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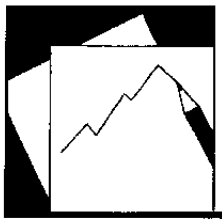

IMF Working Paper

Budget Support Versus Project Aid

Tito Cordella and Giovanni Dell'Ariccia

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Research Department

Budget Support Versus Project Aid

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Abstract

Should donors who are interested in the effectiveness of developmental programs rely on conditional budget support or on project aid? To answer this question, we present a model in which only a subset of the developmental expenditures can be subject to conditionality. We show that budget support is preferable to project aid when donors and recipients' preferences are aligned, and when assistance is small relative to recipients' resources. Then, we test our model estimating a modified growth model for a panel of developing countries, and find evidence in support of our predictions.

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The shift in development thinking from a government-led accumulation strategy to a focus on fundamentals, effectiveness and efficiency [...] requires reorienting the instrument of aid. In particular, it means reconsidering the method of financial assistance (project and program) [...] and how they can be adapted to support the new development strategy (World Bank 1998, p.96)

I. INTRODUCTION

The record of foreign aid in promoting economic development has been, at best, a mixed one. In too many instances, aid just did not work.[2] The donor community, which generally disagrees on the causes of such failures, now seems to agree on one basic principle: aid as such does not foster growth and/or reduce poverty.[3] The success of any development assistance program depends, to a large extent, on the aid recipient country's own policies and priorities. Aid programs should therefore be designed to provide recipient countries with the proper incentives. It follows that the way in which aid is disbursed matters. This is the focus of this study.

Traditionally, donors have provided aid either through the financing of specific projects (project aid), which often involved direct participation in their design and implementation, or through providing support to the recipient government's budget (conditional budget support) while imposing conditionality on how to allocate the available resources. In spite of a large literature on the pros and cons of project aid and budget support, to our knowledge, there has been no attempt to either compare these two instruments in a formal model or to test empirically their relative effectiveness in promoting growth. The contribution of this paper is twofold. First, we present a theoretical model showing that conditional budget support is a better (worse) instrument to foster development than project aid when: (1) recipient governments are relatively more (less) committed to development; (2) aid programs are relatively small (large) with respect to the recipient government's resources. Second, we estimate a modified growth model to test the predictions of our model.

Two main lessons can be drawn from our analysis: First, in the presence of conflicts of interest between donors and recipients, aid policy should be tailored according to the recipient government's characteristics. Second, the distinction between micro and macro policies may be misleading as small aid programs should be part of a broader strategy at the general budget level, and large ones should be implemented through direct project financing.

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[2]As World Bank (1998) candidly recognizes, "If foreign aid has at times been a spectacular success...[it] has also been, at times, an unmitigated failure" (p.1).

[3]There is a quite vast empirical literature supporting such a view. Boone (1996) provides evidence that, on average, aid does not foster growth. Burnside and Dollar (2000) and Collier and Dollar (2002) find that, while in countries with sound economic policies, aid promotes growth, in countries with bad policy environments, aid is dissipated in unproductive government consumption. World Bank (1998) finds that large amounts of aid in countries with a poor policy environment, by delaying reforms implementation, can even potentially reduce growth. For a contrarian view see Hansen and Tarp (2001).

Conditional budget support and project aid have both their own shortcomings when the objectives of donors and recipients are not perfectly aligned. On the one hand, the effectiveness of conditional budget support is limited by the donors' ability to monitor the actual final destination of budget expenses. The need to monitor the recipient's policy effort may force donors to focus on "observable" policy measures, rather than on those measures that would be considered a priority under symmetric information. Then, an inefficiency may emerge if donors are forced to impose higher levels of expenditure for the more controllable components of the budget, because of their inability to monitor the actual final destination of other components.[4] On the other hand, project aid carries the risk of merely crowding out developmental expenditure that the recipient government would have undertaken in the absence of the donor's intervention (the widely recognized fungibility problem).[5] Therefore, as such, it does not eliminate the problem of aid misplacement.

We analyze these issues in a model where the donor's only concern is the effective implementation of developmental programs,[6] while the recipient government obtains utility both from the realization of such programs and from other nondevelopmental-oriented expenses. We assume that the donor can provide budget support, but that only a subset of the expenses destined to the "production " of developmental programs can be subject to conditionality. Alternatively, the donor may opt for project aid and have direct control over the allocation of aid funds, but by doing so it loses the ability to affect the overall allocation of resources.

We find that the relative effectiveness of these two forms of aid depends on the size of the aid program (relative to the recipient government's own resources) and on the degree of misalignment between the objectives of donors and recipients (which could be interpreted as a measure of "lack of program ownership"). In particular, we show that budget support is preferable to project aid when total aid is small relative to the recipient's own resources, while project aid is superior for relatively large programs. In addition, project aid is preferable to budget support when the preferences of the donor and those of the recipient government are relatively far apart.

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[4]Conditionality in international lending is a widely discussed and controversial issue. Sachs (1989) provides a critical assessment of IFIs' conditionality in the context of international debt crises. Killick (1997) focuses on the difficulties of properly enforcing conditionality, while Collier and others (1997) analyze how the imposition of increasingly detailed conditions may create serious incentive problems. The idea that excessive conditionality, by absorbing an excessive amount of scarce domestic resources (such as administrative capacity), can be distortionary is also made by Berg (1997). Cordella and Dell'Ariccia (2002) examine the limits of conditionality with observable and unobservable recipients' types.

