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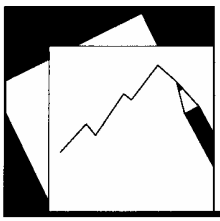

IMF Working Paper

Grants Versus Loans

Tito Cordella and Hulya Ulku

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Grants Versus Loans

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Abstract

Under what conditions should grants be preferred to loans? To answer this question, we present a simple model à la Krugman (1988) and show that, for any given level of developmental assistance, the optimal degree of loan concessionality is positively associated with economic growth if countries are poor, have bad policies, and high debt obligations. We then test our model by estimating a modified growth model for a panel of developing countries, and find evidence supporting our predictions. Finally, we assess the determinants of current aid allocations and find that the degree of concessionality is negatively correlated with countries' levels of development.

JEL Classification Numbers: F35, H63, O40

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I. INTRODUCTION

In July 2001, President George W. Bush, endorsing a recommendation made by the Meltzer (2000) Commission, proposed that the World Bank and other development agencies replace up to 50 percent of their future lending with grants. According to then U.S. Treasury Secretary Paul O' Neill, the "more-grants-less-loans" philosophy was justified by the belief that the World Bank, by lending instead of donating funds to fight poverty, had driven poor countries "into a ditch."[2] The endorsement created a serious divide between the United States and European donor countries. The U.K. minister for international development, in particular, dubbed the proposal "crazy," arguing that it was an attempt "to wreck" the World Bank's lending programs by depleting the amount of resources available for fighting poverty and promoting growth.[3]

If international (as well as domestic) political considerations brought the grants versus loans debate into the limelight, they unfortunately overshadowed economic considerations. Indeed, many questions remain unresolved. Does the way in which aid is delivered matter in fostering development and growth? Is there any trade-off donors (or recipients) should be aware of? Should the composition of aid flows be tailored according to recipients' characteristics? Should good policies be rewarded with more grants or with more loans?

In spite of the large media coverage of the grants versus loans debate, to our knowledge there has been no attempt to either answer these questions with the help of a clear-cut model, or to assess empirically whether the degree of aid concessionality affects aid recipients' growth outcome. To fill such a gap, in this paper we: (i) provide a very simple model that underscores some of the basic trade-offs, and sheds some light on the conditions under which loans are more (less) effective than grants in fostering growth; (ii) estimate a modified growth model to test the predictions of the model; and (iii) provide some evidence on the actual composition of aid flows.

To meaningfully compare grants and loans, we look at the composition of aid flows for any given level of developmental assistance. In doing so, we implicitly agree with Lerrick and Meltzer (2002) who point out that, "If the same level of assistance is maintained, grants cannot cost more than loans."[4] Indeed, for a given amount of assistance, it is the degree of concessionality that determines the size of the loan.

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[2]See "Treasury Chief Accuses World Bank of Harming Poor Countries," by J. Kahn, *The New York Times*, February 21, 2002. For a more complete discussion of the original proposal and the following debate, see Sanford (2002).

[3]See quotes by Clare Short, then UK International Development secretary, in "IMF Awaits Confrontation," by D. Schepp, *BBC News*, April 16, 2002 (available via the Internet at http://news.bbc.co.uk/2/hi/business/1933690.stm). A compromise between the United States and Europe was finally reached on June 15, 2002 at the Halifax meeting of the G-7 finance ministers when it was agreed that 18-21 percent of future aid would be grants rather than loans.

[4]The fact that we agree with Lerrick and Meltzer (2002) on this point does not imply that we agree with their claim that grants are always better than loans.

In our set-up, donors are altruistic,[5] and their resources are limited. The best they can do (to foster growth) is to offer recipient countries the largest loan they are willing to service. The size of the latter is positively correlated with the quality of policies and institutions in the recipient country. Countries with good policies are indeed able to absorb larger volumes of international assistance, and thus to put larger aid flows to work. Countries with bad policies have instead low absorptive capacity.[6] Analogously, the cost of servicing a large loan, and thus the incentives for defaulting on it, is larger in highly indebted and poor countries.

Building upon these intuitions, the main results of our theoretical analysis are that the level of loan concessionality that maximizes growth: (i) is negatively correlated with the quality of a recipient country's policy and institutions; (ii) decreases with the level of initial income, (iii) and increases with the existing debt obligations.

In the empirical part of this paper, we modify a standard growth regression by including a measure of concessionality that we interact with a policy index,[7] with per capita GDP, and with a measure of indebtedness. The results of our regressions lend empirical backing to the predictions of the model. Indeed, once we control for absolute levels of developmental assistance, the degree of loan concessionality is positively associated with per capita GDP growth in countries with a poor political/institutional environment, poor fiscal stance, and lower development level. On the contrary, countries with better policies (or just richer) seem to be able to absorb effectively larger aid flows.

While our framework builds upon the "old" sovereign debt literature à la Cohen and Sachs (1986) and Krugman (1988), the spirit of the analysis is closer to the recent theoretical literature on aid effectiveness in the presence of conflicts between donors' and recipients' objectives.[8] The main lesson we can derive from this relatively new literature is that incentives matter (Easterly, 2002). If this is the case, the way in which aid is disbursed also matters, and donors should tailor their assistance according to each recipient countries' characteristics. In this respect, the grant versus loan analysis of this paper complements Cordella and Dell'Ariccia (2003) who focus on the trade-off between budget support and project aid in fostering development and growth.

As we previously noted, the economic literature on aid concessionality is surprisingly underdeveloped. To our knowledge, the most comprehensive paper on the issue is Odedokun (2004) who provides a broad overview of the main issues at stake and examines whether the degree of loan concessionality affects recipient countries' borrowing patterns and budgetary discipline.

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[5]This assumption is not meant to be realistic, and is discussed in the final section.

[6]Notice that by absorptive capacity we only mean the capacity to serve a loan.

[7]In the spirit of (among others) Burnside and Dollar (2000), Hansen and Tarp (2001), Collier and Dollar (2002), and Easterly and others (2003).

[8]See, inter alia, Murshed and Sen (1995), Svensson (2000), Azam and Laffont (2003), Federico (2001), and Cordella and Dell'Ariccia (2002).

The remainder of the paper is organized as follows: the next section presents the model and discusses the empirical implications. Section III provides an empirical test of the latter and looks at the actual patterns of concessionality, and Section IV concludes.

II. THE MODEL

In order to assess the more effective way of delivering of concessional assistance, we develop a stylized framework in which a donor is willing to transfer a fixed amount of resources, $\overline{A}$, to assist a developing country (the recipient hereinafter). The donor's choice is between grants, loans or any combination of the two. Without any loss of generality, we assume that the donor chooses between a continuum of loan packages with different degrees of concessionality attached. Of course, for a fixed amount of assistance, the degree of concessionality is inversely correlated to the size of the loan: lower concessionality implies larger loans; higher concessionality smaller loans. Normalizing the donor's discount factor to zero, and assuming (for the moment being) that the recipient always pays back the loans it receives, the donor is willing to offer the recipient any aid package $\{L, c\}$, such that

$$\{L, c \,\big|\, cL \geq \overline{A}\} \,, \tag{1}$$

where L is the amount of the loan, and $c \in (0, 1)$ is the degree of loan concessionality, that is, the fraction of the loan that the recipient does not have to pay back. If $c \to 0$, the loan ($L \to \infty$) is non concessional, while if $c = 1$, the loan ($L = \overline{A}$) is a grant, that is, it is fully concessional.

In what follows, we assume that without developmental aid the recipient's production is equal to $\overline{y}$, while a loan L yields (gross) returns zL. Following Krugman (1988), we denote by z, $z \in R^+$, a choice variable capturing the contribution of aid recipient country's adjustment effort to production (per unit of investment). We also assume that the cost of adjustment per unit of input is given by $\frac{\alpha}{2}z^2$, where the parameter α denotes the *exogenous* quality of the overall political/institutional environment. High values of α are indeed associated with a deterioration of such an environment and (see below) with a decrease in the *endogenous* adjustment effort z. Total production in the recipient country is then given by

$$Y = \overline{y} + zL; \tag{2}$$

and the recipient's objective function by

$$U = \overline{y} + L(z - \frac{\alpha}{2}z^2) - \min\{\gamma Y; (1 - c)L + D\}, \tag{3}$$

where γY, $\gamma \in (0, 1)$, denotes the maximum amount of debt that the recipient is able (willing) to pay, $(1 - c)L$ the recipient's obligations vis à vis the donor, and D denotes other existing repayment obligations.

