereas the figure drops to less than 4 for upper middle income countries. This is consistent with the conventional wisdom that AID flows are oriented towards the development of poor countries. In clear contrast, FDI has a higher participation in higher income economies: it represented 6% of GDP for these counties, twice as much as recorded for lower income countries. This result is also suggestive of the idea that FDI seeks to secure profits as its primary objective. Also, as it is observed in Figures 2 and 3, the evolution on AID tends to be more volatile than that of FDI for all levels of income, which may be signalling an allocation of these flows based on extra-economic grounds.

However, the fact that it is clear that both types of foreign capital flows may have different origins and may pursue different ends says little about the effects the may have on economic growth. In particular, if we consider that AID and FDI are mainly oriented to fund the same sort of projects in a specific country (say, investments in human and physical capital), these two external capital's flows might as well have similar impacts on economic activity. More formally, if what matters for economic growth is the total stock of capital, and not its composition, the identity of the foreign flow becomes irrelevant, as outflows in one type would offset inflows of the other. In this sense, AID and FDI can be considered substitutes. This is the empirical question that motivates this paper.

This paper contributes to the discussion of the effects of AID and FDI from a dynamic perspective, by comparing the short-run and long-run effects of AID and FDI on per capita GDP growth using the Pooled Mean Group (PMG) estimator advanced in Pesaran, Shin and Smith (1999). Moreover, we contrast the long-run effects of AID and FDI to examine the hypothesized substitutability between these two forms of external capital. We find that this is indeed the case, and this finding passes several sensitivity analyses.

The remainder of the paper is organized as follows. Section 2 describes key findings from the literature on the effectiveness of external capital to promote economic growth. Section 3 describes and discusses the merits of the PMG estimator. Section 4 describes the data, reports our empirical results and performs a series of robustness checks. Section 5 concludes.

2 Theoretical framework and literature review

The effects of investment on economic growth have a theoretical framework widely developed which can fall into three broad groups: the early post-Keynesian growth models which emphasized the role of savings and investment in promoting growth (i.e., the Harrod Domar model), the neoclassical setup which also emphasizes the role of technical progress (i.e. the Solow model), and the endogenous growth model which furthermore emphasizes the role of Research and Development (R&D, the Romer-Lucas model) and several types of human capital externalities (Balasubramanyam, Salisu and Sapsford, 1996). In general terms, GDP per capita is determined in the long-run by the stock of capital (along other factors such as labor, government size, international trade or total factor productivity) which in turn is the result of accumulating domestic and international investment flows. The latter could be broken down as foreign direct investment and foreign aid. Furthermore, endogenous growth theories provide reasons to explain an indirect link between FDI and AID on economic growth through R&D, human capital and scale economies. However the specific transmission mechanisms are not necessary the same for both, a discussion developed next.

2.1 Public foreign capital: Foreign aid

Foreign aid is often measured as Official Development Assistance (ODA)[1] which present three principal characteristics. First, it has the objective to promote development in developing countries, therefore most of the AID is oriented to finance infrastructure projects and programs or technical cooperation. As shown in Figure 2, AID devoted to social programs and infrastructure projects accounted for more than 50 percent of the total AID received. Second, it can be provided directly by OECD countries (Bilateral AID) or by international agencies such as the World Bank and United Nations (Multilateral AID). In the case of Multilateral AID, the agencies also received an "earmarked" money of the donors so in the way that donors in large extent tell the agencies how to use these earmarked funds, this flow is also counted as Bilateral Aid. Finally, this flow can be consider as grant or soft loans with an interest rate lower than the market. Around 90% of ODA is grant, in other words, donors do not expect to receive their money back.

Following Bourguignon and Sundberg (2007), the transmission channel of the effect of AID with economic growth involves several steps. First, the link between external donors to policy-makers in developing countries, where external donors can influence policy behaviour by technical assistance or by conditionality of loans. Second, the link between policymakers to policies and, finally, the link between policies and outcomes (i.e., economic growth). The last steps are related to governance, bureaucratic capability, institutional capacity, among others. Hence, AID may be considered as promoting economic growth since it is mostly oriented towards long-run projects.

However, AID may be costly because of conditionality or "strings attached", tied treats and dependency. Conditionality is highly controversial for different reasons. First, to receive AID developing countries typically have committees to carry out certain reforms (i.e. liberalizing the economy, improving governance, among others). There is a great debate if these reforms really affect positively the recipients' growth or it may be related to corruption issues. Second, even if there are good reforms, often donors lack the capacity to monitor the successful implementation of the conditions, thereby limiting the impact of accountability (OECD, 2012). On the other hand, AID recipients are sometimes required to accept tied treats, say by importing products from the donor countries, even though cheaper alternatives might be available. Finally, AID may deepen the dependency of many poor countries to donor countries, so one country may prefer not to be an AID recipient to preserve certain forms of sovereignty.

Regarding empirical studies that attempt to unveil the relationship between AID influence growth, evidence is far from conclusive. Indeed, we can divide these studies into three groups: (i) those who find that AID causes a positive economic growth on average, (ii) others who find an effect only in certain countries, such

[1] Two other major sources of AID are (i) private philanthropy which includes charities, non-governmental and civil society organizations and (ii) government or official assistance from countries that are not member of the so-called Development Assistance Committee (DAC) such as Arab countries, China, India and Brazil.

as those with good policies or government, and (iii) those who do not find a significant or robust effect.

In the first group, Bearce and Tirone (2010) argue that foreign AID promotes economic growth by facilitating economic reforms, but only when the strategic benefits associated with providing AID are small for donor governments. Foreign aid becomes ineffective when the strategic benefits are large, because governments cannot credibly enforce their conditions for economic reform.

In the second group, authors like Alesina and Dollar (2000) and Burnside and Dollar (2000) argue that on average AID has little impact on growth, but this effect is more notorious in good policy environments. These results show that conditioning AID flows on the quality of policies would result in further growth for developing economies. Alvi, Mukherjee and Shukralla (2008) explores nonlinearities in the AID-growth relationship and finds only a partial corroboration that AID is growth-enhancing in a good policy environment. Allowing for different types of AID to have different effects on growth, Minoiu and Reddy (2010) disentangle the effects of two kinds: a developmental component consisting of growth-promoting expenditures, and a non-developmental component consisting of other expenditures. They find that development AID has a positive and robust effect on long-run growth, but other types of AID have no effect. Similarly, focusing on long-run cumulative effects of AID in developing countries, Arndt, Jones and Tarp (2015) confirm a positive impact of AID on growth.