[5]The problem of aid fungibility is discussed at length in World Bank (1998), Pack and Pack (1993), Khilji and Zampelli (1994), Feyzioglu and others (1998), Devarajan and Swaroop (1998), and Lahiri and Raimondos-Moller (2000).

[6]In what follows, as standard in the recent theoretical literature on aid (see Svensson (2000), Azam and Laffont (2001), Federico (2001)) we focus on a single and fully altruistic donor. These assumptions are not meant to be realistic and are discussed in greater detail in the concluding section. See also Mayer and Mourmouras (2002).

The intuition for these results is the following. Aid flows associated with project aid are fungible only to the extent that the recipient government is able to reallocate its own budget resources away from similar projects. Hence, aid fungibility is high for small projects but decreases with the magnitude of the aid program.[7] At the same time, it increases with the recipient's commitment to developmental policies, as more development-friendly governments allocate a larger share of their resources to developmental projects. On the contrary, the distortions involved with conditional budget support do not increase with the size of the program and do decrease with the developmental commitment of the recipient government.

In the empirical section, we follow recent work by Burnside and Dollar (2000) and Collier and Dollar (2002) who modify a standard growth regression by including a measure of foreign aid interacted with a policy index. We build on their work by separating aid into its budget support and project financing components, and by allowing their coefficients, and the coefficients of their interaction with the policy index to differ. The results of these regressions lend empirical support to the predictions of our model that the interaction between aid and policy is not the same for project financing and budget support. First, as in our model, the relationship between growth and budget support is more sensitive to the policy environment than that between growth and project financing. Second, there are indications that budget support is more (less) effective than project financing when macroeconomic policies are relatively good (poor). Finally, the data suggest that the effectiveness of project aid tends to be less policy dependent when foreign aid is large relative to the recipient's own resources.

This paper relates to the growing, but still limited, theoretical literature on the effectiveness of aid in the presence of strategic interaction between donors and recipient governments.[8] Murshed and Sen (1995) study aid negotiations where donors care about a reduction of military spending in the recipient country. They focus on multiple and heterogeneous donors or on donors with multiple and conflicting objectives. Our focus is, instead, on the conflict between donors and recipients and the heterogeneity is on the recipients' side. Svensson (2000) studies the strategic interaction between a donor and two recipients in a model in which the preferences of donors' and recipients' are not perfectly aligned, and where the effectiveness of poverty alleviation programs depends on a nonverifiable implementation effort on the part of the recipient. Our set-up shares some of the key features of Svensson's; however, the focus of the analysis is different. In fact, while our interest is in designing an ex-ante optimal aid contract, which depends on the characteristics of recipient governments, in Svensson, recipients are ex ante identical, and the main problem the donor faces is one of commitment.[9] The focus on ex-ante full-commitment contracts links our paper to Azam and Laffont (2003) who study the characteristics of incentive-compatible aid contracts, but assume complete contracts (perfect monitoring).

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[7]This is consistent with the evidence in Pack and Pack (1993) who find that "the more important foreign aid as a source of public resources [...], the more likely are the recipients to reflect donor's intentions" (p.264).

[8]See Drazen (2000).

[9]Federico (2001) studies the optimal level of conditionality under limited donor's commitment.

In addition to the previously cited work focusing on the relationship between aid effectiveness and macroeconomic policies,[10] recent empirical literature has studied how and why aid is allocated across recipient countries. Alesina and Dollar (2000) find evidence that aid patterns are dictated by political and strategic considerations, and that donor governments differ substantially in their degree of altruism. Consistently, Collier and Dollar (2002) find that the actual allocation of aid is not efficient from a poverty-reduction point of view.

The remainder of the paper is organized as follows: the next section presents the model and discusses some possible extension; Section 3 is devoted to our empirical analysis. Section 4 discusses the limits of our framework and concludes.

II. THE MODEL

We consider a stylized framework in which the international community (the donor, from now on) is willing to finance aid programs that increase the resources a developing country government (the recipient, from now on) can devote to activities that the donor cherishes. We denote by G the recipient's tax revenue, and by A, the amount of aid which, we assume to be fixed. The recipient (denoted by subscript R) devotes its budgetary resources to developmental and non developmental consumption. In particular, we assume that it maximizes the following additively separable objective function:

$$U_R = \alpha V(s) + (1-\alpha)V(m), \tag{1}$$

where s denotes consumption of a good that the donor cherishes, a developmental good (for instance, social programs such as poverty alleviation, primary education, access to safe water, or for the sake of simplicity "growth"), m denotes the consumption of goods that the recipient values but the donor does not (e.g., military expenses), and $\alpha \in [0,1]$ the recipient's "developmental preferences."[11] The developmental good is produced out of two inputs: capital, k, which is observable and verifiable by the donor, and a nonobservable input, e, for example, administrative and managerial outlays, and other costly supportive policies. The idea is that the donor cannot observe the allocation of such outlays between expenses for the production of the social good and expenses on activities favored by the recipient. The donor can, instead, observe total non capital expenses, $z = e + m$.[12] We also assume that the developmental good production function, $s = s(k,e)$, is symmetric in its arguments, i.e., $s(x,y) = s(y,x)$, linear homogenous,[13] twice continuously differentiable, and that, $s(0,y) = 0$, $s_x(\cdot) > 0$, $s_{xx}(\cdot) < 0$, and $s_{xy}(\cdot) > 0$. We

[10]See also Isham and Kaufmann (1999) who show that the productivity of investments depends crucially on the presence of undistorted macroeconomic policies.

