Where Has All the Money Gone? Foreign Aid and the Quest for Growth*

Santanu Chatterjee†
University of Georgia

Paola Giuliano‡
University of California-Los Angeles
IZA

Ilker Kaya§
American University of Sharjah

Abstract

This paper examines the link between the composition of foreign aid and that of government spending. Two questions are addressed: (i) does foreign aid crowd out government spending in aid-recipient countries, and (ii) are certain categories of aid more fungible than others? Embedding foreign aid, its allocation, and government spending in a simple endogenous growth model we characterize scenarios where aid might crowd out government spending on investment (say, on infrastructure), thereby mitigating any positive impact on growth. The model is estimated using a panel dataset of 67 countries for 1972-2000. We find strong evidence of fungibility at the aggregate level: almost 70 percent of total aid is fungible in our sample. We also find that investment aid is more fungible than other categories of aid, crowding out about 90 percent of government investment. Aid does not affect private investment, but has a strong positive impact on household consumption. The results are also robust to checks for causality. These findings are significant, since more than two-thirds of all aid flows to developing countries are tied to some form of public investment.

Keywords: Foreign Aid, Aid Effectiveness, Economic Growth, Fungibility, Fiscal Policy.
JEL Classification: E6, F3, F4, O1

*A part of this paper was completed while Chatterjee was visiting the Research Department of the International Monetary Fund, whose hospitality is gratefully acknowledged. The paper has benefited from presentations at the North American Summer Meetings of the Econometric Society at Duke University, the NEUDC Conference at Harvard University, The Third Southeastern International-Development Conference at the Federal Reserve Bank of Atlanta, the SEA meetings in Charleston, the Fifth Annual Conference on Economic Growth and Development at the Indian Statistical Institute in New Delhi, and seminar presentations at the International Monetary Fund, University of Hamburg, HWWI, University of Tennessee, University of Georgia, and Southern Illinois University. We are grateful to Andrew Berg and Eric Werker for comments on an earlier draft. Chatterjee would like to thank the Terry-Sanford Research Award at the University of Georgia for financial support.

†Corresponding Author: Department of Economics, Terry College of Business, University of Georgia, Athens, GA 30602 USA. Phone: +1-706-542-3696. Email: schatt@uga.edu

‡Anderson School of Management, Global Economics and Management Area, UCLA, 110 Westwood Plaza, C517 Entrepreneurs Hall, Los Angeles, CA 90095-1481. Email: paola.giuliano@anderson.ucla.edu, Phone: +1-310-206-6890.

§Department of Economics, School of Business and Management, American University of Sharjah, UAE. Email: ikaya@aus.edu

1 Introduction

The apparent inability of foreign aid in affecting indicators of growth and development in the developing world has emerged as a challenging puzzle to both economists and policy-makers. A growing empirical literature since the mid-1990s has gradually changed the initial enthusiasm and optimism surrounding aid programs into concern and skepticism.[1] In this paper, we attempt to examine a potential transmission mechanism which might mitigate the positive effects of foreign aid on macroeconomic performance. Specifically, our focus is on the composition of foreign aid and its effects on the composition of government spending. In other words, we examine whether foreign aid flows supplement a recipient government's budget or merely substitutes for (crowds out) domestic government spending. This is essentially the problem of *fungibility*, and arises when the marginal dollar of aid ends up financing the provision of a good that it was not intended to finance. We are therefore interested in the extent to which total aid flows are fungible, and whether certain categories of aid are more fungible than others. This channel is of critical importance, since according to the OECD, almost 70% of all aid flows are targeted to public investment in recipient countries (see figure 1). Moreover, as noted by Svensson (2000) and Berg et al. (2007), the largest aid-recipient countries receive more than 50% of their government expenditures in the form of foreign aid. Consequently, if aid allocated for investment crowds out domestic government investment spending, any potential growth benefits are likely to be offset.[2]

Even though anecdotal evidence suggests that fungibility is widely prevalent in most aid-recipient countries, the link between the composition of aid and that of government spending has not been studied systematically either in theory or empirically, thereby underscoring the need to derive a testable link from a micro-founded general equilibrium growth

[1] Notable among these is Boone (1996), who found that foreign aid has had no significant impact on the prominent indicators of development and quality of life. Easterly (1999) paints a much bleaker picture, reporting that an increase in foreign aid has actually led to a decline in growth rates in many recipient countries. The influential work of Burnside and Dollar (2000) argues that aid works only in economic environments that are characterized by "good" policy-making by recipient governments. Thus, their results call for greater selectivity from donors when designing aid programs. However, several papers, including Hansen and Tarp (2001), Dalgaard and Hansen (2001), and Easterly (2003), among others, have argued that the Burnside-Dollar results are not robust to alternative definitions of aid, growth, and good policies.

[2] This phenomenon may arise in circumstances where monitoring the actual disbursement of aid in recipient countries is prohibitively costly for the donor; see Clements et al. (2004)

model.[3] This link is of critical importance since the composition of government spending may have an important bearing on economic growth.[4] By embedding foreign aid, its allocation, and government spending in a general equilibrium model and then testing the resulting hypotheses, we seek to fill this gap in the literature and provide a better understanding of the "missing link" between foreign aid and development.

From a theoretical perspective, starting with the "two-gap" model of Chenery and Strout (1966), the literature on foreign aid has assigned an important role to aid allocated for investment as an engine of growth. Recently, a number of papers, starting with Chatterjee et al. (2003), and including Agenor and Aizenman (2010), Chatterjee and Turnovsky (2007), Dalgaard (2008), and Agenor et al. (2008) have developed long-run growth models that explicitly focus on the "spending" of foreign aid by a recipient government. These studies generally support tying aid to public investment in order to increase its effectiveness. On the other hand, a new strand of the literature has begun exploring the "absorption" or monetary response to aid over the short and medium run, using the DSGE framework; see Buffie et al. (2010) and Berg et al. (2010). These studies generally treat aid flows as *non-fungible*, i.e., the recipient government is assumed to spend aid resources according to the restrictions imposed by donors. We address this shortcoming by developing a simple general equilibrium model to analyze the mechanism through which the allocation of aid determines the composition of government spending between public investment and public consumption. The model characterizes explicit scenarios where an increase in foreign aid may increase, decrease or have no effect on long-run growth, depending on the extent to which aid flows crowd out domestic public investment. Similar conditions are derived for the effect of aid on private consumption. Taken together, these results provide us with an intuitive mechanism underlining the relationship between aid and government spending that can be taken to the data.

From an empirical standpoint, there is little consensus on the exact magnitude and

[3]There is a small theoretical literature which focuses on the diversion of aid away from its intended activities in developing countries. For example, Svensson (2000) and Lahiri and Raimondos-Moller (2004) focus on rent-seeking activities by special interest groups or lobbies which divert aid from its designated uses. On the other hand, Adam and O'Connell (1999) examine the role of lobby groups in forcing the government to use aid money for tax cuts. While all these mechanisms fall under the general category of fungibility, none focus on the impact of aid on the composition of government spending.

[4]For example, see Turnovsky and Fisher (1995) and Devarajan et al. (1996).

importance of fungibility. Pack and Pack (1990, 1993) find that while foreign aid to Indonesia does not seem to be fungible, the opposite is true for the Dominican Republic, where they observe major shifts in public spending away from development expenditures into deficit reduction and debt service. Examining inter-governmental transfers in India, Swaroop et al. (2000) find evidence that foreign aid disbursements typically finance activities that are very different from the intentions of donors. Aggregate studies also differ in their conclusions about fungibility. For example, Feyzioglu et al. (1998), using annual data for 14 developing countries that span over 1971-90, find that foreign aid is not fungible and is also not associated with tax relief. On the other hand, a recent study by Gupta et al. (2003) finds that while concessional loans are not fungible and generate higher domestic resource mobilization, grants do indeed reduce revenue generation in recipient countries. None of these studies, however, examine the impact of the composition of aid on the composition of domestic government spending, and especially public investment, to which most aid flows are increasingly tied. The simple model we develop thus enables us to conduct an empirical test of the theoretical literature that advocates tying aid to public investment. This highlights the second contribution of this paper.