In the last group, Rajan and Subramanian (2008) find no evidence that AID works better in better policy environments, or that certain forms of AID work better than others. These results are also supported by Werker, Ahmed and Cohen (2009), who use oil price fluctuations to test the impact of transfers from wealthy OPEC nations to their poorer Muslim partners. They argue that much AID is consumed, primarily in the form of imported non-capital goods. Thus the AID effect on economic growth is weak and not statistically significant. Another explanation of the probably ambiguous effect of AID is that this may also crowd out productive private investments if it comes in the form of physical capital transfers (Selaya and Sunesen, 2012). Nonetheless, these authors also find that AID may raise the productivity of capital by financing complementary inputs, such as public infrastructure projects and human capital investment.

2.2 Private foreign capital: Foreign Direct Investment

In contrast to AID, there is a wider consensus that FDI is regarded as an important vehicle for the transfer of technology, know-how and managerial skills to developing countries (Balasubramanyam et al., 1996; Borensztein, De Gregorio and Lee, 1998; de Mello, 1999 and Li and Liu, 2005). But its impact seems also conditional to some requirements such as conductive economic climate (Balasubramanyam et al., 1996), certain level of human capital (Borensztein et al., 1998 and de Mello, 1999) and financial markets development (Azman-Saini, Law and Ahmad, 2010).

Regarding empirical studies, Balasubramanyam et al. (1996) find significant results supporting the assumption that FDI is more important for economic growth in export-promoting than in importing-substituting countries. This implies that the impact of FDI varies across countries and that trade policy can affect the role of FDI in economic growth. Furthermore, Borensztein et al. (1998), Bengoa and Sanchez-Robles (2003) and Xu (2000) suggest that the differences in the technological absorptive ability may explain the variation in growth effects of FDI across countries. In their analytical framework, the level of human capital determines the ability to adopt foreign technology, and thus larger endowments of human capital induce higher growth rates for a given the amount of FDI. This hypothesis is supported by their empirical findings.

On the other hand, there is some empirical evidence that the effects of FDI are not necessarily advantageous. Bende-Nabende, Ford, Santoso and Sen (2003) find that the direct long-term impact of FDI on output is significant and positive for comparatively economically less advanced Philippines and Thailand, but it could be negative in the more economically advanced Japan and Taiwan.

2.3 Interaction of foreign capital flows

So far, we have taken as a premise that AID and FDI are unrelated, because AID is mainly oriented to support the government budget and finance investments in human capital, while FDI is a private sector decision and relatively more connected to physical capital (Kosack and Tobin, 2006). However, Caselli and Feyrer (2007) find strikingly that the marginal product of capital (MPK) is roughly the same across countries and one of the implications is that increasing AID inflows to developing countries will lower the MPK in these economies and will tend to be fully offset by outflows of other types of capital investments. In this sense, AID and FDI can be treated as substitutes.

Empirically, Benmamoun and Lehnert (2013) show that AID and FDI are positively and significantly associated with economic growth in low income economies. Moreover, these variables are equally important for countries that are highly dependent on FDI. From a different empirical perspective, Driffield and Jones (2013) find that all sources of foreign capital have a positive and significant impact on growth when institutions are controlled for. More interesting is the fact that the coefficient estimates associated to these foreign capital flows are of similar magnitude. The latter may suggest *pooling* for AID and FDI. With this motivation, Nwaogu and Ryan (2015) create a *Total Capital* variable that measures total external funding (AID, FDI and remittances). However, they find that this variable is only slightly significant. We argue that these results do not consider that the setting of these foreign capital flows is heterogeneous in the short-run and depends on institutional factors, capital market imperfections, economic stability, among others (Borensztein et al., 1998; Burnside and Dollar, 2000; Azman-Saini et al., 2010 and Clemens, Radelet, Bhavnani and Bazzi, 2012). Nevertheless the notion of *"pooling"* AID and FDI may be true in the long-run.

3 Methodological framework

The bulk of the literature using panel data focuses on some variants of the equation

$$y_{it} = \alpha_i + \boldsymbol{\theta x_{it}} + u_{it}\,, \tag{1}$$

where y_{it} is the per capita GDP growth rate, $\boldsymbol{x_{it}} = (\text{AID}_{it}, \text{FDI}_{it}, \text{controls}_{it})$, α_i is a country specific intercept (which may be pooled into a common intercept, $\alpha_i = \alpha$), u_{it} is the error term, $i = 1, 2, \ldots, N$ is the country index, and $t = 1, 2, \ldots, T$.

In an insightful paper, Pesaran and Smith (1995) show that the traditional fixed-effect estimator of equation (1), which we call the static fixed-effect (SFE) estimation, can consistently estimate the long-run effect of $\boldsymbol{x}_{it}$ on y_{it}, what effectively is a cointegrating vector $\boldsymbol{\theta}$. The same may be true for a cross section formed with averaged values of the variables through time, which is also a common empirical practice. The assumptions behind the consistency result, nonetheless, are very restrictive indeed, the most critical is probably taking u_{it} as an uncorrelated perturbation independent from i.

As a much more convenient alternative, Pesaran and Smith (1995) and Pesaran et al. (1999) propose a panel error-correction model approach, where short-and long-run effects are estimated jointly from a flexible autoregressive distributed-lag (ARDL) model and where many parameters, if not all, are allowed to vary across countries. This approach allows for a great amount of heterogeneity across countries (many of the common coefficients assumption found in typical panel data methods are not required), but is only appropriate if the time dimension of the panel T is large enough to estimate the equation of interest for all countries individually, even though the country specific estimates may be plagued with sampling error. This error will be, as in traditional panel data, effectively averaged out using the cross sectional dimension of the panel. Empirical studies following this route (Pesaran et al., 1999; Loayza and Rancière, 2006 and Kim and Lin, 2010) recommend using $T \simeq 20$.

Consider the ARDL specification:

$$y_{it} = \mu_i + \tau_t + \sum_{j=1}^{p} \lambda_{ij} y_{it-j} + \sum_{j=1}^{q} \boldsymbol{\delta}_{ij} \boldsymbol{x}_{it-j} + \varepsilon_{it}, \tag{2}$$

where μ_i is a country effect, τ_t is a time effect and ε_{it} is a country-specific white noise. Equation (2) can be put in error correction format as

$$\Delta y_{it} = \mu_i + \tau_t + \phi_i \left(y_{it-1} - \boldsymbol{\theta}_i \boldsymbol{x}_{it-1} \right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{it-j} + \sum_{j=1}^{q-1} \boldsymbol{\delta}_{ij}^{*} \Delta \boldsymbol{x}_{it-j} + \varepsilon_{it}, \tag{3}$$

where

$$\phi_i = -\left(1 - \sum_{j=1}^{p} \lambda_{ij} \right), \; \boldsymbol{\theta_i} = -\left(\frac{\sum_{j=1}^{q} \boldsymbol{\delta}_{ij}}{\phi_i} \right),$$

$$\lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}, \; j = 1,2,\ldots,p-1, \qquad \text{and} \qquad \boldsymbol{\delta}_{ij}^{*} = -\sum_{m=j+1}^{q} \boldsymbol{\delta}_{im}, \; j = 1,2,\ldots,q-1,$$

where $\boldsymbol{\theta}_i$ defines the long-run or equilibrium relationship among y_{it} and $\boldsymbol{x}_{it}$ (which is comparable to the coefficient vector in equation (1) above), λ_{ij}^{*} and $\boldsymbol{\delta_{ij}^{*}}$ are the short-run coefficients relating economic growth to its determinants $\boldsymbol{x_{it}}$, and ϕ_i measures the speed of adjustment of y_{it} toward its long-run equilibrium following a change in $\boldsymbol{x_{it}}$. The condition $\phi_i < 0$ ensures that such a long-run equilibrium exists. As a result, a significant and negative value of ϕ_i is treated as evidence in support of cointegration between y_{it} and $\boldsymbol{x_{it}}$.