[11]The assumption of substantial heterogeneity in recipients' preferences is hardly a controversial one. For example, according to World Bank data for 1997, the ratio of health to military expenditure in highly indebted poor countries (HIPCs) varied from the 0.13 of Vietnam to the 4.3 of Guyana.

[12]For simplicity we assume that all prices are equal to 1.

[13]The symmetry assumption is not essential for our main results, but substantially simplifies the

further assume that[14] $V(0) = 0$, $V'(\cdot) > 0$, $\lim_{x \to 0} V'(x) = \infty$, $V''(\cdot) < 0$, and that the government runs a balanced budget, both in the case in which aid is granted and in the case in which it is not, that is,

$$k + z \leq G + \delta A, \text{ with} \tag{2}$$

$$\delta = \begin{cases} 1, & \text{if aid is granted;} \\ 0, & \text{otherwise.} \end{cases}$$

We are interested in the case where the donor's and the recipient's preferences on budget allocations differ. In particular, we consider a situation where the donor, if in power, would choose, for any budget, a consumption of the developmental good higher than that chosen by the recipient.[15] For simplicity, we assume that the donor only cares about the success of developmental programs so that its objective function may be written as

$$W = s(k, e). \tag{3}$$

In what follows, we first characterize the effect of aid in the absence of any form of conditionality. Then, we briefly discuss the characteristics of the "optimal" aid contract when all the components of the developmental programs are observable and contractible upon, and then analyze the more interesting (and realistic case) in which the donor is unable to contract upon some of the actions of the recipient. Finally, we discuss the project aid case in which the donor decides to directly finance projects or provide resources to implementing agents, such as NGOs, that share its same objectives, and compare this case with conditional budget support.

A. Unconditional Budget Support

In the absence of conditionality, the government will allocate resources to maximize its objective function (1) subject to the budget constraint (2). After substituting (2) into (1), the problem of a recipient of type α, with $\alpha \in [0, 1)$ can be written as[16]

$$\underset{k,e}{Max} \ [\alpha V(s(k,e)) + (1-\alpha)V(G + \delta A - k - e)]. \tag{4}$$

Since the technology for the production of the developmental good is convex and symmetric in the two inputs, in equilibrium, the recipient government allocates an equal amount of resources to

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math. The linear homogeneity assumption is only necessary for a nonarbitrary comparison between program and project aid, see below.

[14]We loosely indicate with V' the first derivative of V with respect to any of its arguments, and with V'' the second derivative.

[15]Our analysis hinges upon the fact that the objective function of the donor and those of the recipient differ. Our analysis would carry through if the donor cared about military expenses and the recipient about development programs.

[16]For a recipient of type $\alpha = 1$, the problem should be written as $\underset{k}{Max} \ [V(s(k, G + \delta A - k))]$.

the capital and the managerial component of developmental expenditure. The solution of problem (4) is given by $k^* = e^*$, with

$$k^* = \{\mathbf{x} : \alpha V'(s(\mathbf{x}))s'(\mathbf{x}) - (1-\alpha)V'(G + \delta A - 2x) = 0\}, \tag{5}$$

where $\mathbf{x} = (x, x)$.

If $\delta = 0$, the solution of problem (4) gives the values k^{NA} and e^{NA} that the recipient government would choose in absence of aid, with NA denoting the no-aid scenario. This also identifies the recipient's reservation utility that can be written as

$$U^{NA}(\alpha) = \alpha V(s(k^{NA}, e^{NA})) + (1-\alpha)V(G - k^{NA} - e^{NA}). \tag{6}$$

When, instead, $\delta = 1$, the solution of problem (4) yields the capital and managerial expenditure chosen by the recipient when aid is granted but no conditionality is imposed, which we denote by k^{NC} and e^{NC}, respectively. Finally, from a simple inspection of (5) it is evident that aid increases the amount of resources that the recipient is willing to devote to developmental spending, that is,

$$s(k^{NC}, e^{NC}) \geq s(k^{NA}, e^{NA}), \tag{7}$$

with the strict inequality for $\alpha > 0$. However, for any $\alpha < 1$, the objectives of the recipient and those of the donor are not perfectly aligned and the latter should be able to obtain a larger production of the developmental good by imposing conditionality when granting aid.

B. Conditional Budget Support

Should the donor have control over all the components of developmental spending in the recipient country or should it be able to contract on both capital and managerial expenditures, then the first best would be implementable. The optimal contract would be one that maximizes the donor's utility (3) subject to the individual rationality constraint (IR) of the recipient. Then, at the equilibrium, k and e would be efficiently chosen to yield the highest level of production of the developmental good for which the recipient is exactly as well off as in the absence of aid.

In what follows, we consider the more reasonable and interesting case in which the donor can only observe, and make aid disbursement conditional upon, the capital component of developmental programs, k, and thus the recipient is free to choose any non-negative amount for the other component, e. This means that the donor will have to take into account the response of the recipient when setting conditionality on k.

