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Foreign Aid and Revenue Response: Does the Composition of Aid Matter?

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Abstract

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper examines the revenue response to inflows of foreign aid in 107 countries during the period 1970–2000. In particular, it investigates whether the impact of aid on the revenue effort depends on the composition of aid (grants vis-à-vis loans). The results indicate that while concessional loans are associated with higher domestic revenue mobilization, the opposite is true of grants. On average, the dampening effect of grants on the revenue effort is modest. However, for those countries plagued by high levels of corruption, our results suggest that the decline in revenues completely offsets the increase in grants. The results are robust to various specifications.

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I. INTRODUCTION

For some time, the debate on the effectiveness of foreign aid has revolved around the relative efficiency of loans versus grants. Since the early 1960s, an often-repeated view has been that loans are used more efficiently than grants because they are expected to be repaid. Furthermore, the need for repayment motivates governments to select projects or programs whose benefits exceed costs (see Schmidt, 1964). Therefore, concessional loans are better for meeting the objectives underlying development assistance (see Singer, 1961).

This issue has reemerged with recent calls for a shift from loans to grants. In the view of some observers, excessive lending has led to massive debt accumulation in many developing countries while failing to reach intended development objectives. Therefore, it has been argued that aid should be motivated primarily by humanitarian objectives and come in the form of grants (see, for example, Rogoff, 2003). Such an approach would also avoid worsening the debt sustainability outlook of these countries. In 2000, the International Financial Institution Advisory Commission (also known as the Meltzer Commission) concluded that financial assistance from multilateral development banks should be provided exclusively in the form of grants (IFIAC, 2000). In addition, the United States has proposed converting a major share of international development assistance (IDA) lending to grants and called on the World Bank and other multilateral development banks (MDBs) to provide up to 50 percent of their funds to developing countries in this form. In a separate initiative, the U.S. administration announced in 2002 that US$5 billion in additional foreign aid would be provided annually by the fiscal year 2006. The increased aid would take the form of grants and be channeled through a new Millennium Challenge Account (MCA). This fund would finance initiatives in selected countries with good performance as gauged by 16 indicators.

Some donor countries and researchers have expressed reservations regarding the conversion of concessional lending to grants (see, for example, Kapur, 2002).[2] This proposal has important implications for the functioning of IDA, which relies on principal and interest repayments to finance new lending. In the absence of additional contributions from donors, a significant shift from loans to grants would limit IDA from maintaining existing lending over a period of time. In addition, some analysts are concerned that the switch to grants would diminish public support in donor countries for transfers to developing countries.[3] Finally, a massive increase in resource transfers could pose a host of macroeconomic and microeconomic challenges (Heller and Gupta, 2002). For many low-income countries, scaled-up aid could amount to up to *three times* the current levels of domestic revenue.

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[2] Sanford (2002) reviews the main arguments and counterarguments on this issue. See also U.S. Treasury (2000). Bulow (2002) outlines the arguments in favor of converting loans to grants in the context of difficult debt negotiations.

[3] See the general discussion in Bulow (2002).

This debate has not sufficiently emphasized the fiscal implications of these proposals. In particular, an increase in grants could have ramifications for the domestic fiscal revenue effort of these countries. It has been argued that grants are free resources that substitute for domestic revenues, while the burden of future loan repayments induces policymakers to mobilize taxes or, at least, to protect current levels of revenue collection (Bräutigam, 2000).[4] The strength of this argument depends on how strongly policymakers perceive loans, in practice, as being different from grants. If a large share of these loans is frequently forgiven (e.g., through debt relief, such as that provided by the Heavily Indebted Poor Country (HIPC) Initiative), over time rational policymakers may come to view them as roughly equivalent to grants.

Whether the possibly dampening effect of grants on revenues is favorable or unfavorable for economic development must be judged on a case-by-case basis. In some circumstances, a reduction in the tax burden can promote growth by freeing resources for the private sector. Furthermore, cutting marginal tax rates and eliminating taxes that distort private sector incentives may help spur economic activity. On the other hand, reduced revenues—and the resulting dependency on aid—may have adverse macroeconomic consequences. First, aid is much more volatile and unpredictable than revenues, and the volatility of aid grows with the degree of aid dependence (Bulíř and Hamann, 2001). This volatility has implications for macroeconomic stability in aid-dependent countries. Second, poverty-reducing spending becomes dependent on aid and could be cut should aid inflows decline or cease. Third, the growing dependence on aid reduces incentives for governments to adopt good policies and maintain efficient institutions (Azam, Devarajan, and O'Connell, 1999).[5] Furthermore, in many cases, low tax revenues are due to widespread tax exemptions to powerful interest groups and weak tax compliance. Increased aid inflows could thus divert attention from addressing these weaknesses in governance.

A number of important issues remain unresolved in the empirical literature on the revenue response to foreign aid. Studies have also focused largely on individual country experiences or selected regions. They have yielded mixed results (see McGillivray and Morrissey, 2001, and World Bank, 1998, for summaries). In some countries, foreign aid is associated with higher domestic revenues, while in others it is associated with lower revenues.[6] Furthermore,

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[4] Bräutigam (2000) also argues that aid creates enclaves in the economy when projects and consultants are exempted from import duties and other local taxes.

[5] On the other hand, should donors condition their aid on good policies (e.g., as in proposed MCA), then aid-dependent countries could face increased pressure to maintain or improve the efficiency of their public institutions.

