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Where Has All the Money Gone? Foreign Aid and the Composition of Government Spending*

Santanu Chatterjee, Paola Giuliano, and Ilker Kaya

Abstract

This paper examines the link between foreign aid and the composition of government spending in aid-recipient countries. Two questions are addressed: (i) does foreign aid crowd out government spending in aid-recipient countries, and (ii) does the degree of fungibility vary across different categories of aid? Using a panel dataset of 67 countries for 1972-2000 we find that at the aggregate level about 70 percent of total aid is fungible. We also find that aid targeted for public investment crowds out about 80-90 percent of domestic government spending on public 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 public investment projects.

KEYWORDS: foreign aid, aid effectiveness, fungibility, government spending, fiscal policy

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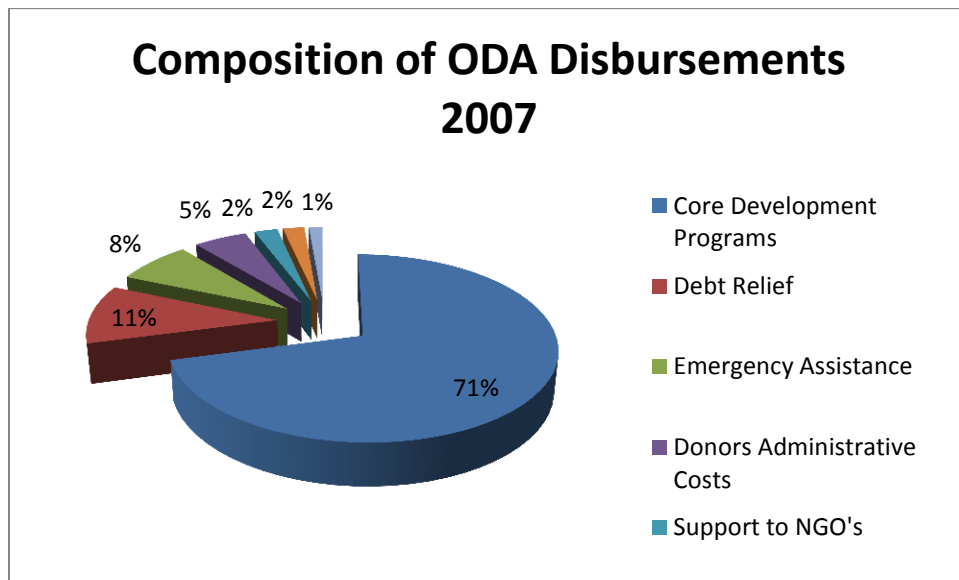
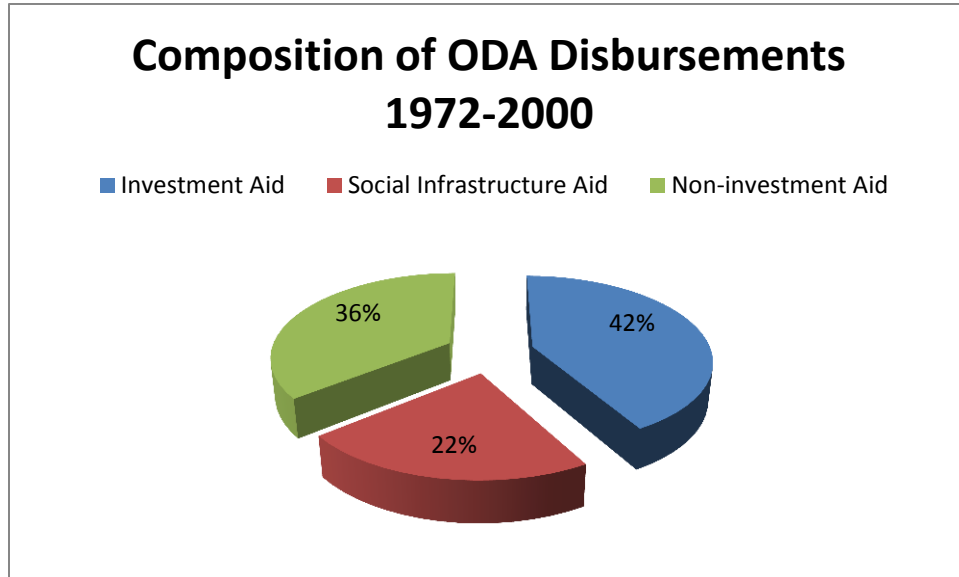
1 Introduction

The link between foreign aid and indicators of growth and development in the developing world has been the subject of intense scrutiny and debate over the last two decades. While significant disagreement exists on the issue of aid effectiveness, relatively little attention has been paid to the underlying mechanisms through which aid may affect drivers of economic growth.¹ In this paper, we attempt to examine a potential transmission mechanism through which foreign aid may affect macroeconomic performance: the *composition* of foreign aid and its effects on the *composition* of government spending. Specifically, we examine whether (i) foreign aid flows supplement a recipient government's budget or merely substitutes for (crowds out) domestic government spending, and (ii) if these effects vary across different categories of aid and 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 by donors to public investment projects in recipient countries, to be used for the financing and provision of infrastructure goods such as roads, bridges, ports, irrigation systems, power grids, etc., that are critical bottlenecks to economic growth (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.