Using a panel of 67 countries over the 1972-2000 period, we first test whether total aid is fungible, by investigating how total government expenditure in aid-recipient countries respond to changes in aggregate foreign aid. Our results indicate strong evidence of fungility: a 1 percentage-point increase in the aid-to-GDP ratio leads to an increase of only about 0.3 percentage points in total government spending (which includes foreign aid) with respect to GDP. This implies that about 70 percent of foreign aid flows are fungible. We then test the link between the composition of aid and the composition of government spending by examining whether specific aid types are used for the targeted sub-categories of public expenditures that they are allocated to by donors. Disaggregating total aid and government spending into three sub-categories, namely, investment, non-investment, and social infrastructure, we find that investment aid is indeed the most fungible among all aid categories: almost 90 percent of all investment aid is fungible. The corresponding degree of fungibility for social infrastructure aid is about 78 percent. By contrast, we find no evidence of fungibility for the non-investment aid category. This suggests that aid tied to public investment might not have any real impact on macroeconomic performance. This is an important result, since more than two-thirds of all aid flows to developing countries are tied in some way to public

investment projects. Finally, we test whether the composition of aid affects that of private spending. We find that while aid (and its composition) has no significant effect on private investment, it does have a strong positive impact on household consumption. In fact, all three sub-categories of aid have strong positive effects on household consumption. These results suggest that aid, though fungible, might be financing private consumption (rather than private or public investment), possibly through government transfers (for example, consumption subsidies and unemployment insurance).[5] Taken together, these results shed some light on the "missing link" between aid and growth.

As with any study involving foreign aid and its effectiveness, the endogeneity of aid is an important econometric issue. To address the issue of causality, we conduct two robustness checks on our empirical specification: (i) the difference GMM estimation procedure, based on Arellano and Bond (1991), and (ii) a traditional instrumental variable estimation, where foreign aid is instrumented by interacting aid flows with indicators of the recipient country's geographical and cultural proximity to donors, based on Tavares (2003). All of our results on aid and fungibility remain robust to these checks.

The rest of the paper is organized as follows. Section 2 lays down the analytical framework and examines the consequences of fungibility. Section 3 contains the empirical analysis and Section 4 concludes.

2 Aid and Fungibility: A Stylized Model

Consider a representative agent who maximizes intertemporal utility from a private consumption good, C, and a public consumption good, G_C, over an infinite horizon

[5] Our results on the effects of aid on the composition of private spending are related to some recent work in this area. The fact that aid has no impact on private investment is consistent with Harms and Lutz (2006), who find that, on average, aid has no effect on private foreign investment in recipient countries. On the other hand, studying a sample of Islamic countries that recieve aid mainly from the OPEC, Werker at al. (2009) document that most aid flows are consumed. Rajan and Subramanian (2010) point to the "Dutch Disease" aspect of foreign aid, whereby a real exchange appreciation has an adverse effect on the manufacturing sector of aid-recipient countries. Our results tie in nicely with these papers, but yet distinguish themselves by focusing specifically on the consequences of the composition of foreign aid, which is often determined by donors.

$$U = \int_0^{\infty} \frac{1}{\gamma}(CG_c^{\theta})^{\gamma} e^{-\beta t} dt, \quad -\infty < \gamma < 1,\ \theta > 0,\ \gamma(1+\theta) < 1 \tag{1}$$

θ denotes the relative weight of the public consumption good in the utility function. The agent produces output using her stock of private capital (an amalgam of physical and human capital), K, and the flow of services from a public investment good, such as infrastructure, G_I, through a neoclassical production function

$$Y = G_I^{\eta} K^{1-\eta}, \quad 0 < \eta < 1 \tag{2}$$

The accumulation of private wealth is subject to the following flow budget constraint

$$\dot{K} = Y - C - T \tag{3}$$

where T denotes lump-sum taxes (or transfers). The government provides the two public goods G_C and G_I, and finances their provision using domestic tax revenues and a flow of foreign aid, F. We will assume, for simplicity, that the government maintains a balanced budget at all points of time:

$$G_c + G_I = F + T \tag{4}$$

In order to maintain an equilibrium of sustained growth, all variables must be tied linearly to the scale of the economy, given by the flow of output, Y. The provision of both public goods are co-financed, using a mix of domestic resources and foreign aid:[6]

$$G_I = G_I^d + \phi F = \left(g_I^d + \phi\varepsilon\right) Y \tag{5a}$$

$$G_c = G_c^d + (1-\phi)F = \left[g_c^d + (1-\phi)\varepsilon\right] Y \tag{5b}$$

where G_I^d and G_c^d represent domestic government spending on the public investment and

[6] Co-financing is an important ingredient of a majority of foreign aid programs. A recent example can be found in the European Union's Community Support Framework (CSF) and Agenda 2000 programs, which involved transfer (aid) programs for both its member countries as well as countries applying for membership to the Union. Most of these transfers were tied to infrastructure investment in the recipients and involved co-financing arrangements.

consumption goods, respectively, while g_I^d and g_c^d are the corresponding domestic expenditure ratios. The foreign aid-output ratio is given by ε and the parameter ϕ $(0 \leq \phi \leq 1)$ denotes the *composition* of aid. In other words, a proportion ϕ of the total foreign aid flow is ear-marked by the donor for the public investment good and $(1-\phi)$ is the corresponding allocation designated for the public consumption good. In that sense, $\phi\varepsilon$ can be thought of as "investment aid", while $(1-\phi)\,\varepsilon$ can be thought of as "consumption" or "non-investment" aid (as a percentage of GDP). Note that the allocation parameter ϕ is exogenous to the recipient economy, as it is assumed to be determined by the donor.[7] Combining (3) and (4), we get the economy's aggregate resource constraint:

$$\dot{K} = Y - C - G_c - G_I + F \tag{6}$$

2.1 Resource Allocation

The representative agent maximizes (1) subject to (2) and (3), taking the expenditures on the two public goods, the foreign aid flow and its allocation, and the tax rate as given. The equilibrium (balanced) growth rate (ψ) is then given by

$$\psi = \frac{(g_I^d + \phi\varepsilon)^{\frac{\eta}{1-\eta}} - \beta}{1 - \gamma(1+\theta)} \tag{7}$$

Totally differentiating (7a) we get

$$d\psi = \frac{1}{1-\gamma(1+\theta)} \left[\left(\frac{\eta}{1-\eta} \right) (g_I^d + \phi\varepsilon)^{\frac{2\eta-1}{1-\eta}} (dg_I^d + \phi d\varepsilon) \right] \tag{7a}$$

It is evident from (7a) that *ceteris paribus*, foreign aid will have a positive effect on growth, as long as $0 < \phi \leq 1$ (some aid is allocated by the donor to public investment). However, given the high cost to donors of monitoring the implementation of aid programs and their allocation, it is entirely plausible that the recipient government treats the aid flow not as a supplemental source of financing public goods, but rather as a *substitute* for domestic

[7] We employ a linear endogenous growth structure, as in Barro (1990), to keep the analysis tractable and derive refutable hypotheses that can be easily taken to the data. The two public goods enter the model's specification as externalities to private decisions. For more complex models that are characterized by transitional dynamics, see Chatterjee et al. (2003) and Chatterjee and Turnovsky (2007).