There are a few existing procedures for estimation of the above model (3). At one extreme, the traditional fixed-effect estimator, the Dynamic Fixed-Effect (DFE) method, assumes a fully homogeneous-coefficient model in which all slope parameters and error variances are restricted to be identical across countries. At the other extreme, the Mean Group (MG) estimator introduced by Pesaran and Smith (1995) is as fully heterogeneous-coefficient model that imposes no cross-country coefficients constraints and can be estimated on a country-by-country basis. The approach amounts to estimate separate ARDL regressions for each group, to then obtain $\boldsymbol{\theta}$ and ϕ as simple average of individual group coefficients $\boldsymbol{\theta_i}$ and ϕ_i. In particular, Pesaran and Smith (1995) show that the MG estimator will provide consistent estimates of the average of the parameters of interest in situations where SFE and DFE are inconsistent.

Between these extremes, Pesaran et al. (1999) propose the Pooled Mean Group (PMG) estimator, which restricts only the long-run parameters to be identical over the cross section ($\boldsymbol{\theta_i} = \boldsymbol{\theta}$, $i = 1,2,...,N$), but allows the intercepts, short-run coefficients (including the speed of adjustment), and error variances to differ across groups. If the long-run homogeneity restrictions are valid, then the MG estimates are inefficient and it is the PMG approach the most efficient estimator.[2] As shown in Pesaran et al. (1999), the validity of the long-run homogeneity restriction, and hence the suitability of the PMG estimator, can be tested by a standard Hausman-type statistic against the MG alternative.

Thus, the PMG estimator is likely to offer the best available compromise in the search for consistency and efficiency. This estimator is particularly useful when the long-run is characterized by conditions expected to be homogeneous across countries, whereas the short-run adjustment depends, as we may suspect, on country characteristics such as monetary and fiscal adjustment mechanisms, capital market imperfections, long-run differences in human capital formation, average rates of AID or FDI, relative price and wage flexibility, among many other factors.

[2] The underlying ARDL specification dispenses with unit root pretesting of the variables. Provided that there is a unique vector defining the long-run relationship among variables involved, with the lag orders p and q suitably chosen, MG and PMG estimates of and ARDL regression yield consistent estimates of that vector, regardless on whether the variables involved are $I(1)$ or $I(0)$.

At this point, it is worth emphasizing that we are exploring a *predictive* effect on economic growth. The question that we are able to answer is: Are AID or FDI receipts followed by any degree of increase in economic growth? In other words, we focus our analysis on Granger (1969) causation instead of the strict definition of causation that would arise from a randomized experiment. Note that this notion of causality does not take into account the fact that decisions about where to invest foreign capital also depends of the expectation of the economies' performance. However, a correct ARDL specification in (3) can mitigate a potential contemporaneous feedback running from economic growth to AID or to FDI (Borensztein et al., 1998), besides the facts that it accommodates the substantial persistence of GDP adjustments and it captures potentially rich AID or FDI adjustment dynamics.

4 Empirical results

4.1 Data description

Our sample consists of annual data for the period 1960 to 2012 for the 94 developing countries shown in Table 1. Given the procedure's requirements on the time series dimension of the data, we include only the countries that have at least 20 consecutive observations. Table 2 presents the definitions and sources of all variables used in our empirical exploration, and Table 3 shows descriptive statistics.

The dependent variable is the growth rate of GDP per capita expressed in international dollars using Purchasing Power Parity rates in constant 2005 international US$, and the data come from the Penn World Table (PWT).

Foreign Aid is defined as the sum of Net Official Development Assistance (ODA Net) and Official Assistance (OA Net). ODA Net consists of disbursements of loans made on concession terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries. OA Net refers to aid flows (net of repayments) from official donors to more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories, using data base of World Bank and OECD National Nations Accounts data files - DAC. The AID variable is the ratio of net official development assistance and official aid received to GDP.

Foreign Direct Investment includes the three following components: equity capital, reinvested earnings and intra-company loans. The International Monetary Fund data on FDI flows we use are presented in net terms (capital transactions' credits less debits between direct investors and their foreign affiliates), so decreases in assets or increases in liabilities are recorded as credits, whereas increases in assets or decreases in liabilities are recorded as debits. Hence, FDI flows may have a negative sign (reverse investment or disinvestment). The FDI variable enters as a ratio to GDP.

As control variables we include (i) the initial level of GDP per capita, measured as the logarithm of initial value of GDP per capita (2005 PPP-adjusted US$); (ii) government size, using the World Bank's World Development Indicators, measured as the general government final consumption expenditure (formerly general government consumption), which includes all government current expenditures for purchases of goods and services (and compensation of employees), and most expenditures on national defence and security, but excludes government military expenditures that are part of government capital formation; and (iii) trade openness which is expressed as the sum of exports and imports, obtained from the PWT. In order to capture proportional effects, the last two control variables enter the regressions as a percent of GDP.

Finally, our sample is composed of countries that are mostly low or middle income according to the World Bank Analytical Classifications in 2015.[3] From Table 4 we observe that lower income economies receive higher AID flows (in terms of GDP) while higher income economies are those that receive greater FDI flows.

[3] It is important to note that although this classification is updated annually, it is rather stable over time for the developing countries considered in this study.

Despite all the heterogeneity that is captured in this sample, there are no significant differences between the countries included and the developing countries excluded from the analysis due to a limited number of observations (42 countries in total). Table 5 reports descriptive statistics and some comparison tests. The mean and median difference tests indicate that the group of developing countries included is not statistically different from the group of developing countries excluded from the sample. The latter implies that the 94 countries selected for the analysis are representative of the developing countries, conditional on these variables. Put it differently, given that growth and its determinants are, on average, not different between these two groups, selection biases caused by choosing countries with a sufficient number time observations seem unlikely.