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, including Chatterjee et al. (2003), Agenor and Aizenman (2010), Chatterjee and Turnovsky (2007), Dalgaard (2008), Agenor et al. (2008), and Neanidis and Varvarigos (2009), among others, 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 dynamic stochastic

¹See Doucouliagos and Paldam (2008, 2011) for excellent surveys of the literature on aid effectiveness. Notable contributions in this literature include Boone (1996), Easterly (1999), Burnside and Dollar (2000), Hansen and Tarp (2001), Dalgaard and Hansen (2001), and Easterly (2003), among others.

FIGURE 1



Source: OECD (DAC and CRS Databases)

general equilibrium (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 endogenous growth 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. As such, this strategy enables us to conduct an empirical test of the theoretical literature that focuses on tying foreign aid to public investment.

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. Second, we investigate whether the degree of fungibility varies across different categories of aid (such as investment aid, social infrastructure aid, etc.). Finally, we examine whether aid affects private resource allocation, by focusing on household consumption and private investment. Since most aid is allocated to the recipient government's budget by donors, the link between the composition of aid (presumably determined by donors) and that of government spending in the aid-recipient country assumes critical significance.²

While the central question in our paper is related to the issue of fungibility, there is little consensus on the magnitude and importance of this phenomenon in the empirical literature. 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.

²There 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. The composition of government spending, in turn, may have an important bearing on economic growth. See, for example, Devarajan et al. (1996).

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, another 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 being increasingly tied.³ More recently, though, the effectiveness of different types of aid vis-a-vis government spending has started receiving more attention. In this context, our work is related to Dreher et al. (2008), who document that aid tied to education has a positive impact on primary school enrollment, in contrast to domestic education spending by the government, and Annen and Kosempel (2009), who focus on the relative effects of technical and non-technical aid on short-term economic growth.

Our results indicate strong evidence of fungibility: first, a 1 percentage-point increase in the aid-to-GDP ratio is associated with 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. Second, we 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 almost 80-90 percent of all investment aid is fungible. The corresponding degree of fungibility for social infrastructure aid is about 75 percent. 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; see Figure 1. Finally, we also find that while aid (and its composition) has no significant effect on private investment, it is associated with a strong positive increase in household consumption. These results sug-

³McGillivray and Morrissey (2001) and McGillivray et al. (2006) provide an extensive critique of the existing literature on aid fungibility. Our paper is also related to the literature on fiscal response models of aid, as in Mosley et al. (1987), and Gang and Khan (1990). These papers attempt to identify how governments respond to aid flows in terms of choosing tax rates, borrowing, etc. However, as McGillivray and Morrissey (2001) point out, the lack of data (especially on tax revenues) make these models notoriously difficult to estimate.

gest that aid, though fungible, might be financing private consumption (rather than private or public investment), possibly through government transfers (for example, consumption subsidies and/or unemployment insurance).⁴

As with any study involving foreign aid and its effectiveness, the endogeneity of aid is an important econometric issue. We address this issue by using both GMM estimation procedures (Arellano and Bond, 1991), as well as 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 (Tavares, 2003). Our results remain robust to these causality 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

In this section, we present a simple and stylized model linking the composition of aid to that of government spending. The objective of this stylized model is to characterize some empirically testable scenarios. 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

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

In specification (1), θ denotes the relative weight of the public consumption good in the utility function.⁵ The agent produces output using her stock of

⁴Our 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 receive aid mainly from the OPEC, Werker et al. (2009) document that most aid flows are consumed. Rajan and Subramanian (2011) 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.

⁵The non-separability of private and public consumption in (1) is consistent with Barro (1990). An alternative would be to have these two variables enter the utility function in an additively separable manner. This would not alter any of the central results of the model.

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

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

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

$$\dot{K} = Y - C - T \quad (3)$$

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:

$$G_c + G_I = F + T \quad (4)$$

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

$$G_I = G_I^d + \phi F = (g_I^d + \phi\varepsilon) Y \quad (5a)$$

$$G_c = G_c^d + (1 - \phi)F = [g_c^d + (1 - \phi)\varepsilon] Y \quad (5b)$$

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

⁶Co-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.