Following the sovereign debt literature, γY can be thought of as the costs of default, that, as in Cohen and Sachs (1986), is assumed to be a constant fraction of output.[9] Accordingly, the country will repay the debt as long as the cost of repaying it, $(1-c)L + D$, is smaller than the cost of default. Without great loss of generality, and in order to simplify the analysis, we work under the assumption that[10]

$$\alpha > \gamma > \frac{D - A}{\overline{y}}. \tag{A1}$$

Assume now that the donor offers a loan of size $L = \frac{\overline{A}}{c}$, and the recipient chooses z to maximize (3). It then follows that:

Lemma 1 *There is a level of loan concessionality c^*, $c^* \in (0,1)$), such that: If $c < c^*$, the recipient chooses a level of adjustment effort $\hat{z} = \frac{1-\gamma}{a}$, and defaults on its debt; if instead $c \geq c^*$, the recipient chooses a level of adjustment effort $\hat{z} = \frac{1}{a}$, and repays its debt.*

Proof: In Appendix

If we assume that the donor's objective is to maximize the recipient's consumption (or growth, that we can define as $Y - \overline{y}$) under the constraint (1), using Lemma 1, and without any loss of generality, we can restrict our attention to loan packages $L = \frac{\overline{A}}{c}$ with a degree of concessionality $\tilde{c} \geq c^*$. Indeed, any loan package with a lower degree of concessionality would not be repaid by the recipient, and thus it would violate the donor's resource constraint. Formally, the problem of the donor can then be written as:

$$\underset{\tilde{c} \in [c^*,1]}{Max}\ \overline{y} + z(\tilde{c})\frac{\overline{A}}{\tilde{c}} - (1-c)\frac{\overline{A}}{\tilde{c}} - D,$$

with $z(\tilde{c}) = \frac{1}{\alpha}$. It then follows that:

Proposition 1 *The optimal degree of loan concessionality is given by $c = c^*$. (i) It is higher in countries with a bad policy environment (high values of α, low values of z); (ii) It decrease with the level of initial production $\overline{y}$; (iii) and with other existing repayment obligations (D).*

Proof: In Appendix.

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[9] This would be the case if the cost of defaulting was conducive to trade sanctions or to other forms of isolation (e.g., financial autarky).

[10] This condition ensures that the optimal level of concessionality, c^*, introduced below, and defined precisely in the Appendix is positive.

Before seeking to derive more general lessons from the analysis, let's try to grasp the main intuitions within the simple framework we developed. First, one should keep in mind that, for a given amount of resources devoted to developmental assistance, the degree of concessionality determines the size of the loan. Although larger loans yield larger investment opportunities, they also bring larger repayment obligations, and thus higher incentives to eventually default. Following the sovereign debt literature, we worked under the assumption that the cost of defaulting on external obligations is a function of GDP. Thus, a recipient that anticipates a default would also anticipate that part of its GDP would be "confiscated." This implies lower returns from a given level of adjustment effort,[11] and thus lower effort (Lemma 1). Given that the donor's resources are limited, the best it can do is to offer the recipient the larger loan that the latter would find in its self-interest to serve. Lower level of concessionality (larger loans) would not only create the incentives for the recipient to default (and thus violate the donor's resource constraint), but they would also reduce the recipient's adjustment effort. Higher levels of concessionality would just decrease the resources that the donor could make available to the recipient, and thus they will be associated with lower consumption (growth).

We also found that the incentive compatible threshold level of concessionality, c^*, increases with the recipient's adjustment costs that are determined by the quality of the institutional environment. Indeed, if such costs are high enough, the recipient would find in its best interest to default on relatively small loans, and thus decrease its adjustment effort. Should this be the case, then the donor would better increase the grant component of the aid package and doing so create the condition for the recipient to not only repay the debt, but also maintain a high adjustment effort. A high level of other repayment obligations would have the same effects, and the recipient's incentive to default on large (and thus mostly non-concessional) loans would be magnified.[12] In highly indebted countries the donor's choice should thus be tilted towards more concessionality. For analogous reasons, servicing the debt is more costly for poor country which should also receive more concessional aid packages.

A. Testable Implications

If growth in the recipient country is the donor's main objective, our model provides clear testable implications. More precisely, the fact that the amount of concessionality that maximizes growth is higher in countries with a bad political/institutional environment (which leads to low reform effort), in countries with low initial production levels, and high level of fiscal obligations implies that:

Testable Implication 1 *The impact of concessionality on growth should be negative in countries with good policies/institution, and positive otherwise.*

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[11] The marginal returns from adjustment effort are given by $\frac{\partial U}{\partial z} = \frac{\overline{A}}{c}(1-\gamma-\alpha z)$ when the recipient anticipates default, and by $\frac{\partial U}{\partial z} = \frac{\overline{A}}{c}(1-\alpha z)$ when the no default condition is verified (see (A-1), and (A-2), in the Appendix).

[12] In our set-up default is a yes-no decision. We implicitly assume cross default negative pledge clauses that rule out partial defaults.

Testable Implication 2 *The impact of concessionality on growth should be negative in richer countries and positive in poorer ones.*

Testable Implication 3 *The impact of concessionality on growth should be positive in highly indebted countries and negative in less indebted ones.*

III. Empirical Evidence

In this section, we first test the above implications using a modified growth model, and then examine the determinants of donors' actual choice of the degree of concessionality of developmental assistance. We start this section by describing our dataset.

A. Data

The data used in this paper consist of an unbalanced panel of 69 countries and seven 3-year time periods from [1975-1977] to [1993-1995].[13] The dependent variable is the real per capita GDP growth ($Dpcgdp$) calculated as the log difference of per capita real GDP ($Pcgdp$) from Summers and Heston's *Penn World Tables* (PWT.6). Data on effective development assistance (Eda), $Loans$ and $Grants$, are from the World Bank database developed by Chang and others (1999). Eda is there defined as the sum of the grant equivalent of loans and official grants (excluding technical assistance). The grant equivalent of a loan is defined as the difference between the present values of the loan's disbursements and stream of expected debt service payments.[14]

We calculate the degree of concessionality ($Conc$), dividing Eda[15] by official developmental assistance (Oda), that is by the sum of grants and loans. In symbols, $Conc = \frac{Eda}{Oda}$. Throughout the paper, Eda, and Oda are expressed as shares of GDP.

To assess the quality of a country's policies, and institutional framework, following Collier and Dollars (2003), we use the country policy and institutional assessment ($Cpia$) index from the World Bank. This index ranges from 1 to 5, and higher values are associated with a better policy environment.[16]

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[13]See Table A.1 in the Appendix for the list of the countries and the availability of 3 year averaged data. See Table A.2 for the complete list of variables and their sources, and Tables A.3 and A.4 for the summary statistics and correlation coefficients.

[14]Grant equivalent is simply the grant component of the concessional loan. When grant equivalent is expressed as a share of the discounted face value of the loans, it is referred to as grant element. Conversely, loans are calculated by dividing the grant equivalent by grant element.

[15]In the original dataset, because of issues related to calculation of the NPV of external debt, there are cases in which Eda takes negative values (negative concessionality). Since we are interested in concessional aid we decided to drop those observations in our dataset.

[16]The $Cpia$ is a composite measure of the policy environment consisting of 20 equally weighted components divided into four categories: macroeconomic management, structural policies,

Among the remaining variables, the terms of trade index (Tot), the openness variable ($Open$), central government budget balance as share of GDP (*Budget*), the ratio of M2 to GDP ($M2gdp$) and GDP in current US dollars are obtained from the IMF WEO database. Infant mortality data ($Mortality$) are obtained from the World Bank WDI database. Finally, the dummy variable for civil war ($Cwar$) is from Doyle-Sambanis (2000), and the dummy variable for IMF programs (*Imf*) is constructed by the authors.