4.2 Comparing estimators

Tables 6 and 7 present the estimation results of the growth model. Table 6 includes the initial GDP per capita, trade openness, government size, AID and FDI separately, whereas Table 7 shows the estimates of the Restricted model, where the variable *Total* is the sum of AID and FDI. As noted, the use of the variable *Total* imposes the restrictions that the estimated coefficients for both foreign capital variables are the same. For comparison purposes, in addition to the PMG estimator, we present the results obtained with other methods such as Static Fixed Effects (SFE), Dynamic Fixed Effects (DFE) and Mean Group (MG). In all cases, following suggestions in Pesaran et al. (1999), the dynamic specifications are obtained by minimizing the Schwarz information criterion in a country-by-country basis, searching for a maximum lag of one for each included variable in the error correction model. The obtained specifications seem rich enough according to the outcome of various unreported model adequacy tests. We perform sensitivity analyses of this choice latter.

It is important to remark the differences among the various panel data methods. The MG estimator produces consistent estimates of the average parameters across countries, but fails to take into account that certain parameter may be the same across countries. If it is true, the MG estimator is inefficient. At the other extreme is the traditional static fixed effect estimator, SFE, that estimates only long-run parameters, under the assumption that the error process is not country specific. Intermediate estimators are the PMG and the DFE model. Like the MG estimator, the PMG estimator deals with the entire error correction model allowing intercepts, short-run coefficients, and error variances to differ freely across groups but, unlike the MG estimator, constraints the long-run coefficients to be the equal across countries. For this reason the short-run effects are estimated using the MG estimator of the corresponding coefficients. Finally, DFE also estimates the error correction model but is far more restricted than PMG, as it constrains all coefficients and error variances to be common for all countries. Formal (unreported) LR tests of homogeneity, comparing the PMG or MG to the more traditional DFE or SFE, strongly rejected the null of equal coefficients and error variances, thereby favoring the flexible alternatives (either the MG or the PMG).

On *a priori* grounds, the PMG approach is preferable because it is consistent and more likely to be efficient when compared to other panel error-correction models. But it is worth-mentioning that these benefits rely on four mild conditions, which seem to be fulfilled in our application. First, the regression residuals have to be serially uncorrelated and the explanatory variables can be tread as exogenous. We seek to fulfil these conditions by using a reduce form and including a rich dynamic specification in equation (3). The second condition refers that both country specific effects and cross-country common factors should be accounted for. Therefore we control for country specific effects by allowing for group specific intercepts, and we eliminate cross-country common factors by demeaning the data using cross-sectional means for every period (this is analogue to include a full set of dummies for specific years in the estimation). The third condition is the existence of long-run relationship, which requires the error-correction coefficient (ϕ) to be statistically negative. In Tables 6 and 7, we report the estimates for the pooled error-correction coefficients and its corresponding standard errors. These coefficients fall comfortably within the dynamically stable range in both models and for all estimators. Finally, the last condition is that the long-run parameters are the same across countries. Hence, in order to contrast the adequacy of the PMG, we perform Hausman-type tests of homogeneity of the long-run slope coefficients. The last columns of Tables 6 and 7 show the Hausman

statistics and their p-values for the Unrestricted and Restricted model, respectively. The null hypothesis can be interpreted as that the long-run coefficients from PMG are efficient and consistent, whereas the long-run coefficients from MG are only consistent (Pesaran et al., 1999). As we can observe, in the case of individual and joint tests, we do not have enough statistical evidence to reject the null hypothesis, which favors the PMG over the MG.

4.3 PMG estimations

In the Unrestricted model we notice that in the short-run the average relationship between the GDP per capita growth and the measures of AID and FDI appears to be insignificant. In the long-run, however, the growth rate of GDP per capita is negatively related to initial income and the size of government, but positively related to trade openness. These are standard results from empirical growth literature (Borensztein et al., 1998; Loayza and Rancière, 2006; Clemens et al., 2012; among others). Most importantly for our purposes, we also find that in the long-run FDI and AID are positively and significantly related to economic growth. The PMG estimations imply that an increase in 1 percent in the participation of foreign direct investment in GDP is associated with an increase of per capita GDP growth rate by 0.06 percent. Also, an increase in the participation of AID in 1 percent is followed by an increase of 0.07 percent in per capita GDP growth rate. These findings shows anecdotally that the long-run effects of AID and FDI on growth appear to be similar.

In order to study the last claim more formally, consider the Restricted model in Table 7. The results regarding the control variables are very similar to those obtained with the unrestricted specification. On the other hand, we find that in the long-run the variable *Total* is positively and significantly related to economic growth and, moreover, its estimated coefficient is similar to the coefficients of AID and FDI in Table 6. All of the above imply two interesting results. First, the effect of AID and FDI are only important in the long term and these flows do not appear to have a considerable role in the short-run. Second, our results on the Restricted model support the hypothesis of a substitution relationship between the average effects of FDI and AID on growth, which can be understood as a *"pooling"* effect of foreign capital. This means that despite the source of these investments, foreign capital will have a similar effect on economic growth in the long-run.

4.4 Alternative dynamic specifications

It is important to wonder whether our conclusions are sensitive to different dynamic specifications of the error correction model. Table 8 presents results for the Restricted and Unrestricted models where, for brevity, only the effects of the variables of interest (AID, FDI and Total) are reported. The dynamic structure of the model is denotes as $(p, \text{lags of } \Delta\text{Initial GDP}, \text{lags of } \Delta\text{Trade}, \text{lags of } \Delta\text{Government}, \text{lags of } \Delta\text{AID}, \text{lags of } \Delta\text{FDI})$, and we have in total eleven different alternative lag structures between (1,0,0,0,0) and (2,2,2,2,2), apart from the minimization of the Schwarz information criterion to select the lag structure, up to r lags, on a variable-by-variable and country-by-country basis. Recall that our baseline results use $r = 1$. The last column presents the p-values resulting from testing the homogeneity between AID and FDI using a standard LR test.

We find that the sign and statistical significance of long-run coefficients remain robust to model specification. In particular, the coefficient of AID is similar to the that of FDI, and in turn to that of Total in the restricted model. The LR test of equality of coefficients for both variables cannot reject the null hypothesis that both coefficients are statistically equal. The substitutability result is still supported by the data.

4.5 Subsample analysis

To enquire further about the robustness of the previous results, we consider different subsamples with varying time windows and by classifying countries according the their income level. The long-run effects of AID and FDI on economic growth for different subsamples are presented in Table 9. We present the Unrestricted and the Restricted models considering the lag order selected by minimizing the Schwarz information criterion, though the results for other lag structures are not substantially different.

Panel A reports the results for the subsamples 1960-2000, 1970-2012 and 1980-2012. We maintain the

original selection criterion of only including countries having at least 20 consecutive time observations, and so the chosen time windows were selected to prevent a significant loss of observations. Similar to the full-sample results, AID and FDI have a positive relationship with economic growth in the long-run. Furthermore, the substitution hypothesis between these two foreign flows is still not rejected.