[6] For example, Pack and Pack (1990) find foreign aid had a positive effect on domestic revenues in Indonesia, while Franco-Rodriguez and Morrissey (1998) find a negative relationship in Pakistan. McGillivray and Ahmed (1999) find that aid depressed tax revenues in the Philippines during the period of 1960–92. The results from the Cashel-Cordo and Craig (1990) study suggest that aid has had a positive impact on revenue mobilization among African countries and a negative impact on non-African countries. Heller (1975) finds a negative effect of aid on revenue for 11 African countries.

a comprehensive and systematic study of how the revenue response differs for the separate components of aid (i.e., loans and grants) is yet to be undertaken. The few studies that have taken the composition of aid into account have either used a limited sample or estimated a very simple model of cross-country variation in tax effort. They have also provided inconclusive results. For example, Otim (1996) finds that in a pooled sample of three South Asian economies, grants are more likely to leak into consumption than loans. For stimulating domestic investment, he suggests that donors should extend loans to developing countries rather than provide grants. He also finds that both grants and loans increase tax effort. On the other hand, Khan and Hoshino (1992) provide some empirical evidence that grants reduce tax effort while loans increase it, for a sample of five South and Southeast Asian countries over the period from 1955–1976. Odedokun (2003) provides preliminary evidence that grants reduce tax effort in low-income countries, using a simple model of tax revenue as a function of per capita income and the (lagged) ratio of grants to total aid in 72 developing countries.

This paper fills the void in the literature by investigating the revenue response to foreign loans and grants separately in a sample of 107 developing countries over the period 1970–2000. The paper builds on the empirical literature on tax effort and the literature on the fiscal response to aid. It augments regression equations for tax effort and adds both grants and net concessional loans to the vector of explanatory variables. The paper explores several variations and specifications using panel data regressions to test the robustness of the baseline specification. Going beyond the standard econometric procedures employed by most studies in this literature, the paper also tests for nonlinearities in the relationship between foreign aid and fiscal response, examines the impact of corruption on the aid-revenue nexus, explores issues related to the endogeneity of the relationship between aid and revenue, and allows for the presence of serial correlation.

The paper is organized as follows: Section II presents a basic analytical framework. Section III presents an empirical model and data. Section IV presents econometric results. Section V discusses the policy implications of the results and concludes.

II. ANALYTICAL FRAMEWORK

The relationship between foreign aid and revenues could be viewed in terms of the government's budget constraint in any given period, written as follows

$$G = T + A + B, \tag{1}$$

where G is government expenditure, T is recurrent revenues, A is aid (comprising both grants and loans), and B is net domestic borrowing (countries are assumed to have no access to nonconcessional foreign borrowing).

Differentiating equation (1) with respect to A yields:

$$\frac{\partial G}{\partial A} = \frac{\partial T}{\partial A} + \frac{\partial A}{\partial A} + \frac{\partial B}{\partial A}. \tag{2}$$

Thus, in response to an exogenous increase in aid, a government could either (i) reduce the tax effort, (ii) increase expenditures, (iii) adjust downward domestic borrowing in order to meet the budget constraint, or choose a combination of (i) through (iii).

In the first scenario, the government chooses to pass the benefit of higher aid inflows to the private sector by reducing the tax effort. At the extreme, the government could decide to reduce this effort by the full amount of aid while holding aggregate public expenditures and borrowing constant.[7] This would imply the following:

$$\frac{\partial T}{\partial A} = -1 \text{ and } \frac{\partial G}{\partial A} = 0 \text{ and } \frac{\partial B}{\partial A} = 0.$$

A similar result would arise when higher aid inflows promote rent-seeking behavior by domestic vested interests that begin to clamor for tax exemptions or a weakening of efforts to collect taxes due.[8] In the extreme, this behavior can cause the tax effort to decline by the full amount of aid inflows.

Under the second scenario—where expenditures increase in response to increase in aid—tax effort may either increase or decrease, depending on the form aid takes, and on the magnitude of the response of expenditures to aid. If the increase in expenditures is smaller than the increase in aid (i.e., aid is "fungible"), or $0 < \partial G/\partial A < 1$, holding domestic borrowing unchanged (i.e., $\partial B/\partial A = 0$), tax effort would decline.[9] If the expenditures' increase is greater than the increase in aid, i.e., $\partial G/\partial A > 1$, tax revenue should increase. This could happen if aid is provided primarily in the form of project assistance that requires matching government spending and when aid is not fungible. [10]

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[7] The assumption is that the aid comes in the form of budget support. If aid is tied to projects, it would require generation of counterpart funds for implementation of projects. In that case, $\partial T/\partial A > -1$.

[8] Azam, Devarajan, and O'Connell (1999) find that when institutions are initially weak, foreign aid undermines institutional capacity building (i.e., revenue-raising capacity). As such, foreign aid eventually finances the whole public budget. There is some evidence that increased aid is associated with a higher level of rent-seeking activities (Knack, 2001, and Svensson, 2000), although Tavares (2003) presents evidence to the contrary.

[9] The fungibility of aid refers to a situation where recipients reallocate resources that would have been spent for purposes now financed by foreign aid.