Admittedly, in the real world, conditionality is much more complex than setting a minimum level on some budget component. For example, conditionality may come in the form of the implementation of banking reforms and transparency laws, or the application of labor or environmental standards. Nevertheless, since implementing such reforms involves non-monitorable activities by recipient governments, an inefficiency may emerge as reform design needs to focus on what is monitorable rather than what is needed. In Stiglitz's words:

conditionality may involve "the subordination of matters of substance to matters of process."[17]

Returning to the model, for any fixed level of $k > k^{NC}$, the recipient will set the unobserved component e of developmental spending so that

$$\widehat{e}(k) = \arg\max_{e}[\alpha V(s(k,e)) + (1-\alpha)V(G+A-k-e)],$$

and the problem of the donor becomes

$$\begin{array}{c} \max_{k} W = s(k, \widehat{e}(k)) \\ s.t. \\ \alpha V(s(k, \widehat{e}(k))) + (1-\alpha)V(G+A-k-\widehat{e}(k)) \geq U^{NA}(\alpha), \end{array} \tag{8}$$

where the last expression is the IR constraint of the recipient. We denote by k^{IR} the value of k for which the IR is exactly binding, that is,

$$k^{IR} \equiv \{k : \alpha V(s(k, \widehat{e}(k))) + (1-\alpha)V(G+A-k-\widehat{e}(k)) = U^{NR}(\alpha)\}.$$

Note that k^{IR} is always increasing in α. To characterize the solution of problem (8) we first prove the following results.

Lemma 1 *(i) Conditionality increases the production of the developmental good: For any $\alpha \in (0,1)$ there exists a $\widetilde{k} \in \left(k^{NC}, k^{IR}\right)$ such that $s(\widetilde{k}, \widehat{e}(\widetilde{k})) > s(k^{NC}, \widehat{e}(k^{NC}))$ (ii) Conditionality results in an inefficiency in the production of the developmental good: For any $k > k^{NC}$, $\widehat{e}(k) < k$.*

Proof. See Appendix.

The previous lemma shows that even if some components of the budget cannot be contracted upon, the donor can generally strictly improve on aid effectiveness by imposing conditionality on the contractible component of developmental spending. However, *conditionality imposes a distortion in the allocation of the resources devoted to the production of the developmental good.* In fact, the efficient allocation of resources is one where $k = e$. Then, since for any $k > k^{NC}$, $\widehat{e}(k) < k$, both the donor and the recipient would be better off if it were possible to contract upon e and to reallocate part of the developmental spending from its capital component to its managerial component.

We are now able to characterize the optimal level of conditionality that the donor would impose upon a recipient government of type α in order to maximize the production of the developmental good. Formally, the optimal level of conditionality $k^{C}(\alpha)$ is given by

$$k^{C}(\alpha) = \min\{k^{IR}; \hat{k}\}, \text{with,}$$

[17] In the context of macrostabilization programs, the choice between inflation targeting and monetary policy approaches based on the explicit targeting of some observable intermediate objectives provides a good example of the problem.

$$\hat{k} \equiv \arg\max_{k} \; s(k, \widehat{e}(k)).$$

$\hat{k}$ can be interpreted as the level of conditionality the donor would choose if it were to disregard the recipient's IR constraint, and thus it is the optimal amount of conditionality when the IR constraint is slack. Of course, when the recipient's IR constraint is binding the maximum level of conditionality that the donor is able to impose is given by k^{IR}.

C. Project Aid

One obvious alternative to budget support and its shortcomings is project aid. With project aid we refer to a situation where the donor is fully in control of all the inputs required in the production of some portion of the developmental good. One typical example of this kind of aid is the realization of large public infrastructures. Another, is the financing of a number of different small projects, implemented directly the donor, by NGOs, local communities, etc. By assuming that the donor (or its agents) are in full control of the projects, we implicitly assume that through project financing it is possible to avoid that aid funds are diverted by the recipient. Of course, this is not necessarily the case, and there are several instances in which funds intended for project have indeed been diverted. However, it is our conjecture that fund diversion is easier under budget support than under project financing. This milder condition is what we need for our results to hold. Accordingly, the above assumption has to be interpreted in a relative sense.

Project aid has its own shortcomings: unlike for budget support, with project aid donors have no control over the overall allocation of resources. Then, nothing prevents recipients from reallocating their own resources away from the developmental sector once projects are financed. As an example, a government that would have allocated resources to build a school may decide to use the resources elsewhere, if donors decide to build the school themselves. This issue is generally known as the aid "fungibility" problem and has been largely analyzed in the literature.

In what follows, after computing the level of production of the developmental good associated with project aid, we compare it with the level associated with conditional budget support. In order to make the results comparable with those in the previous section we assume that a donor is willing to provide the same amount of aid, A, under both schemes. Since the donor is now able to control the implementation of the project, inputs will be chosen efficiently ($k = e$). However, we do not rule out the possibility that "the capital expenditures funded by donor project aid are not perfect substitutes for capital expenditures funded out of government's own domestic budget,"[18] and that there are advantages associated with a holistic approach to aid. We thus assume that, in the case of project financing, the maximum amount of developmental good that can be produced with an amount A of aid is $\lambda s(\mathbf{A}/2)$, where $s(\cdot)$ is the same production function as in the previous section, $\mathbf{A} = (A, A)$, and $\lambda \in (0, 1]$, denotes the degree to which the donor's project fits the overall poverty reduction strategy of the recipient government. Hence, $(1 - \lambda)\, s(\mathbf{A}/2)$ is the cost associated with the potential imperfect fit of the project within the recipient's developmental strategy.

[18] As noted by a senior official of a major aid recipient country.