In *Panel B*, on the other hand, the sample is divided into four income groups according to the World Bank Analytical Classifications (2015): low income, middle income, low income & lower middle income and upper middle income & high income. The coefficients for AID and FDI are, as expected, positive and significant for low income, middle income and low income & lower middle income countries. These flows of foreign capital do not appear to play an important role in explaining growth in upper middle income & high income countries. However, the magnitude of both coefficients seems to be the same in all instances and we can test the idea of *"pooling"* the external capital flows using a LR test, as in the previous analysis. Again, we can not reject the null hypothesis that both flows have a similar impact on economic growth in the long-run. Our hypothesis of a substitution relationship between AID and FDI also survives this sensitivity analysis.

5 Conclusion

Previous studies on economic growth evaluate the impact of AID or FDI independently and do not examine the behaviour of these two variables together. Moreover, these studies do not take into account the fact that the projects that are funded by these foreign capital flows can take a long time to influence growth. This study contributes to the previous literature in two aspects. First, upon applying the Pooled Mean Group (PMG) estimator we estimate the short-run and long-run relationships between AID and FDI on economic growth. Second, we provide an empirical tests to investigate a possible substitution between these two foreign capital flows in the long-run. Our results show that AID and FDI have a statistically significant contribution to economic growth in the long-run for developing countries. Moreover, these variables seem to have no effect in the short-run. The latter may explain the fact that several studies have not found a clear effect of these flows on economic growth.

In particular, the results implies that if a developing country has an increase of 1 percent in the participation of FDI in GDP, we expect a 0.06 percent increase in the long-run per capita GDP growth, whereas this figure amounts to 0.07 percent for the participation of AID in GDP. Since the estimated coefficients of both variables do not appear to be different in magnitude, we can think of a way to assess the aggregate behaviour of both variables (*"pooling"*). We check whether this idea is consistent in the long-run considering a number of different dynamic specifications. The null hypothesis that both effects are similar in the long-run cannot be rejected and therefore, there is statistical evidence that both foreign capital flows are substitutes (affect growth equally). This finding survived various robustness checks.

These results indicate that what really matters for economic growth is the *total* amount of foreign capital, not its composition. It is important to mention that we have only considered two external capital flows suggested by the literature. However, future studies should include other types such as remittances which may also be an important source of capital for developing countries. Furthermore, future research should explore in more depth the possible explanations behind the documented finding that the long-run effect of the AID and FDI on economic growth seems to be the same.

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Figure 1. *Evolution of foreign capital flows*