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:

$$\dot{K} = Y - C - G_c - G_I + F \quad (6)$$

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 inflow and its allocation, and the tax rate as given. The equilibrium (balanced) growth rate (ψ) is then given by

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

Totally differentiating (7) we get

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

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 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

$$dg_I^d = -\rho_I d\varepsilon, \quad 0 \leq \rho_I \leq 1 \quad (8a)$$

⁷We employ a linear endogenous growth structure 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. We abstract from introducing distortionary taxes into the theoretical setup, given the poor quality of data on tax revenues across countries. The lumpsum taxes in our model can be viewed as a proxy for government debt, which we do include in our empirical specification. For more complex models that are characterized by a stock of public capital (rather than the flow specification here), transitional dynamics, government debt, and distortionary taxes, see Chatterjee et al.(2003) and Chatterjee and Turnovsky (2007).

$$dg_c^d = -\rho_c d\varepsilon, \quad 0 \leq \rho_c \leq 1, \quad (8b)$$

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.⁸ 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

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

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.

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.⁹

⁸It should be noted that the adjustment ratios ρ_I and ρ_c , though treated as exogenous parameters in 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. Determinants of fungibility (i.e., ρ_I and ρ_c) may include corruption and rent-seeking, weak institutions, mis-alignment of spending objectives between donors and recipients (e.g. donors may want new schools to be built, while recipients may want to use aid for supplementing teacher's salaries at existing schools). Additionally, Besley and Persson (2009, 2010) argue that the threat of external conflict may also determine an incumbent government's choice of public goods, which may be inconsistent with the intentions of donors. Since our purpose is to derive some simple hypotheses connecting the composition of aid to that of government spending that can be directly taken to the data, rather than test for the determinants of fungibility, we abstract from these modeling issues.

⁹There are two issues related to the structure of the model that deserve comment. First, given that we use a Cobb-Douglas type production function, the coefficient on public investment (η) is set to match labor's share of income. This is a necessary trade-off characteristic of linear endogenous growth models in order to generate an equilibrium of sustained growth.

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:

$$\bar{g} = g_I^d + g_c^d + \varepsilon \quad (10)$$

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

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

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: $d\bar{g}/d\varepsilon < 1$.¹⁰ 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):

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

This problem can be resolved in a neoclassical set-up which decouples the output elasticities for private capital, labor, and government spending. However, in that case, government spending (and aid) would have no implications for long-run growth by construction, even though it would affect the transitional growth path and the long-run *levels* of key economic variables. Second, as we have noted previously, government spending impacts on utility and production purely as a flow variable, rather than a stock. In earlier work, Chatterjee et al. (2003) and Chatterjee and Turnovsky (2007) have analyzed models of aid and growth where government spending is modeled as the accumulated stock of public capital. Such models admit transitional dynamics, enabling a comparison of the short-term and long-term implications of aid flows. Since these issues have been studied previously in the context of aid, we adopt a more stylized approach here. However, in our empirical analysis, we allow lagged values of aid to affect current government spending, thereby attempting to capture at least some of the dynamic implications of foreign aid.

¹⁰This allows total government spending to be unaffected or decrease following the aid inflow, i.e., $d\bar{g}/d\varepsilon \leq 0$, if $\rho_I + \rho_c \geq 1$.

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

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

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 consumption, 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 aid-recipient countries for the 1972-2000 period to examine 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 ex-

penditures.¹¹ The data on government spending are from the International Monetary Fund's Government Financial Statistics. Data on private investment is obtained from the Penn World Tables, and those 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 Organization for Economic Cooperation 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.¹² 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.¹³ 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.¹⁴ 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 use these datasets to construct two measures of total aid flows, namely Aid-DAC and Aid-CRS. Further, to account for the possibility

¹¹Total 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.

¹²See Appendix B for further details.

¹³For 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.

¹⁴We 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.

that some proportion of aid may not be given as grants but as concessionary loans, we use the CRS database to construct a third measure for aid, Aid-CRS-NET, that adjusts aid flows for repayment of the loan component of aid by recipients.¹⁵

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. Investment aid is defined as the sum of economic infrastructure 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. We also construct a measure for non-investment aid that is adjusted for repayments of the loan component of aid. All aid and expenditure variables are expressed as a share of the aid-recipient's GDP.¹⁶ We restrict the time period of analysis to 1972-2000, given the lack of availability of comprehensive government expenditure data across countries after 2000.¹⁷

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, the government budget balance and debt service 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 the savings rate, 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

¹⁵Repayment data for our entire sample period is only available for the CRS measure. For the DAC measure, information is not available prior to 1989. We therefore use only the CRS aid measure to construct the repayment-adjusted aid variable to avoid potential issues with measurement.