[10] This is analogous to scenarios discussed by Feeny and McGillivray (forthcoming), using a similar analytical framework (equations (1) and (2)), where aid inflows lead to additional spending. In their framework, however, additional spending leads to increased (nonconcessional) borrowing rather than to increased tax effort. Catterson and Lindahl (1999) suggest that the mode of aid delivery, such as a "matching funds" system, can provide an incentive to boost domestic revenue generation. They find that in Tanzania, this system has created a "strong incentive for revenue collection."

Finally, consider the implications of a third scenario, where aid induces a decrease in domestic borrowing. Here the government decides not to spend foreign aid, i.e. $\partial G / \partial A = 0$. This can happen when the government builds up deposits with the banking system, so as to release resources for the private sector.

Thus, viewed in terms of the government's budget constraint, the response of the tax effort to increased aid flows could be positive, negative, or zero.

Existing models of the fiscal response to foreign aid also find that taxes could either increase or decrease in response to higher aid. The first models developed in this area tend to conclude that the increase in government spending is likely to be smaller than the increase in aid (i.e. aid is fungible). Thus, assuming domestic borrowing does not decline, aid can lead to a reduced tax effort (see, for example, Heller, 1975 and Leuthold, 1991). More recent literature has considered the theoretical scenarios under which this assumption might not hold. For example, White (1993) finds that whether or not aid adversely affects tax revenues depends, inter alia, on the impact of aid on private investment.

A shortcoming of the existing literature is the tendency to lump together loans and grants when considering the effects of aid on tax revenues (e.g., Leuthold, 1991). Even models that differentiate between the two either make them enter in the government's utility function as a single variable (e.g., Ghura, 1998) or as separate terms (e.g., Otim, 1996), but without explicitly allowing a government to consider the fundamental difference between the two— in particular, that grants are unrequited transfers, but loans need to be repaid. In this light, it is plausible that the effects of loans and grants on revenues could differ. In the scenarios discussed above, for example, the first one is arguably more consistent with aid provided in the form of grants, where free resources substitute for domestic revenues.

As revealed in the existing literature, the direction of the relationship between grants and loans and the revenue effort remains a fundamentally empirical question. In the following section we present our empirical model and data that will be used to investigate this relationship.

III. EMPIRICAL MODEL AND DATA

The econometric approach for the present study is based on the previous literature investigating determinants of cross-country variation in tax effort. Lotz and Morss (1967 and 1970) developed a model of tax ratios as a function of income and trade that has become the standard for subsequent studies. Other variables were added in subsequent studies to reflect the sectoral composition of income and other macroeconomic variables (see, for example, Tanzi, 1992; Stotsky and WoldeMariam, 1997; and Ghura, 1998).

Unlike in the previous empirical models, we distinguish between the effects of loans (L) and grants (F). Following the analytical framework, we test the hypothesis that grants are negatively related to the tax effort. On the other hand, the relationship between concessional

lending and tax effort could be influenced by the fact that loans have to be repaid. Hence, we postulate that multilateral and bilateral borrowing would have a positive effect on the domestic revenue effort.

We thus model cross-country variations in tax shares as a function of grant (F) and loan (L) flows in percent of GDP, controlling for the structure of the economy (agricultural value-added (AGR) and industry value-added (IND) in percent of GDP); openness (the sum of exports and imports in percent of GDP ($TRADE$)); and the level of economic development (real income per capita ($SIZE$)):

$$\left|\frac{T}{GDP}\right|_{i,t} = \beta_0 + \beta_1 AGR_{i,t} + \beta_2 IND_{i,t} + \beta_3 TRADE + \beta_4 SIZE + \beta_5 F + \beta_6 L + \varepsilon_{i,t} \qquad (3)$$

We estimate equation (3) using panel data regression analysis. As noted above, the analysis covers 107 countries over the 1970 to 2000 period. We allow for nonlinearities by including the product variable generated by the squared aid variable. Because the dependent variable is nonnegative and positively skewed,[11] a log transformation of the dependent variable is used in estimating equation (1). This yields a semi-log quadratic regression equation, where the β's are an estimate of the impact of each independent variable on the growth rate of the dependent variable.

Data on total domestic revenue are drawn from the IMF's *Government Finance Statistics*. They refer to a consolidated central government.[12] Data on *net* foreign aid are from the OECD's *Geographical Distribution of Financial Flows to Aid Recipients*. The data include official development assistance (ODA) from all donor countries. ODA includes grants by official agencies of the members of the Development Assistance Committee (DAC) and loans with a grant element of at least 25 percent, and technical cooperation and assistance, less any repayments of loan principal during the same period. Data are expressed in percent of recipient country GDP.

Data on control variables are drawn from the World Bank's *World Development Indicators* (WDI) and the IMF's *World Economic Outlook* database (WEO). These include the agriculture and industry value added in percent of GDP; imports and exports of goods and services in percent of GDP; and GDP per capita in constant US dollars.

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[11] Both the Jarque-Bera and Shapiro-Wilk tests for nonnormal distributions are significant at the 1 percent level. The best equation fit was obtained using the semi-log specification. In addition, the log transformation of the dependent variable has the added benefit that predicted values, which are the exponential of the predicted log value, will always be positive.

[12] Since most foreign assistance is routed through the central government budget, the nonavailability of data on revenue collected at the subnational level should not be a major handicap.

We also test the robustness of the baseline results to the inclusion of other variables that have been found to be significantly related to cross-country variations in domestic revenues. These include corruption, inflation, debt, and dummy for oil-producing countries. Tanzi (1992) suggests that high public debt requires a higher revenue effort; however, a high debt burden could also create macroeconomic imbalances that tend to reduce tax levels. Ghura (1998) finds that variations in tax revenue in percent of GDP are significantly related to economic policies and the level of corruption in a sample of 39 countries over the 1985–96 period.