Finally, in order to deal with the outliers problem in an uncontroversial way we used Hadi (1992) method which identifies multiple outliers in multivariate data,[17] and eliminated 21 observations.[18]

B. Methodology and Results

The main aim of our empirical analysis is that of assessing the effects of loan concessionality on economic growth under different policy environments, per capita income levels, and degrees of indebtedness. With this in mind, we modify a standard growth equation to include the $Conc$ variable, and the following interacted terms: $Polcon$ defined as $Cpia$*$Conc$; $Gdpcon$ defined as $Pcgdp * Conc$; and $Budcon$, defined as *Budget**$Conc$. Regarding the latter variable one may wonder why we decided to use budget surplus instead of the stock of debt. In our sample of developing countries, the problem with debt is that its measures are highly variable both within and across countries because of different debt rescheduling (forgiveness) patterns. Furthermore, it is also likely to reflect past levels of concessionality. In order to (partially) solve for these problems, we decided to use the central government budget balance (*Budget*) that, while less correlated with concessionality, it better reflects the current fiscal stance, and thus aid recipient's repayment capabilities.[19] Our main specification is thus:

$$\begin{aligned} Dpcgdp &= \alpha_0 + \alpha_1 Ingdp_{i,t} + \beta' X_{i,t} + \varphi_0 Eda_{i,t} + \varphi_1 Conc_{i,t} + \\ &\quad + \varphi_2 Polcon_{i,t} + \varphi_3 Gdpcon_{i,t} + \varphi_4 Budcon_{i,t} + \lambda_t + \varepsilon_{i,t} \end{aligned} \tag{4}$$

where $Ingdp$ denotes the logarithm of per capita GDP in the first year of the three year period, $X_{i,t}$ is a vector of country controls including $Cpia$, Eda, *Budget*, $M2gdp$, $Open$, $Mortality$, and Tot; regional dummies,[20] as well as the *Imf* and $Cwar$ dummies. λ_t denotes time fixed

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policies for social inclusion, public sector management and institutions. The latest $Cpia$ data are available (albeit not publicly) from 1977 until 1995 for 76 countries. For more details, see Collier and Dollar (2002).

[17] More precisely, we used the hadimvo routine in STATA8, and identified outliers with respect to our variables of main interest ($Pc\Delta gdp$, Eda, $Conc$, $Cpia$,*Budget*) at the standard 5 percent level cutoff.

[18] Our results with and without outliers are very similar. Accordingly, we decided to present only the latter.

[19] Notice that the difference between stock (debt) and flow (budget) variables is a blurry one in our main econometric specification in which we combine in a system the regressions in differences with the regressions in level (see below).

[20] For Sub-Saharian Africa (Ssa) and $Asia$. We also introduce a $HIPC$ dummy, for the Heavily

effects. The inclusion of $M2gdp$ allows us to control for levels of financial development, (infant) $Mortality$ for the quality of health services, Tot, for the intensity and vulnerability of countries to exogenous shocks. This specification allows us to test whether it is indeed the case that the degree of concessionality is negatively associated with economic growth in countries with good policy environment ($\varphi_2 < 0$), higher development level ($\varphi_3 < 0$), and good fiscal position ($\varphi_4 < 0$).

The estimation of (4) poses several econometric problems, including omitted variables bias, the possible endogeneity of some of the explanatory variables, among which $Conc$, and its interacted terms. In order to partially address this latter problem, in all our regressions we lag our right hand variables by one period. This also allows us to better focus on the longer-run effects of changes of the economic environment on growth, and to fully acknowledge that the effect of concessionality on growth are necessarily lagged. In fact —as long as one does not think that Ricardian equivalence holds perfectly— the degree of concessionality should matter less for economic growth at the time a loan is disbursed than at the (future) time in which it has (eventually) to be repaid.

The results of our OLS regressions are summarized in Table 1, columns 1-5. The coefficient of Eda is not significant in any of the regressions, while the coefficient of $Conc$ is positive and significant when the the $Polcon$, and $Budcon$ interacted terms enter in the regressions. As expected, the $Cpia$ coefficient is positive and highly significant in all regressions, showing that good policies and the quality of institutions do matter for growth. The three interacted terms have always the expected sign, and two out of three ($Polcon$, and $Gdpcon$) are significant both when alone and when all interacted terms are used as regressors (column 5).

While the OLS estimations provide support to the predictions of our model, the recent empirical literature on growth has stressed the advantage of using dynamic panel techniques.[21] First, they allow to control for unobserved (or omitted) country-specific factors reducing the potential bias in the estimated coefficients. Second, they can control for the potential endogeneity of some of the explanatory variables by using their lagged values as instruments.

Following the latest literature (e.g., Beck and Levine (2002)), we employed the GMM system estimator proposed by Arellano and Bover (1995) which combines regressions in differences with regressions in level.[22] More precisely, lagged levels of the variables are used as instrument for the equation in difference, and lagged differences of the variables as instruments for the equations in levels. The choice of this estimator is motivated by the fact that the standard Arellano and Bond (1991) difference estimator is known to have large finite sample bias and poor precision.

Indebted Poor Countries.

[21] See, for example, Levine et al. (2000), Beck et al. (2000), and Hansen and Tarp (2001).

[22] In particular, we used the xtabond2 Stata routine developed by David Roodman.

Indeed, as shown in Blundell and Bond's (1998) Monte Carlo simulations, when the number of time series observations is moderately small, as it is in our case, there are dramatic efficiency gains in using a system rather than a difference estimator.

To avoid making discretionary choices in choosing the set of instruments, we included in the matrix of instruments the whole set of regressors,[23] and we treated them as predetermined variables.[24] The results of our system GMM regressions are summarized in Table 2.[25] Unlike in the OLS framework, now the Eda coefficient is significant in all the regressions and is negative in sign. However, in our specification, aid affects growth through different channels, and the fact that the Eda coefficient is negative does not imply that the overall effect of aid on growth is negative. Indeed, from Table 2, column 5, the derivative of growth on aid[26] is given by

$$\frac{\partial Pc\Delta gdp}{\partial Eda} = \varphi_0 + \frac{\varphi_1}{Oda} + \frac{\varphi_2 Cpia}{Oda} + \frac{\varphi_3 Budget}{Oda} + \frac{\varphi_4 Pcgdp}{Oda}, \tag{5}$$

and at the average values[27] of $Cpia$, $Budget$, Oda and $Pcgdp$ is positive (and equal to 0.89).

The coefficients of $Cpia$, $Open$, and $Mortality$, have all the expected sign (positive) and are significant. The $Conc$ coefficient is always positive and highly significant when $Polcon$, and/or $Gdpcon$ enter in the regressions. When we look at the interacted terms, they all have the right sign, they are significant when alone, and two out of three ($Polcon$, and $Gdpcon$) remain highly significant when all interacted terms enter in the regression.

In order to get a better sense of how the effect of concessionality on growth depends upon policies and economic factors, in Table 3 we compute the estimated first derivatives of growth with respect to $Conc$ at the sample average value of $Cpia$, and $Pcgdp$, and one standard deviation above and below the mean.[28] Indeed, we find that though in poor countries with bad policies the derivative of concessionality on growth is positive, the latter becomes negative as policies improve and percapita income levels increase.

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[23] With the exception of the interacted terms, to allow for comparability.

[24] Remember that our regressors are lagged by one period. Thus, the instrument for those variables are lagged by two period. This is the standard way of treating endogenous variables.

[25] Two assumptions must be satisfied for this estimator to be consistent. First, the original errors should not be serially correlated with each other and with the regressors. In order to address these issues we run a Sargan test of overidentifying restriction, and we then test for second order autocorrelation in the error term.

[26] Remembering that $Conc \equiv \frac{Eda}{Oda}$.

[27] See Table A.3 in the Appendix.

[28] In order to avoid making a decision on the significance of the $Budcon$ coefficient, we estimated the derivative of growth with respect to concessionality assuming a zero budget deficit. We would have obtained the same qualitative results, had we estimated the effect of growth on concessionality at the sample average value of $Budget$.

In the above analysis, we used interacted terms to test the theoretical insights of our model. While this approach is standard in the literature, the robustness of our findings can be checked by running the main regressions splitting the sample between rich and poor countries, countries with good and bad policies, and countries with large and small budget deficits. Table 4 reports the results of such exercise.

In line with our previous findings, the coefficient for concessionality is positive and significant in countries with relatively bad policies ($Cpia$ below the median) and insignificant (and smaller in value) in countries with relatively good policies ($Cpia$ above the median). The same is true for countries with large and small budget deficits. As for the samples with poor and rich countries, the concessionality coefficient is not significant in either samples. However, in the sample with low per capita GDP, the coefficient is larger in absolute values and borderline significant at the ten percent level. The fact that the effects of concessionality on growth are different in different samples provides further evidence that the effect of concessionality on economic growth does depend on aid recipient countries' characteristics.

The main caveat with the previous exercise is that by removing all interacted terms we changed the model specification. In particular, one may wonder whether our results would hold true if the interacted terms for the "other" variables (other than the one according to which we split the sample) enter as regressors. That this is the case is shown in Table 5. Notice that in order to see how concessionality affects growth, one should (performing the same exercise as in Table 3) take into consideration the (sub)sample values of the other variables. The estimated derivative of growth with respect to concessionality at the average (sub)sample values of the other variables are reported in the table and confirm our previous findings. Again, we find that concessionality matters more for growth in poor countries with bad policies and a precarious fiscal stance. Finally, it is worth pointing out that the interacted terms always keep the right sign, and are generally significant even in these smaller samples.