¹⁶We provide the complete aid (CRS) and expenditure classification charts from our data sources in Appendix A (Tables A7 and Table A8).

¹⁷After 2000, there is limited or no update for most of the countries on the GFS data set in our sample.

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 Statistics and data on the government budget balance, debt service, and the savings rate are from the World Development Indicators (WDI). The descriptive statistics for the variables of interest and the list of aid-recipient and donor countries in our sample are presented in Tables A1-A3 in Appendix A.

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.¹⁸ The first step is to test for the fungibility of 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 (we use three measures: Aid-DAC, Aid-CRS, and Aid-CRS-NET), 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. 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.¹⁹ Finally, we use the government's budget balance and debt service as additional controls, since governments may finance their spending with non-tax sources of revenue, such as borrowing and may also pay off some pro-

¹⁸No specific selection method was adopted for the countries included in our study. Rather, it was the availability of the data that determined the panel. Outliers have been excluded from the sample.

¹⁹Real 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.

portion of its outstanding debt over time.²⁰ 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.²¹

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 an adequate amount of public goods to their citizens; 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 specification: i) the use of GMM dynamic panel estimators, 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.²²

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,

²⁰ Another potentially important control variable is tax revenues, since foreign aid could be used to lower tax rates in recipient countries. However, cross-country data for tax revenues are not available for a large number of countries in our sample. As a result, when taxes are included as a control, the number of observations drop dramatically, by more than 65%. The results are then biased due to the small sample size. We therefore excluded tax revenues as a control in our specification.

²¹ We use the same specification when analyzing the link between the composition of aid (investment, social infrastructure, and non-investment) and that of government spending.

²² It is important to note that the use of instrumental variables and GMM in addressing causality is not without criticism. In the context of aid, Clemens et al. (2011) suggests some promising alternatives, but the constraints on our data prevent us from pursuing these. We nevertheless demonstrate the robustness of our results using the conventional techniques.

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 A2 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 (columns 1-3), instrumental variables (columns 4-6), and the difference GMM estimations (columns 7-9) for three measures of aid: Aid-DAC, Aid-CRS, and Aid-CRS-NET. The results indicate that foreign aid is indeed fungible for both the DAC and CRS measures: from columns 1-3 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 0.26 percentage-points in the ratio of total government spending to GDP for Aid-DAC, and about 0.25 percentage-points for Aid-CRS. The corresponding coefficient for the aid-CRS-NET is 0.24. All three coefficients are statistically significant at the 1% level.²³

²³One issue with the interpretation of the coefficient on the foreign aid variable is that not all aid is grants. Part of the aid disbursement can be concessionary loans that may potentially be repaid by the recipient government. We address this issue in two ways: first,

TABLE 1

The Effect of Foreign Aid on Total Government Spending

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE	FE	FE	IV	IV	IV	GMM	GMM	GMM
Aid-DAC (% GDP)	0.259*** (0.075)			0.201** (0.085)			0.370*** (0.080)		
AID-CRS (% of GDP)		0.253*** (0.066)			0.159 (0.106)			0.362*** (0.077)	
AID-CRS-NET (% GDP)			0.238*** (0.068)			0.129 (0.099)			0.311*** (0.082)
Real GDP per capita	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.000)
Budget Balance (%GDP), lag(-1)	-0.202 (0.137)	-0.235* (0.128)	-0.231 (0.139)	-0.222* (0.121)	-0.258** (0.120)	-0.252** (0.128)	-0.083 (0.143)	-0.167 (0.138)	-0.161 (0.153)
Debt Service (% GDP), lag (-1)	0.060 (0.072)	0.119 (0.078)		0.071 (0.065)	0.119* (0.063)		-0.045 (0.079)	0.134 (0.098)	
Infant mortality rate, lag (-1)	-0.072 (0.052)	-0.056 (0.050)	-0.071 (0.050)	-0.071 (0.047)	-0.065 (0.044)	-0.081* (0.045)	-0.067 (0.059)	-0.030 (0.053)	-0.044 (0.052)
Agricultural VA (% of GDP), lag (-1)	-0.202** (0.093)	-0.226** (0.092)	-0.209** (0.094)	-0.197** (0.089)	-0.209** (0.085)	-0.192** (0.089)	-0.199* (0.101)	-0.238** (0.106)	-0.232** (0.109)
Literacy rate, lag (-1)	-0.185 (0.182)	-0.195 (0.177)	-0.203 (0.198)	-0.193 (0.169)	-0.212 (0.167)	-0.212 (0.182)	-0.189 (0.322)	-0.096 (0.317)	-0.100 (0.338)
Import + export (% GDP), lag (-1)	-0.023 (0.027)	-0.024 (0.028)	-0.021 (0.028)	-0.021 (0.025)	-0.019 (0.026)	-0.013 (0.026)	-0.120** (0.047)	-0.108** (0.051)	-0.108** (0.049)
Dependency ratio 65, lag (-1)	-0.252 (1.059)	-0.042 (1.055)	-0.461 (0.997)	-0.135 (0.929)	-0.447 (0.964)	-0.779 (0.858)	-0.211 (1.218)	0.794 (1.366)	0.401 (1.247)
Observations	574	574	597	570	555	573	516	516	534
R-squared	0.90	0.90	0.91						
Under ident. test (rk statistic, p-value)				0.03	0.07	0.10			
F-test				61.20	39.78	54.44			
AR (1) test							0.01	0.00	0.002
AR (2) test							0.24	0.99	0.913
Hansen J-statistic				0.86	0.09	0.08	1	1	1
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	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%