Except for corruption, data on all the other control variables are drawn from the WEO database. Data on corruption are drawn from the *International Country Risk Guide* (ICRG) by Political Risk Services.[13] This corruption index reflects the assessment of foreign investors about the degree of corruption in an economy. In particular, investors are asked whether high government officials are likely to demand special payments and whether illegal payments are generally expected throughout lower levels of government, especially those connected with import and export licenses, exchange controls, tax assessment, police protection, or loans. Thus, the index does not necessarily capture corruption in tax administration alone.

The final sample size varies depending on the specification. The list of countries in the sample and selected summary statistics are provided in Appendix Table 1.

IV. ECONOMETRIC RESULTS

A. Baseline Results

Table 1 provides the results of the baseline regressions. The regression reveals that the effect of overall aid (defined as a sum of net loans and grants) on revenue effort is negative and statistically significant (column 1). When aid is separated into two components, loans have a positive effect on revenues while grants have a negative effect. The sign and magnitude of this effect is more or less similar when each variable is included in the regression separately and also when both variables are included. The results of a random effects regression in column (5) are also similar.[14]

Across all regressions, the impact of the standard set of regressors on the dependent variable is consistent with results of the previous studies. For example, agricultural value added is consistently significant and has a negative impact on revenues, as expected, while trade and industry value-added both have a statistically significant and positive impact on revenues. Per capita income has an ambiguous effect on revenues. In our sample, a bivariate regression of revenue on income yields a positive and significant impact on revenue (not shown); this is

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[13] Data have been re-scaled such that higher values reflect weak institutions.

[14] The Hausman test and the Breusch-Pagan specification test both indicate that the fixed effects model is preferable.

consistent with the seminal regression models of revenue effort. However, when the baseline model controls for other factors, per capita income is negative and significant (or insignificant, in some of the regressions in the following section).

What do the coefficients imply with respect to projected increases in grants and/or concessional loans? Assume, for example, a doubling of foreign aid (both loans and grants) from its current average levels. This is not unreasonable, given the renewed calls for the donor community to meet the 0.7 percent of GNP target for ODA. Some of the increases in grants may also come from a conversion of concessional loans into grants, as recommended by the Meltzer commission and the U.S. administration.

Table 1. Foreign Aid and Domestic Revenue: Baseline Regressions
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

Estimation technique	Fixed Effects (1)	Fixed Effects (2)	Fixed Effects (3)	Fixed Effects (4)	Random Effects (5)
Aid	-0.01*** (-3.91)				
$(Aid)^2$	0.0002 (4.76)				
Loan		0.007** (2.15)		0.011*** (3.05)	0.009*** (2.59)
$(Loan)^2$		-0.0001 (-0.63)		-0.0001 (-0.99)	-0.0001 (-1.03)
Grant			-0.013*** (-4.32)	-0.016*** (-5.00)	-0.014*** (-4.48)
$(Grant)^2$			0.0004*** (4.56)	0.0004*** (5.07)	0.0004*** (4.16)
Agriculture value added	-0.01*** (-9.56)	-0.01*** (-9.78)	-0.01*** (-9.68)	-0.01*** (-9.94)	-0.01*** (-10.89)
Industry value added	0.007*** (6.62)	0.007*** (6.45)	0.007*** (6.51)	0.007*** (6.58)	0.006*** (6.09)
Per capita income	-0.00004*** (-12.12)	-0.00004*** (-11.56)	-0.00004*** (-12.16)	-0.00004*** (-12.03)	-0.00004*** (-13.00)
Trade[1]	0.002*** (8.19)	0.002*** (7.88)	0.002*** (8.51)	0.002*** (8.13)	0.003*** (9.39)
Adjusted r-squared/R-squared	0.87	0.87	0.87	0.87	0.35
F-statistic/Wald chi-square	121.76	120.51	121.62	120.24	540.19
P-value	0.00	0.00	0.00	0.00	0.00
Number of observations	1943	1943	1943	1943	1943
Number of groups	107	107	107	107	107

Source: See text.
(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1]Trade refers to exports plus imports in percent of GDP.

The coefficient estimates in column (4) suggest that a doubling of average loans (from an average of 1.5 percent of GDP, using the sample underlying this regression) leads to a 0.35 percentage point of GDP increase in revenue while a doubling of grants (from an average of 4 percent of GDP) leads to a fall in revenue by about 1.1 percentage points of GDP.[15] This implies, then, that for each additional dollar of aid in the form of grants, 28 percent of it is offset by reduced domestic revenue effort. This increase in grants will also lead to higher aid dependence, as the ratio of grants to domestic revenues goes up from 18 to 39 percent.

B. Robustness Tests

Table 2 adds other control variables to the baseline model such as corruption (following Ghura, 1998), foreign debt (Tanzi, 1992), and others. The results are very similar to those of the baseline model: grants reduce tax effort while loans increase it, even after taking into account the small offsetting effect of the debt stock on revenues. In addition, we find that corruption has a significant impact on domestic revenues. That is, in countries with weaker institutions, revenue effort is lower.