Under such assumption, the problem of the recipient becomes that of

$$\underset{k,e}{Max}\ [\alpha V(s(k,e)+\lambda s(\mathbf{A}/2))+(1-\alpha)V(G-k-e)]\,, \tag{9}$$

and that the solution of problem (9) is given by $k^A = e^A = y^A$, with

$$\mathbf{y}^A = \max\{0; \mathbf{y} : \alpha V'(s(\mathbf{y})+\lambda s(\mathbf{A}/2))s_{\mathbf{y}}(\mathbf{y}) - (1-\alpha)V'(G-2y) = 0\}\,, \tag{10}$$

where $\mathbf{y} = (y, y)$. We are now in a position to compare the level of production of the developmental good under conditional budget support and project aid. In particular, we can prove that

Proposition 1 *For any $A > 0$ and $\lambda \in (0,1]$: (i) for any $\alpha \in (0,1)$, there is a $\widehat{G} \in [0,\infty)$ such that conditional budget support implements a higher level of production of the developmental good than does project aid if, and only if, the recipient's resources, G, are larger than $\widehat{G}$; (ii) for any $G > 0$, there is an $\widehat{\alpha} \in (0,1)$ such that conditional budget support implements a higher level of production of the developmental good than does project aid if, and only if, the recipient's developmental commitment is such that $\alpha > \widehat{\alpha}$.*

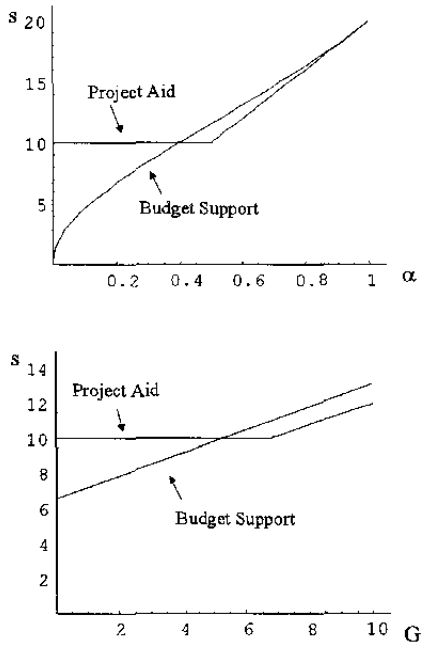
Proof. See Appendix.

Note that $\widehat{G}$ is strictly positive only if the costs associated with the implementation of project financing are small enough (in other words, only for λ large enough). For low values of λ, conditional budget support will be the optimal aid policy for "developmentally committed" recipients, irrespective of the size of their budget.

The intuition for this result is easy to grasp. For small aid programs, the recipient is able to reallocate its budget so to obtain its own preferred allocation of resources. However, when the resources associated with the aid program are large relative to the country's budget, aid fungibility is necessarily limited. Similarly, it is difficult to relocate resources away from developmental spending for countries that would freely dedicate very little of their own budget to such activities. According to Proposition 1, donors should design aid policies that offer budget support (BS) to relatively richer and more developmentally oriented governments and provide project aid (PA) to poorer and less developmentally oriented ones. Figure 1 plots the level of production of the developmental good under conditional budget support and project aid (as a function of α, and as a function of G) for the case of Cobb-Douglas utility, with $\lambda = 1$, and where the parameters A and G are such that the recipient's IR is never binding.[19]

[19]In the Cobb-Douglas case, $\widehat{k} = \frac{A+G}{2}$ for all αs. Hence, for $A \leq G$ the IR is never binding in equilibrium. The figures are plotted for $s(k,e) = 2k^{\frac{1}{2}}e^{\frac{1}{2}}$ and $A = 10$; in the first panel, $G = 10$; in the second panel, $\alpha = 0.6$.

Figure 1.Production of the Developmental Good Under Project Aid and Budget Support



We can complement Proposition 1 with the following results.

Corollary 1 *For any* $A > 0$, *(i) the budget threshold for which* $BS \succ PA$ *is decreasing in* α $(\frac{dG}{d\alpha} < 0)$ *and the developmental commitment threshold for which* $BS \succ PA$ *is decreasing in* G $(\frac{d\alpha}{dG} < 0)$*; (ii) both thresholds are decreasing in* λ, $(\frac{dG}{d\lambda} < 0,$ *and* $\frac{d\alpha}{d\lambda} < 0)$.

Proof. See Appendix.

Again the intuition is straightforward. More developmentally oriented governments will allocate a relatively larger share of its own resources to developmental spending. Hence, for a given amount of aid and its own resources, they will have "more room" to reallocate resources away from developmentally valuable activities. Similarly, for given preferences, richer governments will have relatively more resources to reallocate. Obviously, both thresholds decrease when project aid becomes more efficient.

D. Extensions

The previous analysis helped us to shed some light on the conditions under which a donor, interested in the effective implementation of developmental programs, should rely on conditional budget support or on project aid. The reason why we focused our attention on these two aid instruments is twofold. First, they account for a large share of donor financial assistance.[20] Second, while there is a large literature on the pros and cons of each of such instruments, to our knowledge there is no formal model that allows a comparison of project and program aid in a rigorous way.

[20]The other important component is technical assistance.

Most aid practitioners wouldn't object that the comparison between budget support and project aid is the relevant one. However, from a theoretical point of view, one might argue about why a donor should be limited to the use of these two instruments and should not be able to combine them, making project aid conditional on some policy actions taken by the recipient. Before analyzing the effects of such conditional project aid, we want to stress that such a policy would be difficult to put into practice. This is so for at least two reasons. First, once a donor opts for delivering aid through projects, it is in a much weaker negotiating position with respect to the recipient government. Indeed, it may be difficult to threaten credibly to discontinue a specific project because of violations of unrelated conditionality. For example, it would be hardly credible for a donor to threaten to stop a vaccination program halfway through (or the distribution of food in areas severely affected by a famine) because the recipient refused to carry out some fiscal decentralization measures. This, despite the fact that such measures could be crucial for a successful development strategy. Second, the cases in which the donor prefers project aid are those cases in which it deals with developmentally uncommitted recipient governments. In such situations, it can very well be the case that for political reasons the donor wants to completely bypass the central government and deliver aid directly to certain targeted groups, or use NGOs as implementing agencies.