In column 4-6 we report the results of our IV estimation.²⁴ The results are similar to the OLS specification: a 1 percentage-point increase in the total aid to GDP ratio is associated with approximately a 0.2 percentage-point increase in government spending relative to GDP for the Aid-DAC variable. The effects of the Aid-CRS and Aid-CRS-NET variables (columns 5 and 6) are smaller, but statistically insignificant. The results of the GMM specification (Arellano-Bond (1991) dynamic panel estimator) are reported in columns 7-9: a 1 percentage-point increase in the total aid to GDP ratio is associated with approximately a 0.37 percentage-point increase in government spending relative to GDP for the Aid-DAC variable, a 0.36 percentage-point increase for the Aid-CRS variable, and a 0.31 percentage-point increase for the Aid-CRS-NET variable, with all three coefficients being statistically significant at the 1% level.²⁵ Overall, Table 1 provides strong evidence of fungibility at the aggregate level: since total government expenditure already *includes* foreign aid spending, we see that on average about 70% of total aid flows are fungible.²⁶

Does the Composition of Aid Matter? The evidence presented in Table 1 supports the prediction that total aid is fungible, but 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

in columns 1 and 2 in Table 1, where our dependent variable is total aid, we control for the recipient government's debt service. Second, in column 3 we report the results for aid net of loan repayments (Aid-CRS-NET). We follow the same strategy for the IV and GMM approaches.

²⁴The results of our first stage regressions are presented in Table A6. 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 Kleibergen–Paap statistic for weak identification and the Hansen J-statistic for over-identification tests for all instruments.

²⁵We have also estimated the model using the system GMM procedure of Blundell and Bond (1998). The results are broadly consistent with those reported in Table 1 and are available upon request from the authors.

²⁶Table A4 in Appendix A reports an additional specification that includes lagged values of aid (for up to two years) along with the contemporaneous measures of aid reported in Table 1. This is done to account for the possibility that government spending from foreign aid flows can be delayed by a year or two. Further, it also captures the dynamic consequences of aid, especially when it is spent on investment goods. As can be seen from Table A4, the results are consistent with those reported in Table 1.

performance. To shed light on the link between the composition of aid and that of government spending, we split our sample into sub-categories of foreign aid (investment aid, non-investment aid net of loan repayments, and social infrastructure 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 (for both panel fixed effects and difference GMM estimators). We regress a particular category of government expenditure on all the three categories of aid. The results from the fixed effects regressions in Table 2 suggest that a 1 percentage-point increase in the ratio of investment aid to GDP is associated with approximately a 0.12 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 76%. Comparing the coefficients across the three categories of aid, non-investment aid appears to be the most fungible of the three. However, the coefficient associated with non-investment aid is not statistically significant.²⁷ These results indicate that the composition of aid does indeed effect the composition of government spending, and the degree of fungibility varies significantly across the different categories 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 the domestic share of public 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 sce-

²⁷Since we adjust the non-investment aid variable for loan repayments, we do not include debt service as a percentage of GDP as a control in Table 2. This is consistent with the specifications in columns 3 and 9 in Table 1. Table A5 in Appendix A reports the results from a specification where debt service is included as a control, but non-investment aid is not adjusted for loan repayments, which is consistent with columns 2 and 8 in Table 1.