revenues, and adjusts (reduces) its own expenditure parameters in response to the aid shock. This is the idea of fungibility. To see this clearly, assume that, in response to the inflow of foreign aid, the government adjusts its own expenditure ratios in the following way

$$dg_I^d = -\rho_I d\varepsilon, \quad 0 \leq \rho_I \leq 1 \tag{8a}$$

$$dg_c^d = -\rho_c d\varepsilon, \ 0 \leq \rho_c \leq 1, \tag{8b}$$

In (8a) and (8b), ρ_I and ρ_c denote the proportion in which the government reduces its own spending on the two public goods, in response to the inflow of aid. Thus, $\rho_I(\rho_c) = 0$ indicates that the government remains passive to the aid shock and keeps its spending ratios unchanged. On the other hand, $\rho_I(\rho_c) = 1$ indicates that the reduction in domestic public spending is fully proportional to foreign aid. Using (8a) in (7a), we get

$$\frac{d\psi}{d\varepsilon} = \frac{(\phi - \rho_I)}{1 - \gamma(1+\theta)} \left(\frac{\eta}{1-\eta}\right) (g_I^d + \phi\varepsilon)^{\frac{2\eta-1}{1-\eta}} \tag{9}$$

Eq. (9) gives us an intuitive relationship between equilibrium growth, the composition of aid, and the domestic spending response of the aid-recipient government. Three cases may be identified here:

i. $\phi > \rho_I$: Here, the reduction in domestic public investment spending is less than the increase in investment aid, and the growth rate increases, albeit less than when $\rho_I = 0$ (passive government).

ii. $\phi < \rho_I$: In this case, the reduction in domestic public investment spending more than offsets the increase in investment aid, and the growth rate declines.

iii. $\phi = \rho_I$: The reduction in government spending exactly offsets the increase in investment aid, leaving the growth rate unchanged and independent of the foreign aid shock. This result is consistent with the voluminous empirical literature that finds aid has no effect on growth outcomes.

In all the three cases outlined above, foreign aid is fungible, but depending on the extent of the adjustment in domestic public investment spending, its effect on equilibrium growth may be positive, negative, or zero.[8]

[8]It should be noted that the adjustment ratios ρ_I and ρ_c, though treated as exogenous parameters in

The obvious question that comes up at this juncture is how does an increase in foreign aid affect *total* government spending? To see this, we begin by defining total public expenditures (as a fraction of aggregate output), which include domestic spending on the two public goods and foreign aid:

$$\bar{g} = g_I^d + g_c^d + \varepsilon \tag{10}$$

Totally differentiating (10), while taking into account (8a) and (8b), we get

$$\frac{d\bar{g}}{d\varepsilon} = 1 - (\rho_I + \rho_c) \leq 1 \tag{11}$$

The result in (11) gives us a simple relationship between foreign aid and total government spending that can be taken to the data. If the government remains passive, i.e., $\rho_I = \rho_c = 0$, total government spending must increase by the amount of aid, i.e., $d\bar{g} = d\varepsilon$. When aid is fungible, the increase in total spending will be less than in proportion to the increase in aid: $d\bar{g}/d\varepsilon < 1$.[9] This indicates that foreign aid *substitutes* for domestic spending, rather than supplementing it.

The equilibrium consumption-capital ratio can be derived by dividing (6) by K and substituting from (7):

$$\frac{C}{K} = \mu = \frac{\beta - [1 - \{1 - \gamma(1+\theta)\}(1 - g_I^d - g_c^d)](g_I^d + \phi\varepsilon)^{\frac{\eta}{1-\eta}}}{1 - \gamma(1+\theta)} \tag{12}$$

Totally differentiating (12), while using (8a) and (8b) gives

$$\frac{d\mu}{d\varepsilon} = (g_I^d + \phi\varepsilon)^{\frac{\eta}{1-\eta}} \left[\left(\frac{\eta}{1-\eta} \right) \left(\frac{\{1 - \gamma(1+\theta)\}(1 - g_c^d - g_I^d) - 1}{(g_I^d + \phi\varepsilon)\{1 - \gamma(1+\theta)\}} \right) (\phi - \rho_I) + (\rho_I + \rho_c) \right] \tag{12a}$$

In general, the effect of an increase in foreign aid on the consumption-capital ratio is ambiguous. Under the mild restriction that $\{1 - \gamma(1+\theta)\}(1 - g_c^d - g_I^d) > 1$, we can show that when the government is passive ($\rho_I = \rho_c = 0$), aid has a positive impact on consump-

our simple and stylized set-up, would be endogenous in a more micro-founded model where the government's objectives and allocation decisions are modeled. However, since our purpose is to derive some simple hypotheses that can be directly taken to the data, we abstract from these modeling issues.

[9] This allows total government spending to be unaffected or decrease following the aid inflow, i.e., $d\bar{g}/d\varepsilon \leq 0$, if $\rho_I + \rho_c \geq 1$.

tion, by raising investment and the long-run growth rate. When aid is fungible ($\rho_I > 0$, $\rho_c > 0$), there are two opposing effects on the consumption-capital ratio. On the one hand, the reduction in domestic public spending frees up resources for private consumption (for example, through lumpsum tax rebates or subsidies). On the other hand, to the extent that the reduction in domestic public investment more than offsets the increase in investment aid ($\phi < \rho_I$), the resulting decline in equilibrium growth will tend to reduce private consumption. Whether consumption increases or decreases in equilibrium will depend on which of these two effects dominate. In the case where the reduction in domestic public investment spending exactly offsets the increase in investment aid ($\phi = \rho_I$), the consumption-capital ratio increases unambiguously, leaving long-run growth and private investment unaffected. In this case, all of the aid, irrespective of its initial allocation, is consumed in equilibrium.

3 Empirical Analysis

We use an unbalanced panel dataset of 67 countries for the 1972-2000 period to test the main predictions from the theoretical model outlined in the previous section. Specifically, the empirical analysis is based on the following three questions:

1. Does the marginal dollar of foreign aid finance the activity or good that it was allocated to? In other words, is total aid fungible?

2. Does the composition of aid affect the composition of government spending, i.e., does the degree of fungibility differ across different types of aid?

3. Does aid affect private spending, i.e., private investment and household consumption?

3.1 Data

The dependent variables for our study are: annual total and sectoral government expenditures, private investment, and household final consumption expenditures.[10] The data on government spending are from the International Monetary Fund's Government Financial

[10] Total expenditures do not include defense expenditures, which on average exceed 10 % of the total expenditure for the recipient countries. We exclude defense expenditures as it is unlikely for that type of expenditure to be affected by the social and economic indicators that are included in our empirical specification.

Statistics. Data on private investment is obtained from the Penn World Tables, and that for household consumption expenditures are from the World Development Indicators (WDI).

The main explanatory variable in our analysis is foreign aid. Data on foreign aid is available from the Organisation for Economic Co-operation and Development's (OECD) International Development Statistics (IDS) online databases. These databases cover bilateral and multilateral donors' aid and other resource flows to developing countries and countries in transition. We use two different aid datasets, provided by the Creditor Reporting System (CRS) and Development Assistance Committee (DAC) databases.[11] The DAC report consists of aggregated data for Net Official Development Assistance (ODA), while the CRS report presents sectoral and geographical information on aid. Further, the data on total foreign aid from DAC show disbursements whereas data from CRS show commitments. To test whether the composition of aid matters for fungibility, we need data on the composition of aid and government spending, as the theoretical model makes predictions on how sector-specific expenditures respond to changes in sector-specific foreign aid.[12] Although the DAC report presents more data on disbursements, it does not provide as detailed a sectoral allocation of aid as the CRS report. These two databases may show some differences for some years and sectors due to their underlying information gathering systems and tools. However, using the CRS database has become more feasible recently because of its increased coverage, especially starting from 1990s.[13] To check for robustness, we use total aid data from both the CRS and DAC databases and find that the results are practically unchanged.