As a second robustness test, we reestimated our main equation using the two-step variant of the Arellano and Bover estimator.[29] Table 6 reports these results that are similar to the one obtained with the one-step estimator.

Summing up the main results of this section: Using data from a large sample of aid recipient countries for the period 1975-1995, we have found a quite convincing evidence that the effect of the degree of loan concessionality on economic growth depends on aid recipient countries' characteristics. Furthermore, in line with the predictions of our model, a high degree of loan concessionality improves aid effectiveness in highly indebted poor countries with a bad policy environment. This result holds true in different specifications of the econometric model and is robust to different estimation techniques.

[29]To deal with the fact that the two-step estimator produces standard errors that are downward biased in small sample, we used the Windmeijer (2000) correction.

C. Concessionality Patterns

In this last part of the paper, we look at the determinants of the degree of concessionality in developmental assistance, and ask whether donors take into consideration the quality of policy, the level of GDP per capita, and measures of indebtedness when deciding on the grants loans mix. More precisely, we run a regression similar to the previous ones, substituting concessionality to GDP growth as a left hand variable. Our econometric specification is thus:

$$Conc = \gamma_0 + \gamma_1 Eda_{i,t} + \delta' X_{i,t} + \psi_1 Pcgdp_{i,t} + \psi_2 Budget_{i,t} + \psi_3 Cpia_{i,t} + \lambda + \mu_t + \varepsilon_{i,t} \quad (6)$$

where the $X_{i,t}$ is a vector of controls including Tot, $Open$, $M2gdp$, $Mortality$, Tot, Imf, $Cwar$; the vector λ refers regional dummies or country fixed effects, μ_t denotes time effects.

Our results are summarized in Table 7. Column 1 presents the estimate of the determinants of the degree of concessionality with regional but not country fixed effects. Controlling for the level of effective assistance, we find that (as expected) concessionality is negatively correlated with $Open$ and term of trade shocks, and positively correlated with the $Mortality$ index. Regarding our variables of interest, we find that $Conc$ is negatively correlated with $Pcgdp$, and with the *Budget* variable. Instead, the $Cpia$ index does not influence the degree of concessionality. This actually is not particularly surprising since a country's score on the $Cpia$ index positively affects World Bank's highly concessional IDA allocations.

However, when we estimate equation (6) introducing country fixed effects to take into account of possible omitted variable bias (see column 2) only per capita GDP remains significant. This result raises some doubts on whether it is really the case that donors optimally choose to how to disburse aid according to recipient countries' characteristics. Thus one might wonder whether those geopolitical considerations that explain to whom aid is given[30] might also explain how it is allocated between grants and loans.

IV. Conclusions

There is no doubt that the political economy (or the politics) of international development has played a major role in shaping the grants versus loans controversy. Under such circumstances, it is not surprising that the Sherlock Holmes' dog that did not bark was economic analysis. To break such silence, we developed a simple analytical framework to understand the main trade-offs that could guide the choice of the "right" amount of concessionality in development assistance. This helped us to derive clear testable implications, which steered our empirical analysis, and allowed us to better understand the conditions under which more (or less) concessional aid flows are conducive to better economic performance.

[30]See, among other, Frey and Shneider (1986) or Alesina and Dollar (2000).

This paper's first message is that to compare grants and loans meaningfully one should keep the amount of assistance as fixed. This highlights a basic trade-off: more concessionality means less repayment obligations but also less resources available for donors to offer to recipient countries.

As soon as one focuses on this basic trade-off, he or she immediately realizes that neither of the "corner situations" (all grant or all loans) should a priori be the most desirable outcome, and that the optimal mix of grants and loans should depend on the very characteristics of a country. In this paper, we put emphasis on the quality of policies, the accumulated debt burden, and the level of development. Of course, there are several other channels through which the level of concessionality may affect economic performance.

We are aware that our analysis has many other limitations. For instance, we assumed that donors are altruistic, and that they only care about economic growth. Both these assumptions can easily be challenged, and few would disagree with Alesina and Dollar (2000) who find that aid patterns are dictated by political and strategic considerations, or with Alesina and Weder (2003) who find that donor governments differ substantially in their degree of altruism. However, the fact that donors are not all altruistic does not undermine our main empirical results. Indeed our analysis underscores the fact that the way in which aid is disbursed matters, and this is independent of why it is disbursed.

The question of whether economic growth is the right metric on which to measure the success of aid is a more difficult one. It could very well be argued that some donors are more interested in improving access to basic health or education, or more generally in fighting poverty, than in promoting growth per se. Unfortunately, data on health and education are at best incomplete, and data on poverty are difficult to collect and compare. However, one can build upon Dollar and Kraay (2000) who show that, in developing countries, per capita income for the poor grows one for one with aggregate per capita income. This in turns implies that per capita growth could be used as a proxy for poverty reduction and allows us to argue that our measure of success is highly correlated with the latter.

Finally, we have to recognize that throughout our analysis we kept the amount of assistance as given, and doing so, we explicitly avoided dealing with the problem of how to allocate assistance efficiently across different countries. Also, we didn't look at how aid was disbursed, and thus at whether the policy environment affected the allocation of aid flows between budget support, project aid, and other forms of assistance. Furthermore, we only looked at official aid flows, and thus we are unable to say much on whether the effectiveness of aid flows mediated by NGOs follows the same patterns as official aid.

With these caveats in minds, and recognizing that, despite all our efforts, results from cross-country regressions will (and probably should) always be taken with a grain of salt, we think that this paper provides quite convincing evidence that good policies allow countries to effectively absorb more resources, while high levels of indebtedness, or high poverty levels, have the opposite effect. These findings have important policy implications.

First, it is crucial to link the amount of concessionality to the quality of the policy environment. This does not imply that countries with bad policies should be "rewarded" with more grant. It just means that once the optimal allocation of developmental assistance has been decided across countries, countries with bad policies should be offered less, but more concessional resources. This would also make it easier to deliver aid through NGOs, bypassing the "corrupt" recipient country governments, and would help punish them without punishing innocent citizens (who are already likely to suffer from the bad policy environment).

Second, the amount of loan concessionality should depend upon the overall level of indebtedness of a country, and more indebted countries should receive more concessional aid flows. As in the previous case, this does not imply that by implementing such a policy the donor community would reward highly indebted countries with more grants. The opposite is still more likely to be true. In fact, policymakers are more likely to put a higher weight on resources they do control (the current ones) rather than on those they might control (the future ones) should they remain in power. In other words we think that had they the choice between a large loan and a small grant, they would go for the former.

Finally, the grants versus loan choice is an easy one for the poorest countries. Providing them with larger (but less concessional aid packages) could negatively affect both their current growth performance and the future one through the accumulation of a stock of eventually unsustainable debt. This view is gaining increasing popularity and has shaped some of the features of the Heavily Indebted Poor Countries (HIPC) program. The donor community has in fact stipulated that any new HIPC borrowing (after debt relief is granted) should be on highly concessional terms and preferably in the form of grants. This would avoid repeating the mistakes of the past when large loans left poor countries poor *and* indebted.