TABLE 2

The Composition of Aid and the Composition of Government Spending

	Dependent Variable: Category of Government Expenditure (% of GDP)					
	FE Investment Expenditure	FE Non-Investment Expenditure	FE Social Infrastructure Expenditure	GMM Investment Expenditure	GMM Non-Investment Expenditure	GMM Social Infrastructure Expenditure
Investment aid (% of GDP)	0.123** (0.054)	0.072 (0.093)	0.065 (0.069)	0.189** (0.071)	0.165 (0.102)	0.004 (0.092)
Non-investment aid net (% of GDP)	-0.035 (0.051)	0.036 (0.112)	0.135 (0.116)	-0.003 (0.082)	-0.036 (0.121)	0.267** (0.115)
Social infrastructure aid (% of GDP)	-0.010 (0.110)	0.019 (0.169)	0.239** (0.106)	-0.126 (0.101)	0.037 (0.172)	0.338** (0.127)
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)
Budget balance, lag(-1)	-0.033 (0.038)	-0.167 (0.104)	-0.039 (0.058)	-0.097** (0.046)	-0.103 (0.093)	0.004 (0.071)
Infant mortality rate, lag (-1)	-0.009 (0.026)	-0.091*** (0.026)	-0.007 (0.026)	0.017 (0.017)	-0.059** (0.023)	-0.024 (0.029)
Agricultural VA (% of GDP), lag (-1)	-0.024 (0.033)	-0.061 (0.072)	-0.070 (0.082)	-0.051 (0.042)	-0.042 (0.097)	-0.034 (0.073)
Literacy rate, lag (-1)	-0.043 (0.094)	0.009 (0.083)	-0.182 (0.125)	-0.023 (0.148)	0.114 (0.108)	-0.256 (0.223)
Import + export (% of GDP), lag (-1)	0.021* (0.011)	0.001 (0.015)	-0.041** (0.019)	-0.008 (0.017)	-0.026 (0.033)	-0.039 (0.026)
Dependency ratio 65, lag (-1)	-0.321 (0.717)	-0.483 (0.682)	-0.363 (0.593)	0.328 (0.627)	-0.247 (0.748)	-0.664 (0.717)
Observations	570	553	574	511	494	514
R-squared	0.81	0.75	0.93			
AR (1) test				0.00	0.04	0.13
AR (2) test				0.14	0.51	0.76
Hansen J-statistic				1	1	1
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country 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 (Fixed Effects)

Variable (% GDP)	(1) Private Investment	(2) Private Investment	(3) Private Investment	(4) Private Investment	(5) Private Investment	(6) Hous. Cons.	(7) Hous. Cons.	(8) Hous. Cons.	(9) Hous. Cons.	(10) Hous. Cons.
Aid-DAC	-0.014 (0.027)					0.542*** (0.139)				
Aid-CRS		0.032 (0.022)					0.398*** (0.106)			
Aid-CRS-NET			0.029 (0.026)					0.409*** (0.116)		
Investment aid				0.046 (0.037)	0.038 (0.036)				0.216* (0.119)	0.226* (0.119)
Non-investment aid net				-0.018 (0.041)					0.607** (0.246)	
Non-investment aid					0.001 (0.035)					0.572*** (0.184)
Social Infrastructure aid				0.058 (0.080)	0.054 (0.083)				0.409 (0.438)	0.361 (0.425)
Observations	756	752	752	713	701	1434	1400	1400	1253	1234
R-squared	0.92	0.92	0.92	0.93	0.93	0.84	0.83	0.83	0.84	0.84
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country 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%. The private investment regressions control for lagged private investment, domestic savings, 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)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Private	Private	Private	Private	Private	Hous.	Hous.	Hous.	Hous.	Hous.
	Investment	Investment	Investment	Investment	Investment	Cons.	Cons.	Cons.	Cons.	Cons.
Aid-DAC	0.040 (0.035)					0.578*** (0.160)				
Aid-CRS		0.034 (0.027)					0.369*** (0.134)			
Aid-CRS-NET			0.035 (0.031)					0.386*** (0.136)		
Investment aid				-0.000 (0.048)	-0.003 (0.047)				0.252** (0.114)	0.257** (0.113)
Non-investment aid net				0.021 (0.047)					0.601*** (0.225)	
Non-investment aid					0.021 (0.037)					0.561*** (0.168)
Social Infrastructure aid				0.102 (0.089)	0.100 (0.092)				0.446 (0.412)	0.395 (0.399)
Observations	699	695	695	656	644	1372	1337	1337	1189	1170
AR (1) test	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.03
AR (2) test	0.05	0.05	0.05	0.22	0.14	0.10	0.14	0.13	0.23	0.27
Hansen J-statistic	1	1	1	1	1	1	1	1	1	1
Year Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country 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%. The private investment regressions control for lagged private investment, domestic savings, 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.

nario 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.²⁸ 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 0.54 percentage points for the Aid-DAC variable, 0.40 percentage points for the Aid-CRS variable, and 0.41 percentage points for the Aid-CRS-NET variable (all 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 about 0.22 percentage points (significant at the 10% level). Non-investment aid increase household consumption by amounts larger than investment aid, whereas social infrastructure aid is not significant. 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.