We classify domestic government expenditures and foreign aid into three sub-categories, based on definitions in the OECD CRS (commitments) database: investment, non-investment and social infrastructure.[14] Investment aid is defined as the sum of economic infrastructure

[11] See Appendix B for further details.

[12] For this part of our analysis, we use the two distinct aid datasets obtained from the DAC and CRS database as described above. We compare the results obtained by using these two types of aid data to see if data source selection affects the results considerably. The tables are designed in a way that the reader can see and compare results with these aid data.

[13] We examined the correlation between the two series in our panel in each year starting from 1973 (which is the initial year of the CRS data). In our sample, the correlation between the two series increases over time. The correlation between the two measures is 0.6574 in 1973, 0.8057 in 1990 and 0.9289 in 2000. The overall correlation in our panel between the two series is 0.8355.

[14] We construct three aid and expenditure sub-categories instead of two (as in the theoretical model) to avoid a multicollinearity problem. Dividing the aid (and government expenditures) into two sub-categories would make those categories linearly dependent.

aid and aid to the production sector. Then we use the corresponding spending amounts listed under the Economic Affairs and Services Section in the IMF's Government Financial Statistics (GFS) to construct government investment expenditures for the recipient country that match the definition of investment aid. Social-infrastructure aid is defined as aid to social infrastructure and services in the CRS data. General public services, education, health, social security, housing and recreational and cultural expenditures in the GFS data are then used to construct the corresponding domestic government expenditure on social infrastructure. The remaining components in both the aid and government expenditure datasets are used to construct the non-investment categories. All aid and expenditure variables are expressed as a share of the aid-recipient's GDP.[15]

The control variables for our analysis include agricultural value-added, literacy rate, infant mortality rate, the dependency ratio (the fraction of population 65 years and above), exports plus imports as a percentage of GDP, real per-capita GDP, and the GDP per-capita growth rate. For the regressions involving private investment and household consumption, we use CPI inflation and interest rate spreads as additional controls. Agricultural value-added, the dependency ratio, the literacy rate, and GDP per-capita growth rates are obtained from the World Bank National Accounts Data and the OECD National Accounts. Data on infant mortality rates and real per-capita GDP are obtained from the U.S Census Bureau's International databases (IDB) and the Penn World Table, respectively. Interest rate spreads and CPI inflation are obtained from the International Financial Statisitics. The descriptive statistics for the variables of interest and the list of aid-recipient countries in our sample are presented in Tables A1 and A3 in Appendix A, respectively.

3.2 Estimation Methodology

We begin by examining the sensitivity of government spending and its composition (as defined above) to changes in total foreign aid and its composition in a panel of 67 countries, using annual data for the 1972-2000 period.[16] The first step is to test for the fungibility of

[15] We provide the complete aid (CRS) and expenditure classification charts from our data sources in Appendix A (Tables A5 and Table A6).

[16] The list of aid-recipient countries used in our sample is provided in Appendix A (Table A3). No specific selection method was adopted for the countries included in our study. Rather, it was the availability of the data that determined the panel.

total aid flows. The following specification is estimated for this purpose:

$$GovExp_{it} = \alpha_0 + \alpha_1 Aid_{it} + \alpha_2 X_{it-1} + \epsilon_{it}$$

where $GovExp_{it}$ represents total government expenditures as a share of GDP, Aid_{it} measures total aid as a fraction of GDP, and X_{it} is a set of controls, including variables that are considered standard determinants of government expenditure in the literature. Specifically, we include the recipient's infant mortality rate and the dependency ratio as proxies for health-care and social security spending. The literacy rate and agricultural value-added are used to control for spending in the education and agriculture sectors. Finally, we include trade dependence (imports plus exports as a percentage of GDP) as international exposure could increase government expenditures (see Alesina and Wacziarg, 1998) and real per capita GDP (to control for the size of the government) as a proxy for income.[17] We use lagged values of the above controls to minimize concerns about simultaneity. To address the potential for omitted country-level variables, we include country fixed effects. The time component that is common to all countries in a given period is addressed by including time effects. We also cluster the standard errors by country.

3.3 Endogeneity

OLS estimations of the relationship between foreign aid and government spending might be biased due to the potential endogeneity of foreign aid distributions (foreign aid can be sent where governments fail to provide public goods to their countries; these same countries could be characterized by corruption, weaker institutions and lower preferences for public goods). We address the issue of causality by performing two types of robustness checks in our empirical spefication: i) the use of the difference GMM dynamic panel estimator, and (ii) a traditional instrumental variable estimation, where foreign aid is instrumented by interacting aid flows with indicators of the recipient country's geographical and cultural proximity to donors.

[17] Real GDP per capita of the recipient countries is included as an indicator of development levels which is likely to affect the size of the government, as Feyzioglu et al. (1998) have suggested, based on Wagner's Law. Wagner's law states that the development of an industrial economy will be accompanied by an increased share of public expenditure in GNP.

The difference GMM procedure, based on Arellano and Bond (1991), has important advantages over the fixed effects OLS estimation. First, omitted variable bias due to unobserved country-specific or 'fixed' effects is no longer a problem. Second, using instrumental variables allows endogenous parameters to be estimated consistently. Moreover, with the difference GMM approach, even in the case of measurement error the use of instruments likely results in consistent estimation; see Bond et al. (2001).

For the instrumental variable regressions, we follow Tavares (2003) and use a combination of geographical and cultural ties between major donors and recipient countries as instruments for aid, which in turn are interacted with aid outflows from donors. These interaction terms serve as instrumental variables, determining foreign aid inflows to each recipient country. The procedure we adopt can be described as follows. For each country in our sample, we construct an instrument for aid which captures the exogenous component of the aid sample. We use the inverse of bilateral distance and a contiguity dummy (the presence of a common land border) for geographical proximity, and common official language and the same major religion as measures of cultural affinity. For each country in our sample, we sum the product of aid outflows from 22 donor countries (listed in Table A4 of Appendix A) after multiplying each of them by the bilateral exogenous measures described above. Specifically, the instrumental variable for aid is constructed in the following manner:

$$IV_{i,t} = \sum_{j=1}^{22} Aid_{i,j,t} * Instrument_{i,j}$$

where i : recipient country, j :donor country, t : year. We consider the interaction of the aid variable and instruments for two main reasons: first, since we use country fixed effects in our regressions and the instruments are time-invariant, we are not able to observe their individual effects on foreign aid distributions. Second, the instruments under consideration exist only between donors and recipients on bilateral basis. Since we use total aid from all donors in our empirical study, this method allows us to link bilateral comparisons to total aid.

3.4 Results

Is Foreign Aid Fungible? The effect of foreign aid on total government expenditures is presented in Table 1 (we report panel fixed effects, instrumental variables and the difference GMM estimations). The results indicate that foreign aid is indeed fungible for both the DAC and CRS measures: from columns 1 and 2 in Table 1 (the OLS fixed effects specification), we see that a 1 percentage-point increase in the foreign aid to GDP ratio leads to an increase of about 0.35 percentage-points in the ratio of total government spending to GDP when the DAC aid data is used, and about 0.29 percentage-points when the CRS data is used. Both coefficients are statistically significant at the 1% level.

In column (3) and (4) we report the results of our IV strategy.[18] The results are very similar to the OLS specification: a 1 percentage-point increase in the total aid to GDP ratio is associated with approximately a 0.33 percentage-point increase in government spending relative to GDP for the DAC variable, and a 0.21 percentage-point increase for the CRS variable.

To check the robustness of our results, we also employ the Arellano-Bond (1991) dynamic panel estimator or difference GMM.[19] The results of the GMM specification are reported in columns (5) and (6): a 1 percentage-point increase in the total aid to GDP ratio is associated with approximately a 0.39 percentage-point increase in government spending relative to GDP for the DAC variable, and a 0.35 percentage-point increase for the CRS variable.