Table 1. OLS Regressions
Dependent Variable: Per Capita GDP Growth (Dpcgdp)

	(1)	(2)	(3)	(4)	(5)
	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp
Ingdp	-0.006	-0.009	-0.007	0.020	0.014
	(0.82)	(1.17)	(0.89)	(1.55)	(1.09)
Eda_1	-0.130	-0.075	-0.163	-0.262	-0.216
	(0.73)	(0.42)	(0.92)	(1.42)	(1.19)
Cpia_1	0.016	0.036	0.016	0.016	0.033
	(3.99)***	(4.28)***	(4.06)***	(4.08)***	(3.79)***
Conc_1	0.021	0.159	0.008	0.118	0.210
	(1.03)	(2.66)***	(0.37)	(3.00)***	(3.11)***
Budget_1	-0.025	-0.011	0.102	-0.024	0.058
	(0.55)	(0.25)	(0.91)	(0.55)	(0.50)
Open_1	0.009	0.011	0.010	0.015	0.015
	(1.33)	(1.50)	(1.43)	(2.10)**	(2.20)**
M2gdp_1	-0.012	-0.011	-0.014	-0.006	-0.008
	(0.64)	(0.64)	(0.77)	(0.37)	(0.48)
Mortality_1	-0.050	-0.077	-0.060	-0.103	-0.123
	(0.62)	(0.95)	(0.75)	(1.29)	(1.52)
Tot_1	0.008	0.008	0.008	0.007	0.007
	(1.63)	(1.65)*	(1.75)*	(1.37)	(1.50)
Imf_1	-0.005	-0.005	-0.005	-0.007	-0.006
	(1.07)	(0.94)	(0.94)	(1.57)	(1.30)
Ciwar_1	0.001	0.002	0.001	0.002	0.003
	(0.10)	(0.38)	(0.14)	(0.36)	(0.58)
Hipc	-0.018	-0.020	-0.018	-0.017	-0.019
	(2.62)***	(2.94)***	(2.60)***	(2.57)**	(2.81)***
Ssa	-0.010	-0.010	-0.010	-0.008	-0.008
	(1.80)*	(1.81)*	(1.72)*	(1.46)	(1.48)
Asia	0.010	0.006	0.010	0.005	0.002
	(1.61)	(0.95)	(1.52)	(0.86)	(0.32)
Polcon_1		-0.048			-0.039
		(2.56)**			(2.17)**
Budcon_1			-0.307		-0.172
			(1.28)		(0.69)
Gdpcon_1				-0.030	-0.025
				(2.94)***	(2.65)***
Constant	0.003	-0.035	0.011	-0.206	-0.201
	(0.04)	(0.53)	(0.16)	(1.98)**	(1.98)**
Observations	358	358	358	358	358
R-squared	0.21	0.24	0.22	0.25	0.26

Notes: Robust t statistics in parentheses.
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.

Table 2. One-Step System GMM Regressions
Dependent Variable: Per Capita GDP Growth (Dpcgdp)

	(1)	(2)	(3)	(4)	(5)
	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp
Ingdp	-0.004	-0.006	-0.006	0.036	0.027
	(0.54)	(0.85)	(0.77)	(3.28)***	(2.32)**
Eda_1	-0.458	-0.355	-0.500	-0.582	-0.506
	(2.35)**	(1.83)*	(2.55)**	(3.04)***	(2.61)***
Cpia_1	0.020	0.046	0.020	0.018	0.038
	(5.54)***	(5.74)***	(5.69)***	(5.16)***	(4.69)***
Conc_1	0.034	0.220	0.008	0.188	0.285
	(1.78)*	(4.05)***	(0.35)	(4.95)***	(4.67)***
Budget_1	-0.053	-0.029	0.198	-0.054	0.096
	(0.98)	(0.55)	(1.32)	(1.04)	(0.66)
Open_1	0.017	0.016	0.017	0.024	0.023
	(2.14)**	(2.11)**	(2.23)**	(3.16)***	(3.00)***
M2gdp_1	0.000	0.005	-0.004	0.001	0.002
	(0.01)	(0.29)	(0.18)	(0.03)	(0.13)
Mortality_1	-0.250	-0.258	-0.268	-0.341	-0.341
	(2.33)**	(2.45)**	(2.49)**	(3.22)***	(3.24)***
Tot_1	0.004	0.005	0.006	0.004	0.005
	(0.90)	(1.02)	(1.20)	(0.90)	(1.15)
Imf_1	-0.005	-0.002	-0.003	-0.009	-0.005
	(0.86)	(0.39)	(0.58)	(1.54)	(0.90)
Ciwar_1	0.012	0.014	0.013	0.011	0.013
	(1.68)*	(2.02)**	(1.79)*	(1.53)	(1.87)*
Polcon_1		-0.066			-0.049
		(3.65)***			(2.70)***
Budcon_1			-0.595		-0.315
			(1.79)*		(0.96)
Gdpcon_1				-0.047	-0.038
				(4.66)***	(3.71)***
Constant	-0.028	-0.092	-0.007	-0.346	-0.327
	(0.44)	(1.40)	(0.11)	(3.74)***	(3.45)***
Observations	358	358	358	358	358
Number of ifs	69	69	69	69	69
Sargan p values[1]	0.19	0.25	0.20	0.28	0.30
AR(2) p values[2]	0.92	0.76	0.79	0.72	0.57

Notes: Absolute value of t statistics in parentheses
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.
1/ H_0 regressors are not correlated with the residuals.
2/ H_0 errors in firsty difference regressions exhibit no second order serial autocorrelation.

Table 3. Cpia/Pcgdp Sensitivity of Concessionality

Values represent the estimated derivative of growth with respect to concessionality for a country (with a balanced budget) at the mean values of Cpia and Pcgdp and one standard deviation below or above the average

	Cpia		
Pcgdp	Mean - SD	Mean	Mean + SD
Mean - SD	0.15	0.12	0.09
Mean	0.07	0.03	-0.00
Mean + SD	-0.02	-0.05	-0.09

Notes: Calculations based on coefficients from Table 2 column 5.

Table 4. Split Sample (No Interactions)
One-Step System GMM Regressions
Dependent Variable: Per Capita GDP Growth (Dpcgdp)

	Cpia< Median	Cpia> Median	Budget< Median	Budget> Median	Pcgdp< Median	Pcgdp> Median
	(1)	(2)	(3)	(4)	(5)	(6)
	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp
Ingdp	-0.007	0.003	0.005	-0.011	0.001	0.006
	(0.83)	(0.43)	(0.78)	(1.41)	(0.14)	(0.59)
Eda_1	-0.422	-0.359	-0.285	-0.384	-0.131	-0.104
	(1.41)	(1.82)*	(1.47)	(1.15)	(0.50)	(0.40)
Cpia_1	0.004	0.017	0.017	0.016	0.010	0.019
	(0.64)	(3.29)***	(3.83)***	(3.62)***	(2.16)**	(4.23)***
Conc_1	0.056	0.033	0.048	0.024	0.048	0.013
	(1.99)**	(1.55)	(2.13)**	(0.95)	(1.58)	(0.57)
Budget_1	-0.037	-0.005	-0.146	0.024	0.071	-0.074
	(0.53)	(0.07)	(2.06)**	(0.28)	(0.99)	(1.23)
Open_1	0.006	-0.003	-0.007	0.013	-0.004	0.012
	(0.61)	(0.39)	(0.87)	(1.34)	(0.43)	(1.44)
M2gdp_1	0.013	0.009	0.009	-0.031	0.084	-0.026
	(0.55)	(0.44)	(0.47)	(1.08)	(2.66)***	(1.35)
Mortality_1	-0.195	-0.041	-0.040	-0.454	-0.243	0.061
	(1.45)	(0.39)	(0.41)	(2.75)***	(2.16)**	(0.44)
Tot_1	0.006	-0.009	0.003	0.011	0.003	-0.005
	(1.08)	(1.16)	(0.62)	(1.63)	(0.67)	(0.52)
Imf_1	-0.006	-0.007	-0.004	-0.008	-0.012	-0.001
	(0.84)	(1.21)	(0.70)	(1.07)	(1.63)	(0.11)
Ciwar_1	0.003	0.005	0.012	0.006	0.014	-0.001
	(0.33)	(0.72)	(1.74)*	(0.68)	(1.82)*	(0.12)
Constant	0.026	-0.058	-0.110	0.077	-0.056	-0.093
	(0.32)	(0.82)	(1.74)*	(0.98)	(0.67)	(1.02)
Observations	177	181	181	177	176	182
Number of ifs	55	56	56	56	38	39
Sargan p values[1]	0.52	0.58	0.11	0.55	0.77	0.82
AR(2) p values[2]	0.68	0.62	0.93	0.95	0.33	0.49

Notes: Absolute value of t statistics in parentheses.
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.
1/ H_0 regressors are not correlated with the residuals.
2/ H_0 errors in firsty difference regressions exhibit no second order serial autocorrelation.