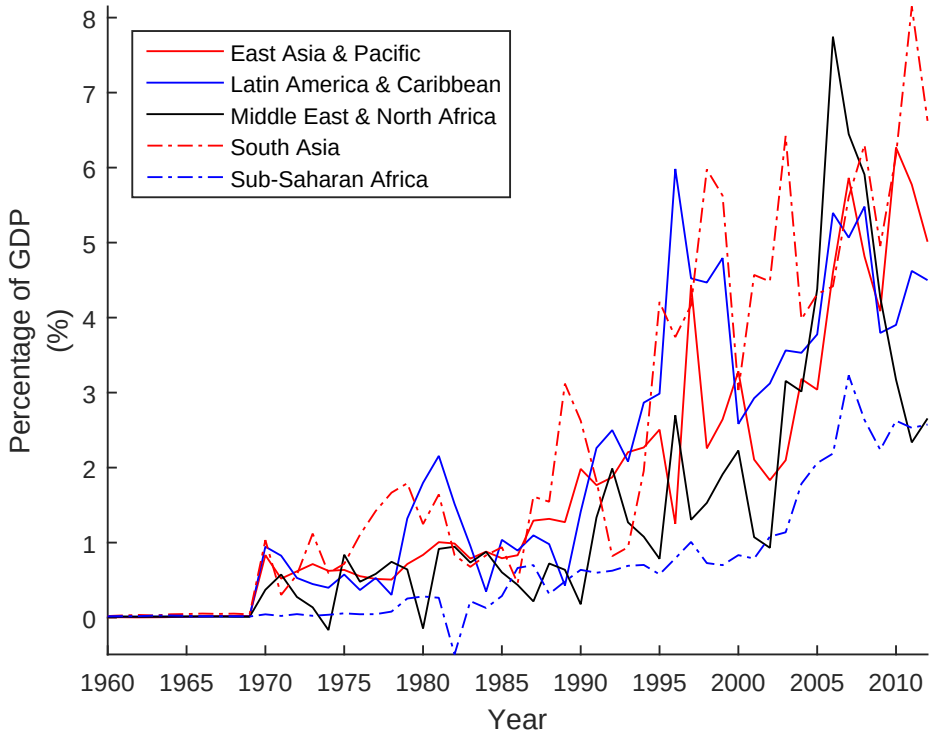

Figure 2. *Evolution of AID*

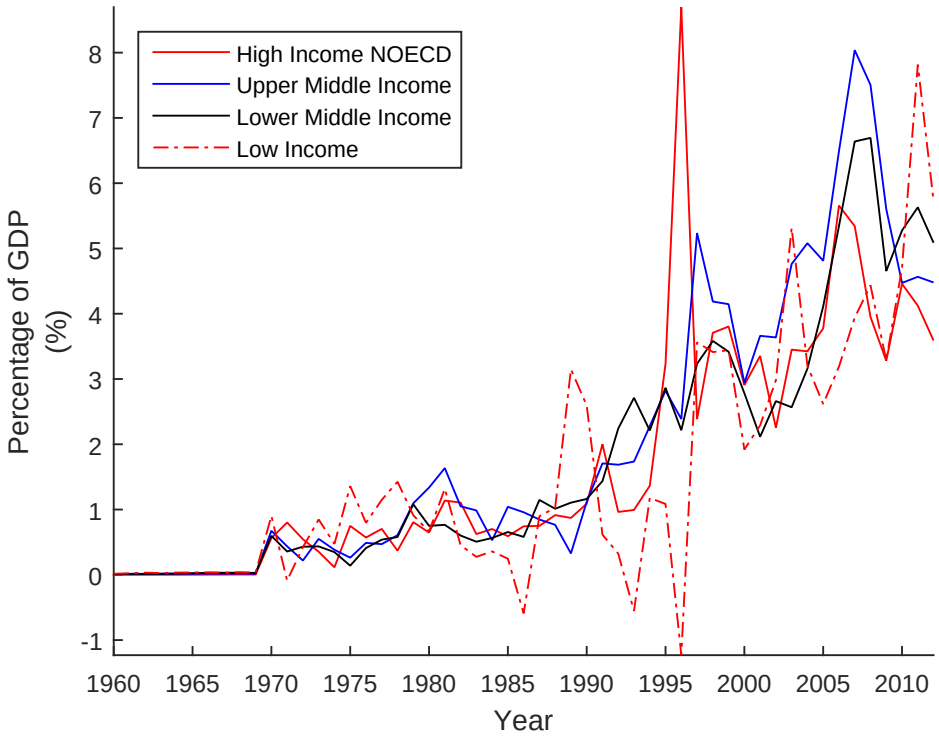

Figure 3. *Evolution of FDI*

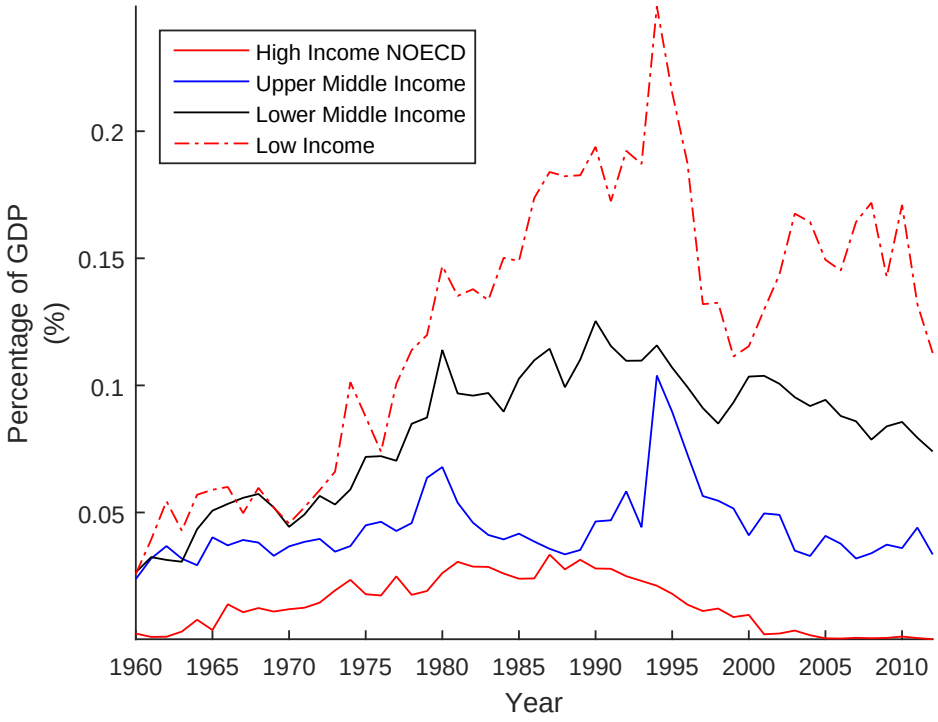

Figure 4. *Participation of AID 2012*

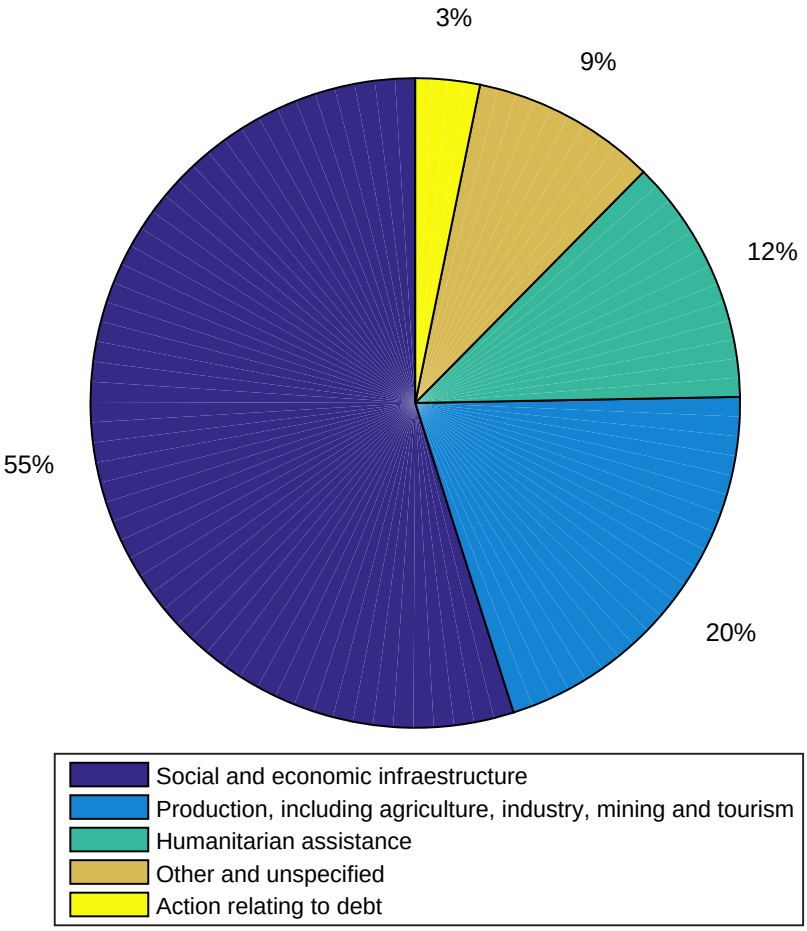

Table 1. *Sample of countries*

Country	Code	Country	Code	Country	Code
Argentina	ARG	Equatorial Guinea	GNQ	Nepal	NPL
Antigua and Barbuda	ATG	Grenada	GRD	Oman	OMN
Burundi	BDI	Guatemala	GTM	Pakistan	PAK
Benin	BEN	Guyana	GUY	Panama	PAN
Burkina Faso	BFA	Honduras	HND	Peru	PER
Bangladesh	BGD	Indonesia	IDN	Philippines	PHL
Bahrain	BHR	India	IND	Papua New Guinea	PNG
Bahamas	BHS	Iran	IRN	Sudan	SDN
Belize	BLZ	Israel	ISR	Senegal	SEN
Bolivia	BOL	Jamaica	JAM	Singapore	SGP
Brazil	BRA	Jordan	JOR	Sierra Leone	SLE
Barbados	BRB	St. Kitts and Newis	KNA	El Salvador	SLV
Botswana	BWA	Kenya	KEN	Suriname	SUR
Central African Republic	CAF	South Korea	KOR	Swaziland	SWZ
Chile	CHL	Liberia	LBR	Seychelles	SYC
China	CHN	St. Lucia	LCA	Syria	SYR
Cote d'Ivoire	CIV	Sri Lanka	LKA	Chad	TCD
Cameroon	CMR	Lesotho	LSO	Togo	TGO
Republic of the Congo	COG	Namibia	NAM	Thailand	THA
Colombia	COL	Morocco	MAR	Tonga	TON
Comoros	COM	Madagascar	MDG	Trinidad and Tobago	TTO
Costa Rica	CRI	Mexico	MEX	Tunisia	TUN
Cyprus	CYP	Mali	MLI	Uganda	UGA
Dominica	DMA	Malta	MLT	Uruguay	URY
Dominican Republic	DOM	Mozambique	MOZ	St. Vincent and the Grenadines	VCT
Algeria	DZA	Mauritania	MRT	Venezuela	VEN
Ecuador	ECU	Mauritius	MUS	Vietnam	VNM
Egypt	EGY	Malawi	MWI	Vanuatu	VUT
Fiji	FJI	Malaysia	MYS	Dem. Rep. of the Congo	ZAR
Gabon	GAB	Niger	NER	Zambia	ZMB
Ghana	GHA	Nigeria	NGA		
Gambia	GMB	Nicaragua	NIC		

Notes: From this list, only 5 countries are currently considered as developed economies by the IMF: Cyprus (since 2001), Israel (since 1997), South Korea (since 1997), Malta (since 2008) and Singapore (since 1997).