Overall, Table 1 provides strong evidence of fungibility at the aggregate level: since total goverment expenditure already *includes* foreign aid spending, we see that on average about 70% of total aid flows are fungible.

Does the Composition of Aid Matter? The evidence presented in Table 1 supports the

[18] The results of our first stage regressions are presented in Table A2. All the exogenous variables have the expected signs (an increase in distance reduces the amount of aid received whereas common borders, religion and official language increase the amount of aid). Three of the instruments (distance, language, and religion) are statistically significant for the total foreign aid variable from the DAC data and two of them (distance and religion) are statistically significant for the total foreign aid variable from the CRS data. Our specification passes the Anderson (1984) canonical correlations likelihood-ratio test for identification and instrumental variable relevance, the Cragg-Donald F-statistic for weak identification and the Hansen J-statistic for over-identification tests for all instruments.

[19] We have also estimated the model using the system GMM procedure; the results remain robust and are available on request. For a discussion of the reasons and the conditions under which a difference GMM estimator outperforms a system GMM estimator, see Bond et al. (2001) and Roodman (2009a, 2009b).

prediction that total aid is fungible, but it does not identify how and if the composition of aid matters for the composition of government spending. This is an important empirical question, since previous studies have shown that the composition of government spending is critical for macroeconomic performance. To shed light on the link between the composition of aid and that of government spending, we split our sample into three sub-categories of foreign aid and match them with corresponding categories of government expenditures. Our dependent variables are now the recipient government's investment expenditures, non-investment expenditures, and social infrastructure expenditures. The independent variables are the corresponding categories for foreign aid, while the control variables remain the same as in Table 1.

The effects of the composition of aid on the composition of government spending are reported in Table 2 (fixed effects and difference GMM estimations are reported). The strategy we adopt for this part of our empirical analysis can be described as follows. For example, the first column of Table 2 regresses government investment expenditure on investment and social infrastructure aid. This strategy is adopted for two reasons. First, we not only want to determine whether a particular category of government expenditure is influenced by the corresponding category of foreign aid, but also whether it is affected by other categories of aid as well. Second, since the three categories of aid sum up to total aid, only two of these categories are independent. We therefore can regress only two categories of foreign aid on any one category of government expenditure. Results from the fixed effects regressions reported in columns 1-3 suggest that a 1 percentage-point increase in the ratio of investment aid to GDP is associated with approximately a 0.1 percentage-point increase in total government investment expenditure relative to GDP (significant at the 5% level), indicating that about 90% of every dollar of investment aid is fungible (since government investment expenditure includes spending from investment aid). In comparison, we see that social infrastructure aid is less fungible than investment aid, with a corresponding crowding out of about 78%. By contrast, there is no evidence of fungibility for non-investment aid.[20] Columns 4-6 report the difference GMM estimation results, and the story remains the same, though the extent

[20] This regression strategy leads to six possible pairs of aid categories. For the purposes of clarity and space, we report results for only three such pairs in Table 2. The results for the other three pairs are available upon request. However, the pattern of results reported in Table 2 remain virtually unaffected for the three other pairs.

of crowding out is marginally smaller than in the fixed-effects regressions. The empirical results in Table 2 indicates that the composition of aid does indeed effect the composition of government spending, and investment aid appears to be the most fungible category of aid.

3.5 Foreign Aid and Private Spending

Though we find that total aid is fungible, the results above do not suggest a cross subsidization of government spending: investment aid reduces domestic government investment, but does not finance any other category of government spending. The question, then, is what type of spending does foreign aid finance? This is no doubt a complex question, and one that is not obvious from the data. However, our theoretical results do point to one potential channel: private spending. Equations (12) and (12a) highlight a scenario where aid may have no effect on private investment (and consequently, growth), but would finance an increase in private consumption. In this section, we test this simple prediction.

Table 3 presents a summary of our results from fixed-effects regressions relating foreign aid and its composition to private investment and household consumption. Columns (1)-(5) indicate that foreign aid or its composition has no significant effect on private investment expenditures.[21] Columns (6)-(10) report the effects of aid and its composition on household consumption expenditures. The findings are broadly consistent with theory: a 1 percentage-point increase in the aid to GDP ratio increases the household consumption-GDP ratio by approximately 0.49 percentage points for the DAC aid variable, and 0.39 percentage points for the CRS aid variable (both significant at the 1% level). Moreover, the composition of aid matters too: a 1 percentage-point increase in the investment aid-GDP ratio increases household consumption by 0.3 percentage points (significant at the 5% level). Social infrastructure aid and non-investment aid increase household consumption by amounts larger than investment aid. The corresponding difference GMM results are reported in Table 4. These results suggest that aid, by crowding out domestic public spending, might be financing private consumption on the margin. The transmission mechanism could be through government transfer programs such as unemployment benefits or subsidies. The fact that

[21] We have also tested for the effect of aid and its composition on GDP growth, using a specification that is quite standard in the empirical aid-growth literature. Consistent with existing results, we find no statistically significant relationship between the two. These results are not reported, but are available upon request.

aid has no effect on private investment expenditures is consistent with our results regarding the crowding out of domestic public investment. By reducing domestic public investment, aid offsets any positive externalities for private investment (through higher productivity of private capital), which consequently might explain why economic growth remains unaffected.

4 Conclusions

In this paper, we have examined fungibility as a possible explanation for the "missing link" between foreign aid and economic growth. We show how the composition of aid, often determined by donors, plays a crucial role in determining the composition of government expenditures in aid-recipient countries and, as a consequence, its impact on macroeconomic performance.

Embedding foreign aid, its allocation, and government spending in an endogenous growth framework, we highlight possible scenarios in which an injection of foreign aid might affect domestic resource allocation, with respect to both public and private expenditures. We show that when aid is fungible, the crowding out of domestic government investment may be large enough to offset the increase in aid allocated to public investment. This could mitigate any positive impact that aid might have on growth. Our theoretical framework generates some interesting hypotheses which we then confront with data. The empirical findings are consistent with our theoretical predictions: we find strong evidence of fungibility at the aggregate level, with almost 70 percent of total aid being fungible in our sample. When aid and government spending are disaggregated into different sub-categories, we find that investment aid is the most fungible type of aid. Finally, we confirm that there is no statistically significant relationship between foreign aid and private investment, but aid does have a strong positive impact on household consumption. We address the issue of causality in all our regressions using difference GMM and standard instrumental variable procedures, and our results remain robust to the instrumentation of foreign aid.

In summary, this paper is related to a growing body of work which, rather than directly testing the effect of foreign aid on growth, attempts to identify indirect mechanisms that might mitigate any positive impact aid may have on macroeconomic performance. Our results provide useful insights for the design and implementation of foreign aid programs.

Recently, much of the theoretical literature on foreign aid has advocated tying aid to public investment, in order to realize large growth and investment effects. In fact, more than two-thirds of all aid flows to the developing world are "tied" to public investment (e.g. infrastructure projects). Our findings, therefore, serve as a caution to donors imposing specific tying restrictions on recipients. On the other hand, the fact that non-investment and social infrastructure aid are less fungible also provides insights on how the disbursement of foreign aid can be designed more effectively. Of course, the problem of fungibility is also a political economy issue and is probably intricately linked with factors such as rent-seeking, corruption, the institutional environment of recipients and their strategic relationships with donors. We believe that our results will provide insights into how the above factors can be integrated into a more comprehensive analysis of foreign aid and its impact on macroeconomic performance.

References

[1] Adam, C. and S. O'Connell (1999), "Aid, taxation and development in sub-Saharan Africa." *Economics & Politics* 11, 225-253.

[2] Agenor, P., N. Bayraktar and K. El Aynaoui (2008), "Roads out of poverty? Assessing the links between aid, public investment, growth, and poverty reduction." *Journal of Development Economics* 86, 277-295.