With the above caveats in mind, let us discuss the extent to which our main findings hold when conditional project aid is an option. In particular, consider the case where the donor makes project aid conditional on a level of capital expenditure k^{CA} on the part of the recipient, where the superscript CA, stands for conditional project aid. Since for any $\alpha > 0$, in the case of project aid, the recipient's IR constraint is slack at $k^{CA} = 0$, the donor cannot be worse off by imposing some conditionality. This in turn implies that, whenever the donor prefers project aid to conditional budget support, with greater reason it also prefers conditional project aid. Thus, the interesting case is the one in which the donor prefers conditional budget support to unconditional project aid. Would this also be the case if the alternative was conditional project aid? In our framework, this depends on the degree of developmental commitment of the recipient government (α) and on the costs associated with the potential imperfect fit of the donor's project within the overall recipient's developmental strategy (λ). In particular, it is easy to show that: (1) for any value of $\lambda \in (0,1)$, for a sufficiently committed government, conditional budget support yields a higher level of production of the developmental good than conditional project aid; (2) For any value of $\alpha \in (0,1)$, if the cost associated with the lack of project ownership are sufficiently large, conditional budget support yields a higher level of production of the developmental good than conditional project aid.[21] This, in turns, implies that most of our main findings are robust to the introduction of more elaborated aid contracts. Even allowing for the imposition of conditional project aid, the trade-offs between program- and project-based poverty reduction strategies remain.[22]

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[21]The proof of such statements is straightforward if one notices that: (1) as long as there are inefficiencies associated with project aid, ($\lambda < 1$), for values of α close to one, conditional budget support yields a higher level of production of the social good than conditional project aid; (2) As long as $\alpha > 0$, for values of λ close to zero, $BS \succ PA$.

[22]One exception is part (i) of Proposition 1. Under conditional project aid, for recipients with low

III. EMPIRICAL EVIDENCE

The effects of conditional budget support on growth and poverty and the issue of aid fungibility in project financing have been studied extensively, but separately, by the existing empirical literature. Indeed, while recent empirical contributions have linked the effectiveness of aid programs to the soundness of the recipient governments' policies, to our knowledge, no study has yet examined how such a relationship is affected by the composition of aid flows.

If growth in the recipient country represents the main donors' objective, our model provides clear testable implications. First, recipient government's policies should affect the effectiveness of foreign aid in promoting growth, but should do so in a different manner for budget support and project financing. Second, budget support should be more (less) effective than project financing in an environment with good (poor) macroeconomic polices; and be more (less) effective than project financing when aid is small (large) relative to the recipient government's own resources.

In this section, we follow the existing work and employ a standard growth equation to test these predictions. In our empirical exercise, we use the methodology and the dataset in Burnside and Dollar (2000), referred to as BD in the text from here on.[23] They first construct a policy index reflecting the contribution of different policy variables to growth. Then, they employ this index in a modified growth regression including foreign aid, and show that while aid alone does not have an average positive effect on growth, it becomes beneficial when associated with a sufficiently good policy environment. Their main finding, confirmed in Collier and Dollar (2002), is that the interacted coefficient of aid with the policy index is indeed positive and significant. In our analysis, we replicate the BD results and then decompose aid into its project and program components. We find that the interacted coefficient of aid with the policy index is different for project and program, and this in a way consistent with the predictions of our model.

The BD dataset is an unbalanced panel of 56 countries and six 4-year time periods from [1970-73] to [1990-1993]. The data include institutional and political variables, and policy proxies like inflation and budget surplus. The dependent variable is the real per capita income growth. We complemented this dataset with series on project financing and budget support from the CRS dataset of the OECD, which reduced the sample to five 4-year periods from [1974–77] to [1990-93], and to 45 countries, for a total of 227 observations. The CRS dataset reports aid data by recipient country and by sector of destination. This allows us to split aid into its project financing and budget support components. Specifically, we classify as budget support the series VI.11 and VI2 defined as "*Non-sector allocable program assistance whose provision is explicitly linked to agreed policy packages, in particular those implementing recommendations made by the World Bank and the IMF*" and "*All actions relating to debt forgiveness, swaps, buy-backs, rescheduling, refinancing,*" respectively. Instead, we classify as project financing all sector-specific aid.

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levels of social commitment (small values of α) project aid can be always preferable to budget support, irrespective of the ammount of their own resources G.

[23]We are very grateful to Craig Burnside and David Dollar for sharing their dataset with us and very kindly answering our queries.

This classification has, of course, some limits. First, unlike in the theoretical model, in reality the line between project and program is a blurry one. In particular, the effectiveness of most projects is likely to depend, in part, on some input from local governments. For example, donors may construct a school or a hospital, but the government is likely to be in charge of building the road leading to them, or of providing them with electricity. Second, while aid classified as budget support is initially released in connection with agreed policy packages, we can assume that its use is subject to conditionality only as long as an IMF/WB program is actually in place. There is little we can do with regard to the first point. Essentially, in the empirical estimation we have to rely on the assumption that the direct contribution of the recipient government to the success of an aid program is more important in budget support than in project financing. The second problem is mitigated by the fact that in the large majority of cases, in our sample, budget support is accompanied by the existence of IMF and/or World Bank structural adjustment programs.