Table 2. *Definitions and sources of variables*

Variable	Definition and Construction	Source
GDP per capita	Per capita gross domestic product in constant 2005 PPP-adjusted international US$.	Penn World Table.
GDP per capita growth	Log difference of GDP per capita multiplied by 100.	
Initial GDP per capita	The fifth lag of the log of real GDP per capita.	
Trade Openness	Ratio of the sum of exports and imports to GDP (%GDP).	Penn World Table.
Government Size	Ratio of government consumption to GDP (%GDP).	World Bank national accounts data, and OECD National Accounts data files.
Net official development assistance and official aid received	Net official development assistance (ODA Net) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries. Net official aid (OA Net) refers to aid flows (net of repayments) from official donors to more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories.	Development Assistance Committee of the Organisation for Economic Co-operation and Development, Development Co-operation Report, and International Development Statistics database.
Foreign Aid	Ratio of net official development assistance and official aid received to GDP (%GDP).	
Foreign Direct Investment	Sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This variable is expressed as net inflows (new investment inflows less disinvestment) relative to GDP (%GDP).	International Monetary Fund.

Table 3. *Descriptive statistics*

	GDP per capita growth	Initial GDP per capita	Trade Openness	Government Size	Foreign Aid	Foreign Direct Investment
			Panel A: Summary statistics			
Mean	1.7086	7.9634	74.0069	15.1934	6.2779	3.0442
Std. Dev.	6.0855	1.0681	43.9022	6.8226	8.7626	6.3167
			Panel B: Correlation matrix			
GDP per capita growth	1.0000	0.0321	0.1160	-0.0626	-0.0642	0.2016
Initial GDP per capita	0.0321	1.0000	0.3572	0.1935	-0.4903	0.0860
Trade Openness	0.1160	0.3572	1.0000	0.2342	-0.0198	0.3189
Government Size	-0.0626	0.1935	0.2342	1.0000	0.2325	0.0568
Foreign Aid	-0.0642	-0.4903	-0.0198	0.2325	1.0000	0.0771
Foreign Direct Investment	0.2016	0.0860	0.3189	0.0568	0.0771	1.0000

Table 4. *Descriptive statistics by income group*

	GDP per capita growth	Initial GDP per capita	Trade Openness	Government size	Foreign Aid	Foreign Direct Investment
			Panel A: Low income			
No. Countries	20	20	20	20	20	20
Mean	0.3559	6.5621	49.5038	12.8247	11.8138	2.5723
Std. Dev.	6.9515	0.3881	25.4404	5.5849	11.8134	9.1155
			Panel B: Lower middle income			
No. Countries	28	28	28	28	28	28
Mean	1.7367	7.524	67.7587	14.678	6.1836	2.669
Std. Dev.	6.1154	0.547	35.4361	7.4663	7.0364	4.4592
			Panel C: Upper middle income			
No. Countries	31	31	31	31	31	31
Mean	2.3959	8.5237	77.5961	15.5485	3.554	3.0857
Std. Dev.	5.7385	0.6473	42.861	5.9358	5.7452	4.8525
			Panel D: High income			
No. Countries	15	15	15	15	15	15
Mean	3.1243	9.179	96.6863	16.3663	2.3771	5.9089
Std. Dev.	7.5462	0.9151	67.3684	7.3668	6.5088	10.3796

Table 5. *Included and excluded countries statistics*

Variable	Developing countries included in the analysis			Developing countries excluded from the analysis			Medians equality test	Difference in means
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	*p*-value	(Std. Error)
GDP per capita growth	1.8807	1.6025	1.6419	2.0535	1.7993	2.1627	0.9699	0.1728
								(0.3373)
Initial GDP per capita	7.9194	7.9796	1.0423	8.0956	7.9252	1.1314	0.4482	0.1762
								(0.1987)
Trade Openness	72.7579	69.772	39.0599	74.935	71.6231	34.2737	0.5157	2.1771
								(6.9898)
Government Size	15.0905	13.9897	5.1126	16.8874	17.1722	5.8422	0.0546	1.7969*
								(0.9923)
Foreign Aid	6.1104	4.0835	6.0278	6.208	3.501	7.0221	0.5403	0.0976
								(1.1783)
Foreign Direct Investment	3.4423	2.2298	3.7967	3.8523	3.1152	3.13	0.1764	0.4101
								(0.6692)

Notes: 94 developing countries included and 42 developing countries excluded because they reported less than 20 consecutive observations over time. Standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 6. *Estimation results for the unrestricted model*

	SFEE		DFEE		MGE		PMGE		Hausman Tests	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	*h*-test	*p*-value
Long-Run Coefficients										
Initial GDP per capita	-4.001***	(0.6339)	-4.045***	(0.7155)	-3.2082***	(1.2283)	-3.5528***	(0.3389)	0.0852	0.7703
Trade openness	0.0361***	(0.0093)	0.0315***	(0.0088)	0.0359	(0.0260)	0.0352***	(0.0039)	0.0009	0.9758
Government size	-0.0627*	(0.0325)	-0.0308	(0.0308)	-0.0148	(0.0743)	-0.0215	(0.0195)	0.0088	0.9254
Foreign aid	0.0152	(0.0404)	-0.002	(0.0410)	0.0667	(0.0850)	0.0683***	(0.0186)	0.0004	0.9841
Foreign direct investment	0.2495***	(0.0881)	0.2554***	(0.0978)	0.0344	(0.0814)	0.0554***	(0.0221)	0.0718	0.7888
							Joint Hausman Test:		0.1976	0.9991
Error-Correction Coefficients										
Phi	-1.0000		-0.924***	(0.0322)	-1.035***	(0.0202)	-1.0059***	(0.0175)		
Sum of Short-Run Coefficients										
Δ Initial GDP per capita			-1.2315	(1.8038)	0.2622	(0.9937)	0.2144	(0.5650)		
Δ Trade openness			0.0291*	(0.0158)	0.0197	(0.0150)	0.019	(0.0147)		
Δ Government size			-0.0656	(0.0529)	-0.1119*	(0.0631)	-0.0727	(0.0484)		
Δ Foreign aid			0.0394	(0.0343)	-0.0574	(0.0482)	-0.0668	(0.0502)		
Δ Foreign direct investment			-0.005	(0.0279)	0.0051	(0.0414)	-0.008	(0.0294)		
Intercept					-0.4158	(1.4339)	-0.1177	(0.4910)		
No. Countries	94		94		94		94			
No. Observations	3076		2982		3076		3076			
Average T	33		32		33		33			
Average adjusted R-squared	0.0847		0.4743		0.5324		0.3588			