4 Conclusions

In this paper, we examine whether aid inflows are fungible and how the degree of fungibility varies across different sub-categories of aid. 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

²⁸We 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.

offset the increase in aid allocated to public investment. 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 the degree of fungibility varies substantially across different categories 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 endogeneity in all our regressions using 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 through which foreign aid may impinge 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 focused on 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. 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.

APPENDIX A

TABLE A1. List of Aid-Recipient Countries

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 A2. List of Donor countries (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.

TABLE A3. 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	3.922629	5.361861	4.30e-06	41.02941	N = 1618
Aid CRS NET (corrected for debt service)	3.746426	5.130569	0	40.64296	N = 1618
Investment aid (CRS)	1.729454	2.525373	2.12e-06	22.93244	N = 1525
Non-investment aid (CRS)	1.476227	2.519797	9.31e-10	22.22922	N = 1571
Non-investment aid NET (CRS)	1.294753	2.246049	-.231557	22.22922	N = 1571
Social infrastructure aid (CRS)	.9368216	1.608255	0	17.5981	N = 1484

TABLE A4

**The Effect of Foreign Aid on Total Government Spending
(Including Lagged Values for Aid)**

	(1) FE	(2) FE	(3) FE
Aid-DAC (% GDP)	0.092 (0.090)		
Aid-DAC (% GDP), lag(-1)	0.192** (0.075)		
Aid-DAC (% GDP), lag(-2)	0.092 (0.071)		
Aid-CRS (% GDP)		0.154*** (0.047)	
Aid-CRS (% GDP), lag(-1)		0.131* (0.074)	
Aid-CRS (% GDP), lag(-2)		0.135*** (0.041)	
Aid-CRS-Net (% GDP)			0.132** (0.050)
Aid-CRS-Net (% GDP), lag(-1)			0.095 (0.063)
Aid-CRS-Net (% GDP), lag(-2)			0.180*** (0.048)
Real GDP per capita	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Budget balance (% GDP), lag(-1)	-0.238* (0.120)	-0.233* (0.131)	-0.240* (0.131)
Debt service (% GDP), lag(-1)	0.029 (0.082)	0.067 (0.069)	
Infant mortality rate, lag(-1)	-0.040 (0.057)	-0.035 (0.056)	-0.049 (0.056)
Agricultural VA (% GDP), lag(-1)	-0.221** (0.103)	-0.256** (0.101)	-0.246** (0.102)
Literacy rate, lag(-1)	-0.129 (0.178)	-0.183 (0.172)	-0.195 (0.191)
Import + export (% GDP), lag(-1)	-0.020 (0.025)	-0.022 (0.025)	-0.019 (0.025)
Dependency ratio 65, lag(-1)	-0.268 (1.140)	-0.128 (1.120)	-0.394 (1.071)
Observations	565	557	578
R-squared	0.91	0.91	0.91

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

TABLE A5

The Composition of Aid and the Composition of Government Spending
(Controlling for Debt Service)