Table 5. Split Sample (Interactions)
One-Step System GMM Regressions
Dependent Variable: Per Capita GDP Growth (Dpcgdp)

	Cpia< Median	Cpia> Median	Budget< Median	Budget> Median	Pcgdp< Median	Pcgdp> Median
	(1)	(2)	(3)	(4)	(5)	(6)
	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp
Ingdp	0.049	0.024	0.040	0.021	-0.003	0.006
	(3.31)***	(2.08)**	(3.40)***	(1.39)	(0.34)	(0.60)
Eda_1	-0.532	-0.415	-0.305	-0.684	-0.201	0.066
	(1.84)*	(2.16)**	(1.60)	(1.93)*	(0.78)	(0.25)
Cpia_1	0.003	0.018	0.024	0.043	0.016	0.039
	(0.40)	(3.61)***	(1.94)*	(4.74)***	(0.76)	(4.86)***
Conc_1	0.251	0.076	0.202	0.367	-0.026	0.186
	(4.52)***	(1.81)*	(2.89)***	(4.82)***	(0.23)	(2.72)***
Budget_1	-0.101	0.238	-0.128	0.047	1.049	0.027
	(0.50)	(1.74)*	(1.86)*	(0.56)	(3.66)***	(0.22)
Open_1	0.011	0.004	0.001	0.028	-0.002	0.014
	(1.10)	(0.44)	(0.08)	(2.81)***	(0.19)	(1.65)
M2gdp_1	0.026	0.001	0.018	-0.056	0.086	-0.024
	(1.11)	(0.03)	(0.99)	(2.05)**	(2.52)**	(1.25)
Mortality_1	-0.303	-0.052	-0.078	-0.476	-0.201	0.065
	(2.33)**	(0.50)	(0.84)	(3.04)***	(1.81)*	(0.48)
Tot_1	0.004	-0.008	0.004	0.009	0.006	-0.003
	(0.80)	(1.12)	(0.93)	(1.37)	(1.18)	(0.34)
Imf_1	-0.010	-0.007	-0.006	-0.005	-0.008	0.001
	(1.39)	(1.28)	(1.09)	(0.80)	(1.13)	(0.21)
Ciwar_1	0.003	0.006	0.012	0.011	0.010	0.002
	(0.37)	(0.75)	(1.78)*	(1.30)	(1.34)	(0.20)
Budcon_1	0.147	-0.642			-1.952	-0.193
	(0.34)	(2.09)**			(3.52)***	(0.62)
Gdpcon_1	-0.067	-0.021	-0.039	-0.036		
	(4.68)***	(2.22)**	(3.69)***	(2.60)**		
Polcon_1			-0.012	-0.075	-0.007	-0.063
			(0.52)	(3.43)***	(0.19)	(2.95)***
Constant	-0.408	-0.228	-0.411	-0.266	0.002	-0.158
	(3.29)***	(2.18)**	(4.20)***	(2.06)**	(0.02)	(1.72)*
∂Dpcgdp/∂Conc[1]	0.10	-0.57	0.08	0.04	0.06	0.01
Observations	177	181	181	177	176	182
Number of ifs	55	56	56	56	38	39
Sargan p val.[2]	0.64	0.52	0.11	0.54	0.83	0.85
AR(2)p values[3]	0.79	0.53	0.92	0.76	0.56	0.45

Notes: Absolute value of t statistics in parentheses
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.
1/ Estimated at the mean (sub)sample values of the other variables.
2/ H_0 regressors are not correlated with the residuals.
3/ H_0 errors in firsty difference regressions exhibit no second order serial autocorrelation.

Table 6. Two-Step System GMM Regressions
Dependent Variable: Per Capita GDP Growth (Dpcgdp)

	(1)	(2)	(3)	(4)	(5)
	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp	Dpcgdp
Ingdp	-0.009	-0.006	-0.013	0.040	0.030
	(0.39)	(0.34)	(0.72)	(1.59)	(1.22)
Eda_1	-0.390	-0.225	-0.214	-0.784	-0.507
	(1.00)	(0.53)	(0.56)	(1.75)*	(1.08)
Cpia_1	0.019	0.054	0.019	0.016	0.039
	(3.43)***	(3.51)***	(3.22)***	(3.05)***	(2.30)**
Conc_1	0.049	0.286	-0.022	0.232	0.325
	(1.12)	(2.96)***	(0.42)	(3.00)***	(3.08)***
Budget_1	-0.086	-0.044	0.596	-0.158	0.243
	(0.69)	(0.44)	(1.84)*	(1.20)	(0.74)
Open_1	0.026	0.030	0.031	0.032	0.032
	(2.17)**	(1.93)*	(2.43)**	(2.04)**	(2.00)**
M2gdp_1	0.007	0.006	0.012	-0.010	0.002
	(0.20)	(0.12)	(0.27)	(0.25)	(0.05)
Mortality_1	-0.411	-0.326	-0.434	-0.436	-0.375
	(1.18)	(1.43)	(1.45)	(1.64)	(1.34)
Tot_1	0.005	0.003	0.001	0.001	0.003
	(0.46)	(0.41)	(0.16)	(0.13)	(0.45)
Imf_1	-0.000	0.004	0.005	-0.005	-0.002
	(0.01)	(0.51)	(0.53)	(0.63)	(0.25)
Ciwar_1	0.006	0.012	0.018	-0.000	0.004
	(0.48)	(0.93)	(1.22)	(0.02)	(0.23)
Polcon_1		-0.087			-0.060
		(3.03)***			(1.85)*
Budcon_1			-1.209		-0.526
			(1.85)*		(0.76)
Gdpcon_1				-0.051	-0.039
				(2.55)**	(1.82)*
Constant	0.007	-0.130	0.056	-0.372	-0.358
	(0.03)	(0.91)	(0.37)	(1.82)*	(1.80)*
Observations	358	358	358	358	358
Number of ifs	69	69	69	69	69
Hansen p values[1]	1.00	1.00	1.00	1.00	1.00
AR(2) p values[2]	0.97	0.78	0.74	0.81	0.62

Notes: Robust z statistics in parentheses (Windmeijer correction).
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.
1/ H_0 regressors are not correlated with the residuals.
2/ H_0 errors in firsty difference regressions exhibit no second order serial autocorrelation.

Table 7. Concessionality Regressions
Dependent Variable: Degree of Concessionality (Conc)

	(1)	(2)
	Conc	Conc
Pcgdp	-0.019	-0.030
	(3.83)***	(3.65)***
Eda	6.329	5.954
	(12.43)***	(11.92)***
Cpia	-0.015	-0.010
	(1.27)	(1.10)
Budget	-0.384	0.064
	(2.96)***	(0.58)
Open	-0.001	-0.000
	(2.12)**	(0.86)
M2gdp	-0.028	0.043
	(0.59)	(0.68)
Mortality	0.410	0.273
	(1.87)*	(0.87)
Tot	-0.023	-0.016
	(1.67)*	(1.32)
Imf	-0.005	-0.010
	(0.34)	(0.83)
Ciwar	0.024	0.007
	(1.44)	(0.47)
Hipc	-0.015	
	(1.04)	
Ssa	0.037	
	(2.62)***	
Asia	0.088	
	(3.89)***	
Constant	0.410	0.451
	(8.13)***	(7.71)***
Observations	420	420
R-squared	0.65	0.39

Notes: Robust t statistics in parentheses
(*) significant at 10 percent, (**) significant at 5 percent, (***) significant at 1 percent.
All Regression include time dummies.

APPENDIX

Proof of Lemma 1: Assume that the country repays its debt. Then, the problem it faces is that of

$$\underset{z}{Max}\ \overline{y} + \frac{\overline{A}}{c}(z - \frac{\alpha}{2}z^2 - 1 + c) - D. \tag{A-1}$$

The F.O.C of the problem yields an optimal level of adjustment effort $\tilde{z} = \frac{1}{\alpha}$. It remains to verify that at $z = \tilde{z}$ the recipient repays its debt. For this to be the case, we need that $\gamma Y(\tilde{z}) \geq (1-c)\frac{\overline{A}}{c} + D$. Substituting the value of $\tilde{z}$ in (2), this condition can be rewritten as $\gamma(\overline{y} + \frac{\overline{A}}{\alpha c})) \geq (1-c)\frac{\overline{A}}{c} + D$, or $c \geq \tilde{c} \equiv \frac{\overline{A}(\alpha-\gamma)}{\alpha(\gamma\overline{y}+\overline{A}-D)}$. Also, using $(A1)$, it is immediate to verify that $0 < \tilde{c} < 1$.Assume now that the country does not repay its debt. Then, the problem it faces is that of

$$\underset{z}{Max}\ \overline{y} + \frac{\overline{A}}{c}(z - \frac{\alpha}{2}z^2) - \gamma(\overline{y} + \frac{\overline{A}}{c}z). \tag{A-2}$$

The F.O.C of the problem yields an optimal level of adjustment effort $\hat{z} = \frac{1-\gamma}{\alpha}$. It remains to verify that at $z = \hat{z}$ the recipient does not repay its debt. For this to be the case, we need that $\gamma Y(\hat{z}) \leq (1-c)\frac{\overline{A}}{c} + D$. This condition can be rewritten as $\gamma(\overline{y} + \frac{\overline{A}(1-\gamma)}{\alpha c}) \leq (1-c)\frac{\overline{A}}{c} + D$, or $c \leq \hat{c} \equiv \frac{\overline{A}(\alpha-(1-\gamma)\gamma))}{\alpha(\gamma\overline{y}+\overline{A}-D)}$.