It might be argued that there is some endogeneity in the relationship between foreign aid and revenue, as foreign aid may respond to shortfalls in domestic revenue mobilization (see, for example, Ghura, 1998). However, a number of papers have modeled the allocation of aid based on foreign policy and commercial interests of the donor and economic and welfare needs of the recipient (see, for example, Alesina and Dollar, 2000). These models have generally used initial mortality rates or per capita income as proxies for recipient need, not revenue effort.[16] Nonetheless, to allow for the possibility of some endogeneity, Table 3 reruns the regression models in Table 2, using (one-period) lagged values of the loans and grants. The results are broadly similar.[17]

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[15] These estimates are drawn from the regression coefficients reported in column (4) and use the average values of revenues (about 21 percent of GDP) and of loans and grants (about 1.5 and 4 percent of GDP, respectively). The estimates are based on the sample underlying this regression. Given a semi-log regression of the form $\ln Y = \beta_1 + \beta_2{}^*X + \beta_3{}^*(X^2)$, the slope is equal to $Y^*(\beta_2 + 2\beta_3 X)$, while the elasticity is equal to $X^*(\beta_2 + 2\beta_3 X)$.

[16] The other standard determinants of aid allocation are arms imports and total population.

[17] To further assess whether endogeneity affects the results, we also estimated an instrumental variable regression of the baseline model, using initial income and initial population of recipient countries as instruments for aid, along with lagged values of aid. The results (not shown) are similar. In addition, we employed other estimation techniques (not shown) such as robust regression and maximum likelihood. We tested both the relationship between revenue and contemporaneous aid as well as revenue and lagged aid. The results are consistent with the baseline estimates in the magnitude, direction, and significance of the aid variables.

Table 2. Foreign Aid and Domestic Revenue: Including Other Regressors
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

Estimation technique	Random Effects (1)	Fixed Effects (2)	Random Effects (3)	Fixed Effects (4)	Random Effects (5)	Fixed Effects (6)
Loan	0.009**	0.01***	0.009**	0.01***	0.011***	0.014***
	(2.51)	(2.96)	(2.51)	(2.96)	(3.04)	(3.79)
(Loan)^2	-0.0001	-0.0001	-0.0001	-0.0001	-0.0002	-0.0002
	(-1.02)	(-0.98)	(-1.01)	(-0.98)	(-1.53)	(-1.57)
Grant	-0.015***	-0.016***	-0.015***	-0.016***	-0.008**	-0.010***
	(-4.59)	(-5.12)	(-4.63)	(-5.12)	(-2.38)	(-3.15)
(Grant)^2	0.0004***	0.0005***	0.0004***	0.0005***	0.0002***	0.0004***
	(4.36)	(5.28)	(4.39)	(5.28)	(2.84)	(4.54)
Inflation	-0.00001*	-0.00002*	-0.00001*	-0.00002*	-0.000003	-0.000008
	(-1.70)	(-1.89)	(-1.70)	(-1.89)	(-0.34)	(-0.80)
Dummy for oil exporter			-0.12	-0.21	0.19*	0.17*
			(-0.88)	(-1.57)	(1.69)	(1.79)
Foreign debt (in percent of GDP)					-0.0005***	-0.0004***
					(-4.24)	(-4.40)
Corruption					-0.10**	-0.20***
					(-2.22)	(-4.77)
Other control variables[1]	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted r-squared/R-squared	0.35	0.87	0.36	0.87	0.34	0.85
F-statistic/Wald chi-square	539.28	118.84	539.72	118.84	432.65	100.79
P-value	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	1923	1923	1923	1923	1426	1426
Number of groups	107	107	107	107	74	74

Source: See text.
(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1] Agriculture and industry value added in percent of GDP; real per capita income; and trade (exports plus imports in percent of GDP).

The analytical framework also suggests that the impact of foreign aid on revenue could be either magnified or mitigated by the quality of institutions. In countries with weaker institutions, for example, higher aid inflows may undermine efforts to raise revenue (Azam and others, 1999). There could then be some heterogeneity in the relationship between revenues and foreign aid, depending on the quality of governance.

To test this possibility, we rank countries in the sample according to their average corruption index. We then identify the lower half and the bottom quartile of the sample based on the quality of institution. Table 4 reports the regression results based on the sample of relatively corrupt countries. The results indicate that in countries with weak institutions, the magnitude of the negative relationship between grants and revenue mobilization is substantially higher than for the sample as a whole. Concessional loans have some offsetting effect, because they are associated with higher revenue effort, but the impact is statistically insignificant in the most corrupt quartile.

Table 3. Foreign Aid and Domestic Revenue: Lagged Values of Loans and Grants
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

Estimation technique	Random Effects (1)	Fixed Effects (2)	Random Effects (3)	Fixed Effects (4)	Random Effects (5)	Fixed Effects (6)
Loan	0.011***	0.012***	0.011***	0.012***	0.012***	0.014***
	(3.16)	(3.54)	(3.15)	(3.54)	(3.24)	(3.85)
(Loan)^2	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(-1.03)	(-0.99)	(-1.03)	(-0.99)	(-1.24)	(-1.22)
Grant	-0.015***	-0.016***	-0.015***	-0.016***	-0.010***	-0.011***
	(-4.88)	(-5.20)	(-4.90)	(-5.20)	(-2.88)	(3.41)
(Grant)^2	0.0004***	0.0004***	0.0004***	0.0004***	0.0003***	0.0004***
	(4.50)	(5.08)	(4.52)	(5.08)	(3.25)	(4.37)
Inflation	-0.00001	-0.00001	-0.00001	-0.00001	0.000001	0.000002
	(-1.29)	(-1.20)	(-1.29)	(-1.20)	(0.13)	(0.23)
Dummy for oil exporter			-0.08	-0.21	0.19	0.21
			(-0.60)	(-1.59)	(1.64)	(2.04)
Foreign debt (in percent of GDP)					-0.0004***	-0.0004***
					(-4.07)	(-3.97)
Corruption (ICRG)					-0.10**	-0.22***
					(-2.30)	(-4.93)
Other control variables[1]	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted r-squared/R-squared	0.37	0.88	0.37	0.87	0.34	0.85
F-statistic/Wald chi-square	515.68	113.04	515.68	113.04	432.83	99.09
P-value	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	1879	1879	1879	1879	1412	1412
Number of groups	107	107	107	107	74	74