[3] Agenor, P. and J. Aizenman (2010), "Aid, volatility, and poverty traps." *Journal of Development Economics* 91, 1-7.

[4] Alesina, A. and R. Wacziarg (1998), "Openness, country size, and the government." *Journal of Public Economics* 69(3), pp. 305–21.

[5] Anderson, T. W. (1984), *An Introduction to Multivariate Statistical Analysis.* 2nd edn. New York: Wiley.

[6] Arellano, M. and S. Bond (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *Review of Economic Studies* 58, 277-297.

[7] Barro, R. (1990), "Government spending in a simple model of endogenous growth." *Journal of Political Economy* 98, S103-S125.

[8] Berg, A., S. Aiyar, M. Hussain, S. Roache, T. Mirzoev, and A. Mahone (2007), "The macroeconomics of scaling up aid: Lessons from recent experience." *IMF Occassional Paper* 253.

[9] Berg, A., T. Mirzoev, R. Portillo, and L-F. Zanna (2010), "The short-run macroeconomics of aid inflows: understanding the interaction of fiscal and reserve policy." *IMF Working Paper* WP/10/65.

[10] Bond, S., A. Hoeffler and J. Temple (2001), "GMM Estimation of Empirical Growth Models," Economics Papers 2001-W21, Nuffield College, University of Oxford.

[11] Boone, P. (1996), "Politics and the effectiveness of foreign aid." *European Economic Review* 40, 289-329.

[12] Buffie, E., S. O'Connell, and C. Adam (2010), "Fiscal Inertia, donor credibility, and the monetary management of aid surges." *Journal of Development Economics* 93, 287-298.

[13] Burnside, C. and D. Dollar (2000), "Aid, policies, and growth." *American Economic Review* 90, 847-868.

[14] Chatterjee, S., G. Sakoulis, and S. Turnovsky (2003), "Unilateral capital transfers, public investment, and economic growth." *European Economic Review* 47, 1077-1103.

[15] Chatterjee, S. and S. Turnovsky (2007), "Foreign aid and economic growth: the role of flexible labor supply." *Journal of Development Economics* 84, 507-533.

[16] Chenery, H. and A. Strout (1966), "Foreign assistance and economic development." *American Economic Review* 56, 679-733.

[17] Clements, B., S. Gupta, A. Pivovarsky, and E. Tiongson (2004), "Foreign aid: grants versus loans." *Finance and Development*, 46-49.

[18] Dalgaard, C. (2008), "Donor Policy Rules and Aid Effectiveness." *Journal of Economic Dynamics and Control* 32, 1895-1920.

[19] Dalgaard, C. and H. Hansen (2001), "On aid, growth, and good policies." *Journal of Development Studies* 37, 17-41.

[20] Devarajan, S., V. Swaroop, and H. Zou (1996), "The composition of public expenditure and economic growth." *Journal of Monetary Economics* 37, 313-344.

[21] Easterly, W. (1999), "The ghost of financing gap: testing the growth model used in the international financial institutions." *Journal of Development Economics* 60, 423-438.

[22] Easterly, W. (2003), "Can foreign aid buy growth?" *Journal of Economic Perspectives* 17, 23-48.

[23] Feyzioglu, T., V. Swaroop, and M. Zhu (1998), "A panel data analysis of the fungibility of foreign aid." *The World Bank Economic Review* 12, 29-58.

[24] Gupta, S., B. Clements, A. Pivovarsky, and E. Tiongson (2003), "Foreign aid and revenue response: does the composition of aid matter?" *IMF Working Paper* 03-176.

[25] Hansen, H. and F. Tarp (2000), "Aid effectiveness disputed." *Journal of International Development* 12, 375-398.

[26] Harms P., and M. Lutz (2006), "Aid, governance and private foreign investment: Some puzzling findings for the 1990s" *Economic Journal* 116, 773-790.

[27] Lahiri, S. and P. Raimondos-Moller (2004), "Donor strategy under the fungibility of foreign aid." *Economics & Politics* 16, 213-231.

[28] Pack, H. and J. Pack (1990), "Is foreign aid fungible: the case of Indonesia." *Economic Journal* 100, 188-194.

[29] Pack, H. and J. Pack (1993), "Foreign aid and the question of fungibility." *Review of Economics and Statistics*, 258-265.

[30] Rajan, R. and A. Subramanian (2010), "Aid, Dutch Disease, and manufacturing growth." *Journal of Development Economics*, forthcoming.

[31] Roodman, D. (2009a), "How to do xtabond2: An introduction to difference and system GMM in Stata," *Stata Journal* 9(1), 86-136.

[32] Roodman, D. (2009b), "A Note on the Theme of Too Many Instruments," *Oxford Bulletin of Economics and Statistics* 71(1),135-158.

[33] Svensson, J. (2000), "Foreign aid and rent-seeking." *Journal of International Economics* 51, 437-461.

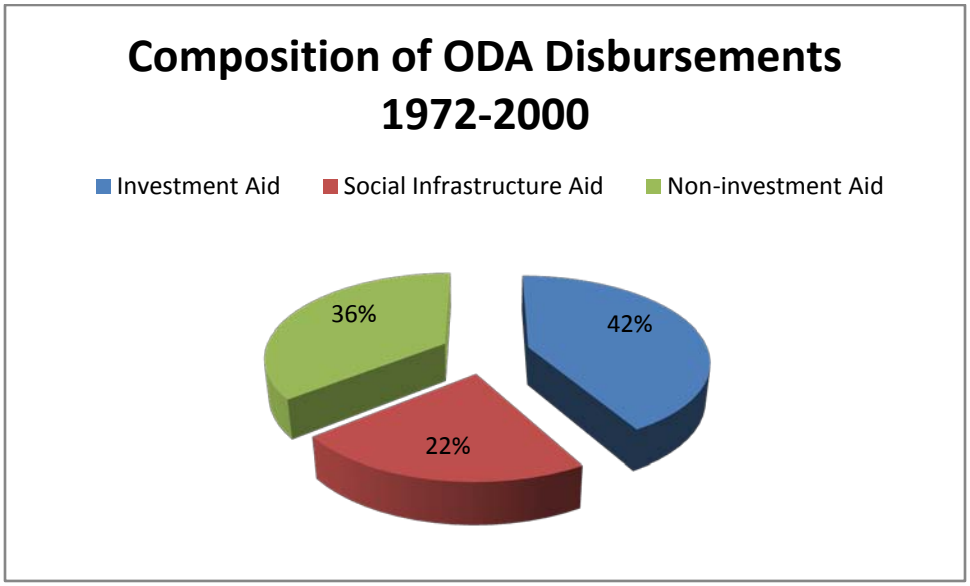
[34] Swaroop, V., S. Jha, and A. Rajkumar (2000), "Fiscal effects of foreign aid in a federal system of governance: the case of India." *Journal of Public Economics*, 307-330.