A. Methodology and Results

Following BD's approach, we start constructing the policy index, and define a policy environment "good" or "bad" on the basis of its impact on growth. We use a growth regression without aid terms to estimate the values of the coefficients for the various policy indicators in the index. This approach produces an index where the relative weight of each variable reflects its impact on growth. As in BD, we estimate the following equation:

$$y_{i,t} = \alpha y_{i,t-1} + \gamma' Z_{i,t} + \lambda_t + \varepsilon_{i,t},$$

where $Z_{i,t}$ is BD's vector of policy variables and of country controls. The constant λ is allowed to vary over time. Three policy variables are considered: inflation, budget surplus, and openness (measured by the Sachs Warner index).[24] Country controls include a measure of ethnic fractionalization to reflect conflicts, a measure of violent crime, and its interaction with ethnic fractionalization, a measure of institutional quality, the lagged ratio of M2 to GDP, and dummy variables for East Asia and Sub-Saharan Africa. Results for this regression are in the first column of Table 1. All coefficients have the expected sign, and the coefficients for the policy variables are all significant. As in BD, the most significant variables are institutional quality, the dummy for sub-Saharan Africa, the inflation rate and openness. In our specification, the introduction of a dummy for the presence of an IMF program adds significant explanatory power while the assassination variable and its interaction with ethnic fractionalization lose significance. The policy index can then be constructed using the coefficients from Table 1, column 1, with the constant obtained from the average of the regression constant and time fixed effects. Thus we have:

$$policy = -0.02 - 1.20\ inflation + 6.85\ budgetsurplus + 2.06\ openness.$$

These coefficients are very similar to those in BD, who were able to use an additional period at the beginning of the sample. The inclusion of an AID/GDP term, leaves the policy coefficients virtually unchanged (column 2). Furthermore, its coefficient is very small and statistically insignificant. Allowing for the possible endogeneity of the aid variable, we also ran a two-stage

[24] Similar variables are employed by Isham and Kaufmann (1999).

least square estimation for the same specification (column 3). The results were similar to those obtained in our main regression, and a Hausman test could not reject the consistency of the OLS estimator. In summary, the results in Table 1 confirm the previous findings by BD, Collier and Dollar (2002), and Boone (1996), that on average aid does not have a statistically significant effect on growth.

In order to obtain their main result, BD modifies a standard growth equation to include the policy index, *policy*, and the interaction between *policy* and aid. Here, we diverge from BD and include two interacted terms among the regressors. The first interacted term is the product of *policy* and a measure of budget support. The second interacted term is the product of *policy* and a measure of project financing. Furthermore, as in BD, we allow the relationship between aid, policy, and growth to be nonlinear and include two quadratic interacted terms. Our main specification is then

$$\begin{aligned} y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \varphi_0 BS + \varphi_1 \left(BS \cdot policy\right) + \varphi_2 \left(BS^2 \cdot policy\right) + \\ + \psi_0 PA + \psi_1 \left(PA \cdot policy\right) + \psi_2 \left(PA^2 \cdot policy\right) + \lambda_t + \varepsilon_{i,t}, \end{aligned} \tag{11}$$

where $X_{i,t}$ is a vector of country controls including a dummy variable indicating the existence of an IMF program, a measure of ethnic fractionalization to reflect conflicts, a measure of violent crime, and its interaction with ethnic fractionalization, a measure of institutional quality, the lagged ratio of M2 over GDP, and dummy variables for East Asia and Sub-Saharan Africa.

To reconcile our specification with that in BD it is sufficient to impose the following three linear restrictions: $\varphi_0 = \psi_0$, $\varphi_1 = \psi_1$, and $\varphi_2 = \psi_2$. We do so in Table 2, columns 1-2, which replicate BD's results for our reduced sample. Column 1 confirms that aid, on average, does not have a significant positive effect on aid, while the coefficients in column 2 support the idea that aid has a positive effect on growth when delivered in the context of good macroeconomic policies. The coefficients of both interacted terms are indeed significant, and all other coefficients maintain the same sign as in the original study. As expected, the IMF coefficient, which is a proxy for macroeconomic crises, is significant and negative. According to these estimates the cross-derivative of growth with respect to aid and policy is positive and significant. As in BD, this indicates that there exists a level of policy good enough for aid to have a positive effect on growth.

We now allow budget support and project financing to have a different effect on growth, as in equation (11). Our model predicts the cross-derivative of growth with respect to budget support and policy to be positive, $\varphi_1 + 2\varphi_2 BS > 0$. Instead, we are agnostic about the sign of the cross-derivative of growth with respect to project aid and policy. Indeed, while "better" governments will tend to allocate more resources to development-oriented expenses, they will also find aid more fungible (for any given project size). Our model also predicts that the effectiveness of project financing relative to budget support decreases with the policy index. Then, relative to the first derivative of growth with respect to budget support, the first derivative of growth with respect to project aid should be large for low levels of policy and small for high levels of policy.

The results are summarized in Table 2, columns 3-4. These results confirm the finding of previous papers that aid alone does not have an average positive effect on growth, but it becomes beneficial

when associated with a sufficiently good policy environment. Indeed, neither the coefficient for budget support, nor that for project financing is significant, while the coefficients of the interacted terms, the cross-partial derivatives of growth with respect to BS and *policy*, and with respect to PA and *policy*, are both positive and statistically significant at the 10 percent level.