Notes: Robust standard errors in parentheses. SFEE = Static Fixed Effects; DFEE = Dynamic Fixed Effects; MGE = Mean Group; PMGE = Pooled Mean Group. For the DFEE model the dynamic specification is ARDL(1,1,1,1,1,1). For the MGE and PMGE, individual specifications were selected by minimizing the Schwarz information criterion with a maximum lag of 1. All estimates have been controlled for country and time effects. For the Hausman test, h-test = Hausman statistic for both individual coefficients and the joint vector. Individual Hausman tests are asymptotically χ^2 with 1 degree of freedom, and the joint test is asymptotically χ^2 with 5 degrees of freedom. Under H_0: PMGE is efficient and consistent, and MGE is only consistent. Under H_1: PMGE is inconsistent, and MGE is still consistent. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 7. *Estimation results for the restricted model*

	SFEE		DFEE		MGE		PMGE		Hausman Tests	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	*h*-test	*p*-value
Long-Run Coefficients										
Initial GDP per capita	-3.4486***	(0.5497)	-3.5882***	(0.6675)	-3.4795***	(1.0924)	-3.4964***	(0.3430)	0.0003	0.9870
Trade openness	0.0376***	(0.0106)	0.0337***	(0.0104)	0.0497**	(0.0240)	0.0354***	(0.0040)	0.3635	0.5466
Government size	-0.0899**	(0.0438)	-0.057*	(0.0331)	-0.0314	(0.0700)	-0.0248	(0.0198)	0.0097	0.9214
Total	0.1257***	(0.0472)	0.1064***	(0.0417)	0.127**	(0.0535)	0.0639***	(0.0144)	1.4952	0.2214
							Joint Hausman Test:		1.8330	0.7664
Error-Correction Coefficients										
Phi	-1.0000		-0.8965***	(0.0486)	-1.0174***	(0.0188)	-0.9981***	(0.0173)		
Sum of Short-Run Coefficients										
Δ Initial GDP per capita			-0.6959	(1.6621)	0.4143	(0.9619)	0.1718	(0.5858)		
Δ Trade openness			0.0294*	(0.0156)	0.0052	(0.0186)	0.0203	(0.0156)		
Δ Government size			-0.0587	(0.0556)	-0.0705	(0.0550)	-0.0594	(0.0404)		
Δ Total			0.0373*	(0.0213)	-0.009	(0.0223)	-0.0109	(0.0131)		
Intercept					-0.2293	(1.1978)	-0.0771	(0.4791)		
No. Countries	94		94		94		94			
No. Observations	3076		2982		3076		3076			
Average *T*	33		32		33		33			
Average adjusted R-squared	0.059		0.4617		0.5153		0.3759			

Note: See notes to Table 6.

Table 8. *Long-run effects of AID and FDI on growth under alternative dynamic specifications*

	Unrestricted model		Restricted model	$H_0 : \theta_{AID} = \theta_{FDI}$
ARDL	Foreign aid	Foreign direct investment	Total	p-value
1,0,0,0,0,0	0.0654***	0.0699***	0.0649***	0.9671
	(0.0200)	(0.0247)	(0.0156)	
1,0,0,0,1,1	0.0637***	0.0555**	0.062***	0.8294
	(0.0210)	(0.0277)	(0.0169)	
1,1,1,1,1,1	0.0489**	0.0533*	0.0506***	0.8227
	(0.0216)	(0.0280)	(0.0176)	
Schwarz(1)	0.0683***	0.0554***	0.0639***	0.6663
	(0.0186)	(0.0221)	(0.0144)	
2,0,0,0,0,0	0.0573***	0.0675***	0.0588***	0.8981
	(0.0200)	(0.0232)	(0.0153)	
2,0,0,0,2,2	0.0452**	0.046	0.059***	0.6670
	(0.0222)	(0.0288)	(0.0175)	
2,1,1,1,2,2	0.0441*	0.0595**	0.0515***	0.2971
	(0.0229)	(0.0294)	(0.0179)	
1,2,2,2,1,1	0.0715***	0.0505*	0.0559***	0.6543
	(0.0233)	(0.0281)	(0.0183)	
2,2,2,2,1,1	0.0707***	0.0600**	0.0544***	0.6923
	(0.0216)	(0.0244)	(0.0171)	
2,2,2,2,2,2	0.0407*	0.0700***	0.0458**	0.3584
	(0.0233)	(0.0273)	(0.0188)	
Schwarz(2)	0.0872***	0.0464**	0.0732***	0.3727
	(0.0184)	(0.0209)	(0.0142)	

Notes: The dynamic specification is (p, lags of ΔInitial GDP, lags of ΔTrade, lags of ΔGovernment, lags of ΔAID, lags of ΔFDI) in the unrestricted models, whereas in the restricted model the last two entries are replaced by the lags of ΔTotal. Schwarz(r) = the lag order is chosen by minimizing the Schwarz information criterion with a maximum lag of r. Robust standard errors in parentheses. All estimations have been controlled for country and time effects. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 9. *Long-run effects of AID and FDI on growth under alternative subsamples*

Sample	Unrestricted model		Restricted model	$H_0 : \theta_{AID} = \theta_{FDI}$	No. Countries	Average T
	Foreign aid	Foreign direct investment	Total	p-value		
			Panel A. Time country subsamples			
1960-2000	0.1015***	0.1069***	0.101***	0.9279	93	24
	(0.0242)	(0.0282)	(0.018)			
1970-2012	0.0634***	0.0628***	0.0654***	0.9853	94	31
	(0.0188)	(0.0219)	(0.0144)			
1980-2012	0.0793***	0.0483**	0.0657***	0.5675	93	23
	(0.0189)	(0.0208)	(0.014)			
			Panel B. Income country subsamples			
Low income	0.1159***	0.1695***	0.0719***	0.8385	20	32
	(0.0299)	(0.0562)	(0.0226)			
Middle income	0.0583**	0.0473*	0.0652***	0.8658	59	32
	(0.0279)	(0.0277)	(0.0201)			
Low income and	0.0992***	0.1314***	0.0804***	0.6971	48	33
lower middle income	(0.0207)	(0.0316)	(0.0163)			
Upper middle income	0.0352	0.0256	0.0381	0.3702	46	32
high income	(0.0477)	(0.0293)	(0.0241)			

Notes: Robust standard errors in parentheses. All estimates have been controlled for country and time effects. Lag orders were chosen by minimizing the Schwarz information criterion with a maximum lag of one. * significant at 10%, ** significant at 5%, *** significant at 1%.