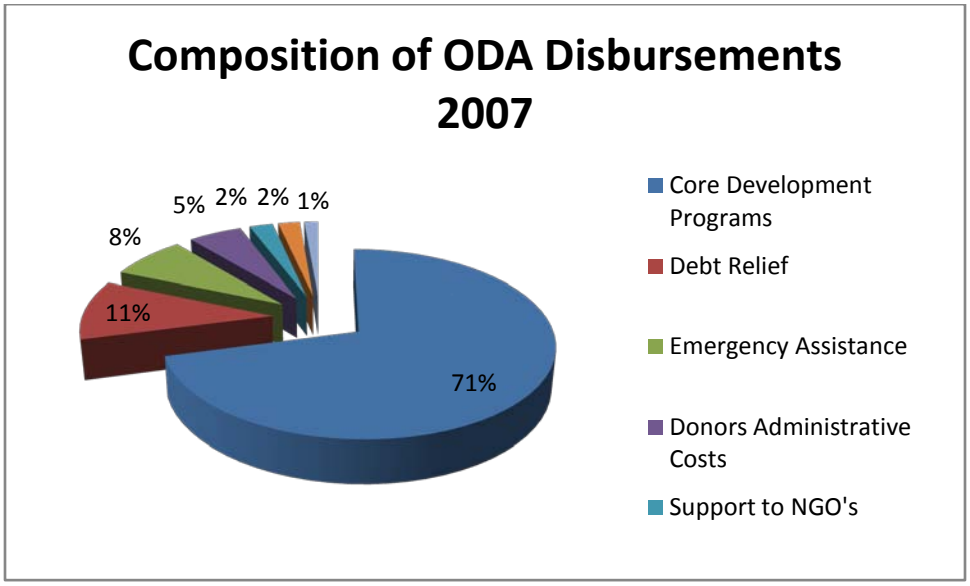
[35] Tavares, J. (2003), "Does foreign aid corrupt?" *Economics Letters* 79(1), pp. 99-106.

[36] Turnovsky, S.J. and W.H. Fisher (1995), "The composition of government expenditure and its consequences for macroeconomic performance." *Journal of Economic Dynamics and Control* 19, 747-86.

[37] Werker, E., F. Ahmed, and C. Cohen (2009), "How Is Foreign Aid Spent? Evidence from a Natural Experiment." *American Economic Journal: Macroeconomics*, forthcoming.

FIGURE 1





Source: OECD (DAC and CRS Databases)

Table 1
The Effect of Foreign Aid on Government Spending

	(1) **FE**	(2) **FE**	(3) **IV**	(4) **IV**	(5) **GMM**	(6) **GMM**
Aid DAC (% of GDP)	0.347***		0.329***		0.365***	
	(0.061)		(0.070)		(0.093)	
Aid CRS(% of GDP)		0.288***		0.212**		0.360***
		(0.058)		(0.086)		(0.083)
Real GDP per capita	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Infant mortality rate, lag (-1)	-0.103**	-0.095*	-0.104**	-0.106**	-0.095*	-0.057
	(0.051)	(0.050)	(0.046)	(0.045)	(0.054)	(0.061)
Agricultural VA (% of GDP), lag (-1)	-0.227***	-0.252***	-0.226***	-0.242***	-0.236*	-0.257**
	(0.083)	(0.081)	(0.077)	(0.076)	(0.120)	(0.121)
Literacy rate, lag (-1)	-0.213	-0.235	-0.216	-0.232	-0.210	-0.084
	(0.182)	(0.182)	(0.169)	(0.163)	(0.351)	(0.377)
Import + export (% of GDP), lag (-1)	-0.037	-0.038	-0.037	-0.030	-0.129***	-0.117**
	(0.025)	(0.025)	(0.023)	(0.024)	(0.045)	(0.047)
Dependency ratio 65, lag (-1)	-0.883	-0.726	-0.863	-1.083	-0.557	0.260
	(0.975)	(1.061)	(0.877)	(0.968)	(1.081)	(1.359)
Observations	620	620	613	596	555	555
Number of countries	65	65	59	59	59	59
Anderson canonical corr. test (p-value)			0.00	0.00		
Cragg-Donald F-statistic			314	108		
Hansen J-statistic (p-value)			0.83	0.14		
AR(1) test					0.02	0.01
AR(2) test					0.17	0.81
Hansen test					1.00	1.00
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are clustered at the country level. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2
The Composition of Aid and the Composition of Government Spending

	Dependent Variable (% of GDP)					
	Inv exp	Non-inv exp	Soc infrastr exp	Inv. Exp.	Non inv. exp	Soc. infrastr. Exp.
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	**FE**	**FE**	**GMM**	**GMM**	**GMM**
Investment aid (% of GDP)	0.100**			0.154**		
	(0.047)			(0.064)		
Noninvestment aid (% of GDP)		0.158	0.122		0.064	0.287***
		(0.100)	(0.129)		(0.092)	(0.103)
Social infrastructure aid (% of GDP)	0.029	0.065	0.221**	0.151*	-0.043	0.270***
	(0.070)	(0.097)	(0.086)	(0.081)	(0.105)	(0.074)
Real GDP per capita	0.000	0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Infant mortality rate, lag (-1)	-0.015	-0.104***	-0.011	-0.031	-0.056*	0.003
	(0.025)	(0.028)	(0.025)	(0.037)	(0.030)	(0.036)
Agricultural VA (% of GDP), lag (-1)	-0.042	-0.077	-0.086	-0.058	-0.026	-0.058
	(0.028)	(0.064)	(0.079)	(0.037)	(0.089)	(0.079)
Literacy rate, lag (-1)	-0.051	0.035	-0.181	-0.001	0.262*	-0.227
	(0.085)	(0.074)	(0.121)	(0.119)	(0.141)	(0.185)
Import + export (% of GDP), lag (-1)	0.019*	-0.007	-0.043**	0.003	-0.022	-0.035
	(0.010)	(0.014)	(0.019)	(0.017)	(0.034)	(0.032)
Dependency ratio 65, lag (-1)	-0.329	-0.637	-0.318	0.120	0.534	-0.433
	(0.657)	(0.730)	(0.616)	(0.520)	(0.875)	(0.684)
Observations	591	584	610	506	495	518
Number of countries	56	56	57	56	56	57
AR(1) test				0.00	0.07	0.04
AR(2) test				0.26	0.45	0.81
P-value Hansen test				1.00	1.00	1.00
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are clustered at the country level * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3
The Effect of Foreign Aid (and its Composition) on Private Investment and Household Consumption (FE)

Variable (% of GDP)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Invest.	Invest.	Invest.	Invest.	Invest.	Consump.	Consump.	Consump.	Consump.	Consump.
Aid DAC	0.080					0.489***				
	(0.121)					(0.119)				
AID CRS		0.023					0.387***			
		(0.080)					(0.098)			
Investment aid			0.002	0.010				0.289**	0.283**	
			(0.096)	(0.118)				(0.113)	(0.134)	
Non-inv. aid				-0.001	-0.018				0.569***	0.493***
				(0.113)	(0.132)				(0.111)	(0.094)
Social inf. aid			0.097		0.113			0.717*		0.517
			(0.244)		(0.301)			(0.391)		(0.379)
Observations	590	591	560	560	556	1494	1424	1273	1321	1291

Standard errors are clustered at the country level.. * significant at 10%; ** significant at 5%; *** significant at 1%. Each regression controls for year and country fixed effects. The private investment regressions control for lagged private investment, openness to trade, per capita GDP growth, inflation and the interest rate spread (the difference between the lending rate and the deposit rate). The consumption regressions control for per capita GDP growth, trade, and inflation. All control variables are taken from the WDI dataset.

Table 4
The Effect of Foreign Aid (and its Composition) on Private Investment and Household Consumption (GMM)

	invest	invest	invest	invest	invest	consump	consump	consump	consump	consump
Aid DAC	0.031					0.496***				
	(0.029)					(0.161)				
Aid CRS		0.022					0.359***			
		(0.028)					(0.131)			
Investment aid			-0.026	-0.031				0.268**	0.188	
			(0.055)	(0.048)				(0.131)	(0.149)	
Social. inf. aid			0.024		0.009				0.789*	0.591
			(0.296)		0.035)				(.409)	(0.376)
Non-inv. aid				0.101	0.089			0.540***		0.431***
				(0.088)	(0.098)			(0.172)		(0.137)
Observations	786	767	703	698	709	1366	1321	1192	1137	1158
Number of countries	59	59	59	59	59	65	65	65	65	65
AR(1) test	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.04	0.03
AR(2) test	0.06	0.08	0.14	0.27	0.12	0.11	0.15	0.28	0.21	0.21
P-value Hansen test	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Year Fixed Effects	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are clustered at the country level. * significant at 10%; ** significant at 5%; *** significant at 1%. Each regression controls for year and country fixed effects. The private investment regressions control for lagged private investment, openness to trade, per capita GDP growth, inflation and the interest rate spread (the difference between the lending rate and the deposit rate). The consumption regressions control for per capita GDP growth, trade, and inflation. All control variables are taken from the WDI dataset.