Source: See text.

(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1]Agriculture and industry value added in percent of GDP; real per capita income; and trade (exports plus imports in percent of GDP).

The level of domestic revenue mobilization tends to persist over time. Previous empirical studies—with the exception of Leuthold (1991)—have not taken this into account.[18] A Durbin-Watson test suggests that there is evidence of the presence of first-order serial correlation in our sample. To estimate our regression model in the presence of serial correlation, we utilize several regression techniques: (i) Feasible GLS (FGLS) with AR1 correlation, assuming both common and panel specific AR1 processes; (ii) the Baltagi-Wu (1999) estimator that allows for unbalanced panels with unequally spaced observations; and (iii) panel corrected standard error (PCSE) estimates using Prais-Winsten regression to correct for autocorrelation.[19]

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[18] Leuthold (1991) estimated a feasible GLS (FGLS) to correct for serial correlation.

[19] The use of the FGLS procedure in the estimation of time series cross-section models has been criticized for underestimating standard errors (see Beck and Katz, 1995). The PCSE procedure addresses this problem and assumes that disturbances are heteroskedastic and contemporaneously correlated across panels.

Table 4. Foreign Aid and Domestic Revenue: Fixed Effects with Sub-Sample of Corrupt Countries[1]
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

	Contemporaneous Aid		Lagged Aid	
	Lower Half (1)	Lowest Quartile (2)	Lower Half (3)	Lowest Quartile (4)
Loan	0.015***	0.001	0.013***	0.014
	(3.57)	(0.19)	(3.04)	(1.62)
$(Loan)^2$	-0.0003**	0.0006	-0.0003**	-0.001
	(-2.41)	(1.12)	(-2.54)	(-1.64)
Grant	-0.037***	-0.091***	-0.033***	-0.081***
	(-5.97)	(-8.10)	(-6.01)	(-7.29)
$(Grant)^2$	0.002***	0.003***	0.002***	0.003***
	(8.94)	(10.85)	(9.27)	(9.42)
Inflation	-0.0001	0.003***	-0.002***	-0.002***
	(-0.94)	(2.67)	(-7.48)	(-3.38)
Dummy for oil exporter	0.3788	0.035	0.12	0.54***
	(2.37)	(0.26)	(1.55)	(3.26)
Foreign debt (in percent of GDP)	-0.001***	-0.0001	-0.0006***	-0.0001
	(-3.79)	(-0.40)	(-2.40)	(-0.27)
Corruption (ICRG)	-0.08	-0.12	-0.02	-0.031
	(-1.53)	(-1.44)	(-0.53)	(-0.32)
Other control variables[2]	Yes	Yes	Yes	Yes
Adjusted r-squared/R-squared	0.90	0.93	0.91	0.91
F-statistic	143.56	128.88	155.92	155.92
P-value	0.00	0.00	0.00	0.00
Number of observations	657	253	653	250
Number of groups	37	18	37	18

Source: See text.

(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1]The sub-samples are based on the ICRG index of corruption, averaged over the 1984-2000 period. The lower half and lowest quartile refer to sub-samples of relatively corrupt countries.

[2]Agriculture and industry value added in percent of GDP; real per capita income; and trade (exports plus imports in percent of GDP)

Columns (1) to (6) in Table 5 report the regression results corresponding to these three regression techniques. The results are weaker than the baseline results; in particular, the PCSE results yield, as expected, larger standard errors. In general, the results still suggest that loans are associated with higher domestic revenue mobilization while grants are associated with lower tax effort. A doubling of the current average level of grants, for example, is associated with a 0.35 percent of GDP decline in revenue. It also implies that for

each additional dollar of aid in the form of grants, about 10 percent is offset by reduced revenues.

It might again be argued that some heterogeneity exists in the relationship between foreign aid and revenue effort, depending on the existing level of rent seeking. To allow for this possibility, we run the serial correlation-corrected regressions using the sub-sample of relatively corrupt countries. The results indicate that the inflows of grants have a bigger, negative impact on revenues in countries with weak institutions. The positive impact of loans on grants mitigates this to some extent, but the impact is statistically insignificant among the most corrupt countries. The level of corruption in itself is also associated with lower revenue effort.

The coefficient estimates suggest that a doubling of grants as a share of GDP is associated with a 1.3 percentage point decline in revenues in percent of GDP among the relatively corrupt countries and as much as a 3.8 percentage point decrease in revenues among the most corrupt countries. This means that the additional inflow of grants, whether from an overall increase of foreign aid from donor countries or from a conversion of loans into grants, may be completely offset by reduced domestic revenues in countries where institutions are weakest.