It is then easy to verify that $\hat{c} > \tilde{c}$. This in turn implies that: (i) for $c \leq \tilde{c}$, $\hat{z}$ is the equilibrium adjustment effort level; (ii) for $c > \hat{c}$, $\tilde{z}$ is the equilibrium adjustment effort level; and (iii) for $c \in [c^*, \hat{c}]$, $\tilde{z}$ and $\hat{z}$ are the two candidate equilibrium adjustment effort levels. To determine which one is indeed the equilibrium, notice that $U(\tilde{z}) = \overline{y} + \overline{A} - D + \frac{\overline{A}(1-2\alpha)}{2\alpha c}, U(\hat{z}) = (1-\gamma)(\overline{y} + \frac{(1-\gamma)\overline{A}}{2\alpha c})$, and $U(\tilde{z}) > U(\hat{z}) \Leftrightarrow c > c^* \equiv \frac{\overline{A}(2(\alpha-\gamma)+\gamma^2)}{2\alpha(\gamma\overline{y}+\overline{A}-D)}$. Finally, it is immediate to verify that $c^* \in [\tilde{c}, \hat{c}]$, so that the optimum level of effort is given by $\hat{z} = \frac{\gamma}{a}$, for $c \in [0, c^*]$, and by $\hat{z} = \frac{1}{a}$, for $c \in [c^*, 1]$.

Proof of Proposition 1: We have to prove that no aid package with a level of concessionality $\mathring{c} > c^*$maximizes the recipient consumption. Assume this is not the case, and consumption is maximized by a loan package $\mathring{L} = \frac{\overline{A}}{\mathring{c}} < L^* = \frac{\overline{A}}{c^*}$. This would yield a level of consumption $Y(\mathring{c}) = \overline{y} + \frac{\overline{A}}{\mathring{c}}(\frac{1}{\alpha} - (1-\mathring{c})) < Y(c^*) = \overline{y} + \frac{\overline{A}}{c^*}(\frac{1}{\alpha} - (1-c^*))$. But such inequality can only hold if $\mathring{c} < c^*$. A contradiction.

The optimal degree of concessionality is then $c^* \equiv \frac{\overline{A}(2(\alpha-\gamma)+\gamma^2)}{2\alpha(\gamma\overline{y}+\overline{A}-D)}$. The remain of the proof follows directly from the fact that $\frac{\partial c^*}{\partial \alpha} = \frac{\overline{A}(2-\gamma)\gamma}{2\alpha^2(\gamma\overline{y}+\overline{A}-D)} > 0$; $\frac{\partial c^*}{\partial D} = \frac{\overline{A}(2(\alpha-\gamma)+\gamma^2)}{2\alpha(\gamma\overline{y}+\overline{A}-D)} > 0$; $\frac{\partial c^*}{\partial \overline{y}} = -\frac{\overline{A}(2(\alpha-\gamma)+\gamma^2)}{2\alpha(\gamma\overline{y}+\overline{A}-D)^2} < 0$.

Table A1. Availability of Three-Year Averaged Data For Each Country[1]

	Country	Code	Dpcgdp	Pcgdp_1	Eda_1	Cpia_1	Conc_1	Budget_1	Open_1	M2gdp_1	Mortality_1	Tot_1	War_1	Imf_1
1	Algeria	DZA	6	6	6	6	6	6	6	6	6	6	6	6
2	Bangladesh	BGD	6	6	6	6	6	6	6	6	6	6	6	6
3	Barbados	BRB	6	6	6	5	6	6	6	6	5	6	6	6
4	Belize	BLZ	4	4	4	4	4	4	4	4	4	4	4	4
5	Benin	BEN	6	6	6	6	6	6	6	6	6	6	6	6
6	Bolivia	BOL	6	6	6	6	6	6	6	6	6	6	6	6
7	Botswana	BWA	6	6	6	6	6	6	6	6	6	6	6	6
8	Burkina Faso	BFA	6	6	6	6	6	6	6	6	6	6	6	6
9	Burundi	BDI	6	6	6	6	6	6	6	6	6	6	6	6
10	Cameroon	CMR	6	6	6	6	6	6	6	6	6	6	6	6
11	Cape Verde	CPV	3	3	3	3	3	3	3	3	3	3	3	3
12	Central African Rep.	CAF	6	6	6	6	6	6	6	6	6	6	6	6
13	Chad	TCD	3	3	3	3	3	3	3	3	3	3	3	3
14	China	CHN	4	4	4	4	4	4	4	4	4	4	4	4
15	Comoros	COM	4	4	4	4	4	4	4	4	4	4	4	4
16	Congo, Republic Of	COG	6	6	6	6	6	6	6	6	6	6	6	6
17	Costa Rica	CRI	5	5	5	5	5	5	5	5	5	5	5	5
18	Dominican Republic	DOM	6	6	6	6	6	6	6	6	6	6	6	6
19	Egypt	EGY	6	6	6	6	6	6	6	6	6	6	6	6
20	El Salvador	SLV	5	5	5	4	5	5	5	5	5	5	5	5
21	Ethiopia	ETH	4	4	4	4	4	4	4	4	4	4	4	4
22	Fiji	FJI	6	6	6	6	6	6	6	6	6	6	6	6
23	Gambia, The	GMB	6	6	6	6	6	6	6	6	6	6	6	6
24	Ghana	GHA	6	6	6	6	6	6	6	6	6	6	6	6
25	Guatemala	GTM	6	6	6	6	6	6	6	6	6	6	6	6
26	Guinea	GIN	1	1	1	1	1	1	1	1	1	1	1	1
27	Guyana	GUY	4	4	4	4	4	4	4	4	4	4	4	4
28	Haiti	HTI	5	5	5	5	5	5	5	5	5	5	5	5
29	Honduras	HND	6	6	6	6	6	6	6	6	6	6	6	6
30	India	IND	6	6	6	6	6	6	6	6	6	6	6	6
31	Indonesia	IDN	6	6	6	6	6	6	6	6	6	6	6	6
32	Jamaica	JAM	6	6	6	6	6	6	6	6	6	6	6	6
33	Jordan	JOR	4	4	4	4	4	4	4	4	4	4	4	4
34	Kenya	KEN	6	6	6	6	6	6	6	6	6	6	6	6
35	Korea	KOR	5	5	5	5	5	5	5	5	3	5	5	5
36	Lesotho	LSO	6	6	6	6	6	6	6	6	6	6	6	6
37	Madagascar	MDG	6	6	6	6	6	6	6	6	6	6	6	6
38	Malawi	MWI	6	6	6	6	6	6	6	6	6	6	6	6
39	Malaysia	MYS	6	6	6	6	6	6	6	6	5	6	6	6
40	Mali	MLI	6	6	6	6	6	6	6	6	6	6	6	6
41	Mauritania	MRT	5	5	5	5	5	5	5	5	5	5	5	5
42	Mauritius	MUS	6	6	6	6	6	6	6	6	6	6	6	6
43	Morocco	MAR	6	6	6	6	6	6	6	6	6	6	6	6
44	Mozambique	MOZ	3	3	3	3	3	3	3	3	3	3	3	3
45	Nepal	NPL	6	6	6	6	6	6	6	6	6	6	6	6

Table A1. Availability of Three-Year Averaged Data For Each Country[1] (continued)