	Dependent Variable: Category of Government Expenditure (% of GDP)					
	FE	FE	FE	GMM	GMM	GMM
	Investment Expenditure	Non- Investment Expenditure	Social Infrastructure Expenditure	Investment Expenditure	Non- Investment Expenditure	Social Infrastructure Expenditure
Investment aid (% GDP)	0.118** (0.053)	0.063 (0.090)	0.069 (0.073)	0.180*** (0.065)	0.129 (0.101)	0.040 (0.092)
Non-investment aid (% of GDP)	-0.005 (0.031)	0.128 (0.128)	0.108 (0.140)	0.032 (0.073)	0.095 (0.157)	0.219 (0.169)
Social infrastructure aid (% GDP)	-0.016 (0.113)	-0.027 (0.147)	0.229** (0.087)	-0.157 (0.101)	0.031 (0.153)	0.312*** (0.113)
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)
Budget balance, lag(-1)	-0.032 (0.040)	-0.172 (0.106)	-0.046 (0.048)	-0.107** (0.047)	-0.106 (0.097)	-0.005 (0.062)
Total debt service (% GDP), lag (-1)	0.013 (0.030)	0.044 (0.041)	0.077 (0.049)	0.033 (0.031)	0.106 (0.069)	0.033 (0.065)
Infant mortality rate, lag(-1)	-0.006 (0.026)	-0.094*** (0.027)	0.005 (0.025)	0.024 (0.017)	-0.067*** (0.025)	0.001 (0.027)
Agricultural VA (% GDP), lag(-1)	-0.031 (0.033)	-0.060 (0.071)	-0.077 (0.081)	-0.057 (0.039)	-0.051 (0.095)	-0.027 (0.072)
Literacy rate, lag(-1)	-0.049 (0.099)	0.002 (0.086)	-0.191* (0.113)	-0.014 (0.133)	0.100 (0.116)	-0.153 (0.203)
Import + export (% GDP), lag(-1)	0.020* (0.011)	-0.002 (0.016)	-0.041** (0.019)	-0.009 (0.018)	-0.025 (0.033)	-0.038 (0.026)
Dependency ratio 65, lag(-1)	-0.212 (0.813)	-0.733 (0.789)	0.003 (0.581)	0.362 (0.757)	-0.586 (0.817)	0.194 (0.775)
Observations	550	533	554	493	476	496
R-squared	0.81	0.75	0.93			
AR (1) test				0.00	0.05	0.14
AR (2) test				0.21	0.52	0.62
Hansen J-statistic				1	1	1

TABLE A6
First-Stage Instrumental Variables (IV) Regressions

Variable	Dependent Variable		
	Aid DAC (% of GDP)	Aid CRS (% of GDP)	Aid CRS net (% GDPP)
Aid/Distance	2601.95*** (775.27)	3027.41** (1397.2)	1771.39** 861.26
Aid*Border	1.031 (13.21)	-7.653 (13.06)	-2.163 (11.48)
Aid*Language	0.803*** (0.216)	0.318 (0.426)	0.357 (0.354)
Aid*Religion	0.718*** (0.188)	0.771* (0.405)	1.055*** (0.281)
Observations	570	555	573

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

TABLE A7. Aid Categories

AID CLASSIFICATIONS	SOURCE
<u>TOTAL AID</u>	
<i>TOTAL AID CRS</i>	OECD DAC
<i>TOTAL AID DAC</i>	OECD CRS
<u>SOCIAL INFRASTRUCTURE AID</u>	
<i>I.SOCIAL INFRASTRUCTURE & SERVICES</i> which includes the following categories:	OECD CRS
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	
<u>INVESTMENT AID</u>	
<i>II.ECONOMIC INFRASTRUCTURE + III.PRODUCTION SECTORS</i> which includes the following categories:	OECD CRS
II.1 Transport & Storage	
II.2 Communications	
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	
<u>NON-INVESTMENT AID</u>	
<i>TOTAL AID CRS – (INVESTMENT AID + SOCIAL INFRASTRUCTURE AID)</i> which includes the following categories	OECD CRS
IV. Multisector	

V. Commodity aid / general prog. ass.	
VI. Action relating to debt (<i>not included in the "net" aid categories</i>)	
VII. Emergency assistance and reconstruction	
VIII. Administrative costs of donors	
IX. Support to NGO's	
X. Unallocated/unspecified	

TABLE A8. Government Expenditure Categories

GOVERNEMENT EXPENDITURE CLASSIFICATION	SOURCE
<u>TOTAL GOVERNMENT EXPENDITURE</u>	
82. TOTAL EXPENDITURE	IMF, GDF.
<u>SOCIAL INFRASTRUCTURE EXPENDITURE</u>	
82A. GENERAL PUBLIC SERVICES	IMF, GDF.
82AC. PUBLIC ORDER & SAFETY (B3) (National Defense is excluded.)	
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.
<u>INVESTMENT EXPENDIRE</u>	
82H. ECONOMIC AFFAIRS & SERVICES (sum of the B9 to B13)	IMF, GDF.
82HB. AGRI, FORESTRY, FISHING, & HUNTING (B10)	
82HC. MINING & MINERAL RESOURCES, MANUF, & CONSTRUCTION (B11)	
82HD. FUEL & ENERGY (B9)	
82HI. TRANSPORTATION & COMMUNICATION (B12)	
82HL. OTH ECONOMIC AFFAIRS & SERVICES (B13)	
<u>NON-INVESTMENT EXPENDITURE</u>	
TOTAL EXPENDITURE – (INVESTMENT + SOCIAL INFRASTRUCTURE EXPENDITURE)	

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 Millennium Development Goals Indicators webpage.

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