Table 5. Foreign Aid and Domestic Revenue: Accounting for Serial Correlation
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

	FGLS Common AR1 (1)	FGLS Panel specific AR1 (2)	Baltagi-Wu Estimator (3)	Baltagi-Wu Estimator (4)	Panel-Corrected Standard Errors Common AR1 (5)	Panel-Corrected Standard Errors Panel specific AR1 (6)
Loan	0.005**	0.006**	0.004	0.004	0.006*	0.006*
	(2.08)	(2.27)	(1.48)	(1.53)	(1.67)	(1.83)
$(Loan)^2$	-0.00005	-0.00005	-0.00003	-0.00003	-0.00006	-0.00006
	(-0.60)	(-0.57)	(-0.35)	(-0.37)	(-0.80)	(-0.72)
Grant	-0.007**	-0.008***	-0.007**	-0.007***	-0.007	-0.008*
	(-2.28)	(-2.77)	(-2.21)	(-2.23)	(-1.37)	(-1.70)
$(Grant)^2$	0.0004***	0.0004***	0.0004***	0.0004***	0.0004***	0.0004**
	(6.20)	(6.70)	(5.38)	(5.48)	(2.57)	(2.68)
Inflation	-0.00001*	-0.00001*	-0.00001	-0.00001	-0.000002	-0.000001
	(-1.98)	(-1.96)	(-1.18)	(-1.21)	(-0.12)	(-0.05)
Foreign debt (in percent of GDP)	-0.0007***	-0.0008***	-0.00086***	-0.0008***	-0.0006**	-0.0007**
	(-5.40)	(-6.72)	(-5.66)	(-5.65)	(-2.17)	(-2.59)
Dummy for oil exporter	0.26*	0.20**	0.17	0.24*	0.25	-0.002
	(1.82)	(2.00)	(1.22)	(1.73)	(1.17)	(-0.02)
Corruption (ICRG)	-0.22***	-0.19***	-0.11**	-0.11**	-0.21*	-0.28***
	(-3.73)	(-5.72)	(-2.14)	(-2.12)	(-1.89)	(-6.12)
Other control variables[1]	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	No	No	Yes	No	No	No
Country dummies	Yes	Yes	No	No	Yes	Yes
Adjusted r-squared/R-squared			0.37	0.31	0.88	0.97
F-statistic/Wald chi-square	3286.53	6347.99	287.42	315.26	30790.82	78554.14
P-value	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	1426	1426	1426	1426	1426	1426
Number of groups	74	74	74	74	74	74

Source: See text.
(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1] Agriculture and industry value added in percent of GDP; real per capita income; and trade (exports plus imports in percent of GDP).

Table 6. Foreign Aid and Domestic Revenue: Accounting for Serial Correlation with Sub-Sample of Corrupt Countries[1]
(T-statistics in parentheses; dependent variable is the log revenue in percent of GDP)

	FGLS (Panel Specific AR1)		Baltagi-Wu		Panel Corrected Standard Errors (Panel Specific AR1)	
	Lower Half (1)	Lowest Quartile (2)	Lower Half (1)	Lowest Quartile (2)	Lower Half (3)	Lowest Quartile (4)
Loan	0.013***	0.009	0.007*	-0.004	0.011***	0.009
	(3.70)	(1.41)	(1.77)	(-0.60)	(2.88)	(1.38)
(Loan)²	-0.0002**	0.0004	-0.0001	0.001**	-0.0002***	0.0004
	(-2.51)	(1.30)	(-0.98)	(2.40)	(2.10)	(0.94)
Grant	-0.036***	-0.083***	-0.022***	-0.052***	-0.046***	-0.084***
	(-6.26)	(-8.57)	(-3.02)	(-3.56)	(-4.92)	(-7.04)
(Grant)²	0.002***	0.003***	0.001***	0.001***	0.002***	0.003
	(11.44)	(13.83)	(4.82)	(4.55)	(5.64)	(10.42)
Inflation	0.00005	0.0004***	0.00006	0.0003*	0.0001	0.0004***
	(0.63)	(4.21)	(0.52)	(1.82)	(1.21)	(4.43)
Dummy for oil exporter	-0.029	-0.12	0.38*	0.79**	0.12	1.52***
	(-0.32)	(-0.77)	(1.72)	(2.18)	(0.63)	(6.41)
Foreign debt (in percent of GDP)	-0.001***	-0.0007*	-0.001***	-0.001**	-0.0006*	-0.00008
	(-3.78)	(-1.65)	(-2.85)	(-2.09)	(-1.76)	(-0.15)
Corruption (ICRG)	-0.47***	-0.23**	-0.13	0.14	-1.06***	-1.35***
	(-6.27)	(-2.37)	(-1.27)	(-0.59)	(-15.12)	(-13.96)
Other control variables[2]	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted r-squared/R-squared			0.27	0.16	0.98	0.97
F-statistic/Wald chi-square	5832.83	63000.66	146.73	85.90	443385.80	1310000
P-value	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	657	253	657	253	657	253
Number of groups	37	18	37	18	37	18

Source: See text.

(***), (**), and (*) denote significance at the 1, 5, and 10 percent levels, respectively.

[1] The sub-samples are based on the ICRG index of corruption, averaged over the 1984-2000 period. The lower half and lowest quartile refer to sub-samples of relatively corrupt countries.