	Country	Code	Dpcgdp	Pcgdp_1	Eda_1	Cpia_1	Conc_1	Budget_1	Open_1	M2gdp_1	Mortality_1	Tot_1	War_1	Imf_1
46	Nicaragua	NIC	6	6	6	6	6	6	6	6	6	6	6	6
47	Niger	NER	6	6	6	6	6	6	6	6	6	6	6	6
48	Nigeria	NGA	3	3	3	3	3	3	3	3	2	3	3	3
49	Pakistan	PAK	6	6	6	6	6	6	6	6	6	6	6	6
50	Panama	PAN	6	6	6	6	6	6	6	6	5	6	6	6
51	Papua New Guinea	PNG	6	6	6	6	6	6	6	6	6	6	6	6
52	Paraguay	PRY	6	6	6	6	6	6	6	6	6	6	6	6
53	Peru	PER	5	5	5	5	5	5	5	5	5	5	5	5
54	Philippines	PHL	6	6	6	6	6	6	6	6	6	6	6	6
55	Romania	ROM	1	1	1	1	1	1	1	1	1	1	1	1
56	Rwanda	RWA	5	5	5	5	5	5	5	5	5	5	5	5
57	Senegal	SEN	6	6	6	6	6	6	6	6	6	6	6	6
58	Sierra Leone	SLE	6	6	6	6	6	6	6	6	6	6	6	6
59	Sri Lanka	LKA	6	6	6	6	6	6	6	6	6	6	6	6
60	Syrian Arab Republic	SYR	4	4	4	3	4	4	4	4	4	4	4	4
61	Tanzania	TZA	2	2	2	2	2	2	2	2	2	2	2	2
62	Togo	TGO	6	6	6	6	6	6	6	6	6	6	6	6
63	Trinidad And Tobago	TTO	3	3	3	3	3	3	3	3	3	3	3	3
64	Tunisia	TUN	6	6	6	6	6	6	6	6	6	6	6	6
65	Turkey	TUR	6	6	6	6	6	6	6	6	6	6	6	6
66	Uganda	UGA	5	5	5	5	5	5	5	5	5	5	5	5
67	Uruguay	URY	3	3	3	3	3	3	3	3	3	3	3	3
68	Zambia	ZMB	5	5	5	5	5	5	5	5	5	5	5	5
69	Zimbabwe	ZWE	5	5	5	5	5	5	5	5	5	5	5	5

1/ The numbers in the table indicate the numbers of periods the data are available for each country. Total numbers of periods are 7. One period is lost because of the use of first lag.

Table A2. List and Sources of Variables

Variable Name	Definitions/Explanations	Source	Variable Codes In the Main Source	Variable Codes in The Tables
Per capita real GDP	Real per capita gross domestic product in 1996 constant (thousand) dollars.	PWT6	RGDPCH	Pcgdp
Per capita GDP growth	Log difference of Pcgdp.	Authors' calculation	_	Dpcgdp
Population	Population in thousands of people (POP).	PWT	POP	Pop
Real GDP	Real gross domestic product in 1996 constant (millions dollars). Computed multplying Pcgdp by Pop.	Authors' calculation	_	Rgdppwt
Log of initial per capita GDP	Natural log of the first year's per capita GDP (RGDPPCH) in the three-year period.	Authors' calculation	_	Lningdp
Unit import price index	Price index (base 1996) for the unit value of the world imports.	IFS	_	Unimpva96
Effective developmental assistance as share of GDP	Present value of total effective development assistance in millions of current $US (EDA) deflated using 1996 unit import price index from IFS and divided by real GDP (Rgdppwt).	Chang-Arias-Serven (1998)	EDA	Eda
Grants	Total grants in millions of current $US (Grants) deflated using 1996 unit import price index from IFS.	Chang-Arias-Serven (1998)	Grants	Grants96
Loans	Present value of total loans in millions current $US (Loans) deflated by using 1996 unit import price index from IFS.	Chang-Arias-Serven (1998)	Loans	Loans96
Official developmental assistance as share of GDP	Sum of Grants96 and Loans96 divided by real GDP (Rgdppwt).	Authors' calculation	_	Oda
Concessionality	Eda divided by Oda.	Authors' calculation	_	Conc

Table A2. List and Sources of Variables (continued)

Variable Name	Definitions/Explanations	Source	Variable Codes In the Main Source	Variable Codes in The Tables
Policy index	World Bank's country policy and institutional assessment index (CPIA).	World Bank (Confidential)	CPIA	Cpia
Budget surplus as share of GDP	Central government balance in percent of GDP (GCB)	WEO (2003)	GCB	Budget
Interaction of concessionality and policy index	Concessionality times Cpia.	Authors' calculation	_	Polcon
Interaction of concessionality and fiscal balance	Concessionality times Budget.	Authors' calculation	_	Budcon
Interaction of concessionality and per capita GDP	Concessionality times Pcgdp.	Authors' calculation	_	Gdpcon
Openness	Exports plus imports as a share of real GDP (OPENK).	PWT6	OPENK	Open
Infant mortality	Infant mortality rate infant (per milion live births)	WDI	SPDYNIMRTIN	Mortality
Broad Money as share of GDP	Broad money as share of GDP (FMB NGDPG).	WEO (2003)	FMB NGDPG	M2gdp
TOT	Terms of trade index for goods and services, based on 1996 prices (TT).	WEO (2003)	TT	Tot
War	Dummy for civil war, takes 1 for war, zero otherwise. Calculated using start and end year of the civil war in JCR_EWARD data.	Doyle-Sambanis (2000)-WB	yrend warstds	Cwar
Imf program	Dummy for IMF program (1 if there is an IMF program)	IMF and authors' calculation	_	Imf

Table A3. Summary Statistics of Variables

Variable	N	Min	Max	Mean	Median	Std Dev.
Dpcgdp	358	-0.13	0.15	0.01	0.01	0.04
Lningdp	358	6.17	9.51	7.68	7.71	0.74
Pcgdp	358	0.47	13.88	2.87	2.25	2.29
Eda	358	0.00	0.08	0.02	0.01	0.02
Oda	358	0.00	0.13	0.03	0.03	0.03
Conc	358	0.03	0.92	0.44	0.48	0.19
Cpia	355	1.00	5.00	2.91	2.93	0.69
Budget	358	-0.26	0.16	-0.05	-0.04	0.05
Open	358	0.15	2.37	0.67	0.58	0.37
Tot	358	0.33	3.91	1.10	1.00	0.38
War	358	0.00	1.00	0.20	0.00	0.38
Imf	358	0.00	1.00	0.56	0.67	0.43
M2gdp	358	0.07	1.24	0.31	0.26	0.17
Mortality	352	0.01	0.19	0.08	0.08	0.04
Budcon	358	-0.12	0.07	-0.02	-0.02	0.02
Polcon	355	0.14	3.41	1.26	1.25	0.60
Gdpcon	358	0.05	7.61	0.99	0.78	0.69
Imf	358	0.00	1.00	0.56	0.67	0.43
Cwar	358	0.00	1.00	0.20	0.00	0.38

Table A4. Correlation Coefficients

	Dpcgdp	Lningdp	Pcgdp	Eda	Oda	Conc	Cpia	Budget	Open	Tot	War	Imf	M2gdp	Mortality	Budcon	Polcon	Gdpcon
Dpcgdp	1.00																
Lningdp	0.15*	1.00															
Pcgdp	0.17*	0.92*	1.00														
Eda	-0.24*	-0.57*	-0.51*	1.00													
Oda	-0.25*	-0.49*	-0.46*	0.95*	1.00												
Conc	-0.18*	-0.71*	-0.66*	0.68*	0.53*	1.00											
Cpia	0.37*	0.27*	0.32*	-0.07*	-0.09*	-0.21*	1.00										
Budget	0.15*	0.22*	0.20*	-0.14*	-0.12*	-0.27*	0.20*	1.00									
Open	0.09	0.28*	0.30*	0.16*	0.27*	-0.12*	0.08	-0.02	1.00								
Tot	-0.01	-0.18*	-0.12*	0.08	0.11*	0.03	-0.08	0.07	0.02	1.00							
War	-0.03	-0.04	-0.08*	-0.12*	-0.17*	0.05	-0.13*	0.00	-0.31*	-0.08	1.00						
Imf	-0.13*	-0.20*	-0.23*	0.17*	0.21*	0.14*	0.02	-0.13*	-0.11*	-0.04	0.09*	1.00					
M2gdp	0.13*	0.45*	0.41*	-0.18*	-0.16*	-0.28*	0.23*	-0.18*	0.33*	-0.03	-0.17*	-0.11*	1.00				
Mortality	-0.19*	-0.79*	-0.71*	0.47*	0.38*	0.57*	-0.35*	-0.18*	-0.28*	0.21*	0.05	0.11*	-0.48*	1.00			
Budcon	0.15*	0.41*	0.38*	-0.32*	-0.24*	-0.55*	0.25*	0.91*	0.03	0.05	-0.02	-0.12*	-0.08	-0.34*	1.00		
Polcon	-0.02	-0.56*	-0.51*	0.65*	0.50*	0.87*	0.27*	-0.15*	-0.07	0.00	0.00	0.17*	-0.17*	0.38*	-0.39*	1.00	
Gdpcon	0.08	0.58*	0.53*	-0.08	-0.11*	0.09*	0.16*	0.03	0.34*	-0.21*	-0.03	-0.18*	0.34*	-0.48*	0.00	0.16*	1.00

Note: (*) significant at 10 percent significance level.

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