APPENDIX A

Table A1. Summary Statistics

Variable (% of GDP)	Mean	Std. Dev.	Min	Max	Observations
Total expenditure (excluding defense)	22.96231	9.929409	.0275524	56.08927	N = 1019
Investment expenditure	5.684408	4.034981	.0033656	25.72717	N = 1048
Non-investment expenditure	3.887969	3.568834	1.43e-06	23.37628	N = 988
Social infrastructure expenditure	13.81117	7.381383	.021869	55.66596	N = 1058
Aid DAC	4.963536	6.418934	-.5458025	48.14704	N = 1727
Aid CRS	4.147479	5.361861	4.30e-06	41.02941	N = 1618
Investment aid (CRS)	1.729454	2.525373	2.12e-06	22.93244	N = 1525
Non-investment aid (CRS)	1.481203	2.522273	9.31e-10	22.22922	N = 1566
Social infrastructure aid (CRS)	.9368216	1.608255	0	17.5981	N = 1484

APPENDIX A

Table A2. First-Stage Instrumental Variables (IV) Regressions

Variable	Dependent Variable	
	Aid DAC (% of GDP)	Aid CRS (% of GDP)
Aid/Distance	1865.634**	2714.921*
	(783.88)	(1525.237)
Aid*Border	10.295	10.975
	(9.805)	(12.7)
Aid*Language	0.838***	0.033
	(0.222)	(0.476)
Aid*Religion	0.847***	0.803*
	(0.174)	(0.459)
Real GDP per capita	-0.000*	-0.000
	(0.000)	(0.000)
Infant mortality rate, lag (-1)	0.033	-0.038
	(0.05)	(0.024)
Agricultural VA (% of GDP), lag (-1)	-0.087**	0.06
	(0.035)	(0.039)
Literacy rate, lag (-1)	-0.021	-0.054
	(0.066)	(-0.081)
Total trade, lag (-1) (% of GDP)	0.01	0.011
	(0.006)	(0.008)
Dependency ratio 65, lag (-1)	0.723	0.857*
	(0.538)	(0.487)
Observations	613	596

Standard errors are clustered at the country level. * significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX A

Table A3. List of Aid-Recipient Countries Included in Panel Dataset

Argentina, Bahrain, Barbados, Belarus, Belize, Bolivia, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Chile, Colombia, Congo - Rep., Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Dominican Republic, Egypt, El Salvador, Estonia, Ethiopia, Guatemala, Honduras, Hungary, India, Indonesia, Iran, Jamaica, Kazakhstan, Kuwait, Latvia, Lesotho, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Nepal, Nicaragua, Niger, Pakistan, Panama, Paraguay, Peru, Romania, Russia, Rwanda, Senegal, Singapore, Slovenia, Sri Lanka, Syria, Tajikistan, Thailand, Togo, Trinidad & Tobago, Tunisia, Turkey, Uruguay, Venezuela.

Table A4. List of Donor countries included in the IV regression

Australia, Austria, Belgium, Canada, Denmark, Finland, Japan, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

APPENDIX A

Table A5. Foreign Aid Classification

	SOURCE
TOTAL AID	
TOTAL AID CRS	OECD, DAC.
TOTAL AID DAC	OECD, CRS.
SOCIAL INFRASTRUCTURE AID	
I.SOCIAL INFRASTRUCTURE & SERVICES	OECD, CRS.
which includes the following categories:	
I.1 Education, Total	
I.2 Health, Total	
I.3 Population Programmes	
I.4 Water Supply & Sanitation	
I.5 Government & Civil Society	
I.6 Other Social Infrastructure & Services	
INVESTMENT AID	
II.ECONOMIC INFRASTRUCTURE + III.PRODUCTION SECTORS	OECD, CRS.
which includes the following categories:	
II.1Transport & Storage	
II.2Communications	
II.3 Energy	
II.4 Banking & Financial Services	
II.5 Business & Other Services	
III.1 Agriculture - Forestry - Fishing, Total	
III.2 Industry - Mining - Construction, Total	
III.3 Trade Policy and Regulations	
III.4 Tourism	
NON-INVESTMENT AID	
TOTAL AID CRS – (INVESTMENT AID + SOCIAL INFRASTRUCTURE AID)	OECD, CRS.
which includes the following categories	
IV. Multisector	
V. Commodity aid / general prog. ass.	
VI. Action relating to debt	
VII. Emergency assistance and reconstruction	
VIII. Administrative costs of donors	
IX. Support to NGO's	
X. Unallocated/unspecified	

APPENDIX A

Table A6. Government Expenditure Classification

	SOURCE
TOTAL GOVERNMENT EXPENDITURE	
82. TOTAL EXPENDITURE	IMF, GDF.
SOCIAL INFRASTRUCTURE EXPENDITURE	
82A. GENERAL PUBLIC SERVICES	IMF, GDF.
82AC. PUBLIC ORDER & SAFETY (B3) (National Defense is excluded.)	IMF, GDF.
82C. EDUCATION (B4)	IMF, GDF.
82D. HEALTH (B5)	IMF, GDF.
82E. SOCIAL SECURITY & WELFARE (B6)	IMF, GDF.
82F. HOUSING & COMMUNITY AMENITIES (B7)	IMF, GDF.
82G. RECREATIONAL, CULTURAL, & RELIG AFFAIRS (B8)	IMF, GDF.
INVESTMENT EXPENDITURE	
82H. ECONOMIC AFFAIRS & SERVICES (sum of the B9 to B13)	IMF, GDF.
82HB. Agriculture, forestry, fishing, & hunting (B10)	
82HC. Mining & mineral resources, manufacturing, & construction (B11)	
82HD. Fuel & energy (B9)	
82HI. Transportation & communication (B12)	
82HL. Other economic affairs & services (B13)	
NON-INVESTMENT EXPENDITURE	
TOTAL EXPENDITURE – (INVESTMENT + SOCIAL INFRASTRUCTURE EXPENDITURE)	IMF, GDF.

APPENDIX B

All data on ODA are collected by the OECD/DAC Secretariat from its 23 members, then checked and aggregated by the OECD/DAC Secretariat. The DAC Secretariat collects two sets of data:

(i) Development Assistance Committee (DAC) Database: The DAC statistics provide comprehensive data on the volume, origin and types of aid and resource flows to over 180 aid-recipient countries. The data cover official development assistance (ODA), other official flows (OOF) and private funding (foreign direct investment, bank and non-bank flows) from members of the DAC, multilateral organizations and other donors. See *www.oecd.org/dac/stats/dac/guide* for further details.

(ii) Creditor Reporting System (CRS) Database: The objective of the CRS Aid Activity database is to provide a set of readily available basic data that enables analysis on where aid goes, what purposes it serves and what policies it aims to implement, on a comparable basis for all DAC members. The Aid Activity data are used to analyze the sectoral and geographical breakdown of aid for selected years and donors or groups of donors. But the database also permits to consider specific policy issues (e.g. tying status of aid) and monitor donors' compliance with various international recommendations in the field of development co-operation. See *www.oecd.org/dac/stats/crs/guide* for further details.

The Net Official Development Assistance (ODA) data comprises grants or loans to developing countries and territories on the OECD/DAC list of aid recipients that are undertaken by the official sector with promotion of economic development and welfare as the main objective and at concessional financial terms. This definition is from Milliennium Development Goals Indicators webpage.