[2] Agriculture and industry value added in percent of GDP; real per capita income; and trade (exports plus imports in percent of GDP).

V. CONCLUSION AND POLICY IMPLICATIONS

To meet the Millennium Development Goals (MDGs), including cutting global poverty in half by 2015, donor countries have been called upon to meet the goal of allocating 0.7 percent of their GNP for official development assistance. Some recent initiatives have called for a shifting of foreign aid away from loans to grants while increasing overall assistance to developing countries. Such an initiative could have important fiscal consequences.

This paper examines the revenue response to inflows of foreign aid in 107 countries during 1970–2000. In particular, it investigates whether the impact of aid on the revenue effort depends on the composition of aid, that is, grants vis-à-vis loans. The results indicate that concessional loans are generally associated with higher domestic revenue mobilization, while grants have the opposite effect. The results are robust to various specifications. The results

also indicate that foreign aid is non-linearly related to domestic revenue and its impact is influenced by the level of corruption.

These results have important policy implications. The efforts to increase the provision of grants to developing countries, as well as the proposal to convert concessional loans into grants, may lower revenue effort. This effect varies greatly, however, depending on the level of corruption in the country. For the sample as a whole, the effect is modest; a doubling of grants from an average of about 4 percent of GDP to 8 percent of GDP could decrease revenues by just 0.4 percentage points of GDP. In countries plagued with high levels of corruption, our empirical results suggest that any increase in aid would be fully offset by reduced revenue effort. Thus, grants to these countries cannot be expected to increase the aggregate amount of resources available to finance government expenditure. Loans, on the other hand, do not suffer from this drawback. If higher ODA targets are achieved by increased tax effort in industrial countries, falling revenue-to-GDP ratios in recipient countries would shift the burden of taxation to donor countries.

Whether the decline in domestic revenues prompted by higher aid facilitates or retards a country's development will depend on each country's circumstances. In some countries, the dampening effect of aid on revenues could be part of a strategy to return resources to the private sector to accelerate economic growth. In these cases, it would be important that the reduction in the tax burden is realized through measures that improve the efficiency of the tax system (e.g., through a reduction in tax rates), rather than reduced efforts to ensure tax compliance. In many other countries, however, additional foreign aid is needed to supplement domestic revenues and help finance well-targeted poverty-reducing outlays (e.g., in primary education and basic health) to help meet the MDGs. However, the conclusions of this paper suggest that in countries with high levels of corruption, higher aid will fail in reaching this objective, unless accompanied by offsetting measures to protect the revenue effort in recipient countries.

Traditionally, donors have imposed conditions on the expenditure side on how their resources could be utilized, without taking into account the impact of assistance on revenues. For example, debt relief under the Enhanced HIPC Initiative is meant for spending on programs that reduce poverty. A similar type of requirement could be considered for the revenue side, particularly if the share of grants in aid flows is increased. Donors could impose and then monitor certain thresholds for domestic revenues to ensure that aid-receiving countries do not scale back their efforts to generate resources for poverty reduction and to reduce aid dependence.

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Appendix Table 1. Countries Included in the Sample

Albania	Cyprus	Lebanon	Sierra Leone
Algeria	Dominican Republic	Lesotho	Singapore
Argentina	Ecuador	Madagascar	South Africa
Azerbaijan	Egypt	Malawi	Sri Lanka
Bahrain	El Salvador	Malaysia	St. Kitts and Nevis
Bangladesh	Ethiopia	Mali	St. Lucia
Barbados	Fiji	Malta	St. Vincent & Grens.
Belize	Gabon	Mauritania	Sudan
Benin	Gambia, The	Mauritius	Suriname
Bhutan	Georgia	Mexico	Swaziland
Bolivia	Ghana	Mongolia	Syrian Arab Republic
Botswana	Grenada	Morocco	Thailand
Brazil	Guatemala	Namibia	Togo
Burkina Faso	Guinea	Nepal	Tonga
Burundi	Guinea-Bissau	Nicaragua	Trinidad and Tobago
Cameroon	Guyana	Niger	Tunisia
Central African Rep.	Honduras	Nigeria	Turkey
Chad	India	Oman	Uganda
Chile	Indonesia	Pakistan	United Arab Emirates
China	Iran, I.R. of	Panama	Uruguay
Colombia	Jamaica	Papua New Guinea	Vanuatu
Comoros	Jordan	Paraguay	Venezuela, República
Congo, Dem. Rep. of	Kazakhstan	Peru	Bolivariana de
Congo, Rep. of	Kenya	Philippines	Vietnam
Costa Rica	Korea, Republic of	Rwanda	Yemen, Republic of
Côte d'Ivoire	Kuwait	Senegal	Zambia
Croatia	Kyrgyz Republic	Seychelles	Zimbabwe

Appendix Table 2. Summary Statistics for Selected Variables, 1970–2000[1]

Variable	Mean	Std. Dev.	Min	Max
Net Foreign Aid (in percent of GDP)	5.6	7.5	-0.5	58.7
Loans (in percent of GDP)	1.5	2.6	-8.6	43.5
Grants (in percent of GDP)	4.0	5.8	0.0	52.5
Domestic Revenue (in percent if GDP)	21.6	10.4	0.1	91.3
Real GDP per capita	2392.1	3671.2	84.7	37841.2

[1]The summary statistics cover a common sample of 107 countries with 1,943 observations based on the baseline specification.