The evidence in Column 4 supports our theoretical prediction that the nature of the relationship between aid, policy environment, and growth depends on whether aid is delivered as budget support or project financing. Indeed, equality between the coefficients of the PA and BS interacted terms can be rejected at the 10 percent level. The estimated first derivatives of growth with respect to PA and BS (at their average values) are -0.55 and -0.11, respectively, when computed at *policy* equal to -1.38 (one standard deviation below its mean); and become 0.14 and 0.42 respectively, when computed at *policy* equal to 1.19 (one standard deviation above its mean). These differences are consistent with the theoretical prediction that budget support is more (less) effective than project aid when delivered in a good (poor) macroeconomic environment; they are statistically significant at the 20 percent level

Furthermore, as Table 3 shows, the impact of budget support on growth is more policy sensitive than that of project financing. More precisely, at the BS average, the difference between the derivative of growth with respect to BS in a country at the 25th percentile and one at the 75th percentile of the *policy* distribution is about 0.47 percent; the same measure for PA is only 0.16 percent. In addition, this difference is decreasing in the size of aid relative to GDP for PA, in a way that does not find a counterpart in BS. Indeed, if computed at the 25th percentile of the PA distribution, the difference is 0.17 percent and decreases to about 0.1 percent at the 75th percentile. The difference is instead about constant for BS. This is consistent with the prediction of our model that the effectiveness of project financing should tend to be less policy dependent when foreign aid is large relative to the recipient's resources.

B. Robustness

Recent empirical literature on growth has emphasized the merits of using dynamic panel techniques.[25] First, the availability of pooled cross-section and time-series data allows to control for unobserved (or omitted) country-specific effects thus reducing the potential bias in the estimated coefficients. Second, dynamic panel estimator can control for the potential endogeneity of some of the explanatory variables by using their lagged values as instruments. In particular, GMM estimators have been widely used in recent empirical work on growth[26] and are commonly available in standard estimation software.[27]

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[25]See for example, Levine and others(2000), Beck and others (2000), and Hansen and Tarp (2001).

[26]See for example, Caselli and others (1996), Levine and others (2000), Beck and others (2000), and Forbes (2000).

[27]DPD98 for Gauss in our case.

Following the model in Levine and others (2000), we consider the following growth regression:

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)\, y_{i,t-1} + \beta' X_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}, \tag{12}$$

where y is the logarithm of real per capita GDP, X is a set of explanatory variables including the various BS and PA terms, λ is a time-specific effect, and η a country-specific effect. Equation (12) can be rewritten as

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}. \tag{13}$$

The use of country dummies eliminates the potential bias due to unobserved country-specific effects. However, the introduction of country-specific dummies leads to a bias due to the correlation between the error term and the lagged value of y used as a regressor. This bias can be large when the time-series dimension of the sample is small, as in the case of the present study. First-differences equation (13) eliminates the country dummies turning equation (13) into

$$y_{i,t} - y_{i,t-1} = \alpha\left(y_{i,t-1} - y_{i,t-2}\right) + \beta'\left(X_{i,t} - X_{i,t-1}\right) + \left(\lambda_t - \lambda_{t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right).$$

However, this specification has the same bias problem because of the correlation between $\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)$ and $\left(y_{i,t-1} - y_{i,t-2}\right)$. The GMM difference estimator proposed by Arellano and Bond (1991) solves this problem by using lagged levels of the dependent variable and predetermined variables as instruments. Two assumptions must be satisfied for this estimator to be consistent. First, the original errors $\varepsilon_{i,t}$ need not be serially correlated, that is, $E(\varepsilon_{i,t+s}\varepsilon_{i,t-s}) = 0$ for all $s > 0$. Second, the regressor must be predetermined by at least one period, that is, $E(X'_{i,t}\varepsilon_{i,t+s}) = 0$ for all $s > 0$. In what follows, we provide tests of both these assumptions. A more precise estimator proposed by Arellano and Bover (1995) (system GMM estimator) employs a stacked regression in differences and levels, where lagged differences of the explanatory variables are used as instruments in the level equation. This requires the additional restriction $E\left[\left(X'_{i,t-s} - X'_{i,t-s-1}\right)\left(\varepsilon_{i,t} + \eta_i\right)\right] = 0$.

Table 4 reports the results for equation (13) estimated with the difference GMM estimator and the system GMM estimator. Note that in the case of the difference estimator, data requirements reduce the usable sample to 165 observations. In this specification, most coefficients maintain the correct sign, and our main coefficients of interest remain significant. Notably, the regression imposing equality between the coefficients of BS and PA fails to confirm the OLS results (column 1). However, once we allow BS and PA to have different coefficients, we obtain results that, although less precise than our OLS estimates, also indicate that the nature of the relationship between aid, policy and growth depends on how aid is delivered. Indeed, the BS interacted terms maintain the correct sign and are significant with both the system estimator and the difference estimator; while the coefficients for project financing are never significant. It is worth noting that in our case the reduced number of observations makes it difficult to obtain precise estimates with this methodology.

Finally, as a further robustness test, we eliminate four outliers from our regression (Sierra Leone 1986-89, Guyana 1990-93, Gambia 1986-89, and Nicaragua 1990-93). These observations (similarly to what happens in BD) are responsible for the significance of the quadratic term for

BS in the OLS estimations (see Table 5, column 1).[28] The same regression without that quadratic term is a better fit for the data. However, while the coefficients of the PA interacted terms remain significant, the coefficient of the BS interacted term is significant only at the 16 percent level (Table 5 column 2). Finally, it is comforting that once we allow for country fixed effects, in the GMM estimates (see column 3) we find coefficients for the interacted variables that are significant (the interacted BS coefficient actually increases in size) and consistent with the prediction of our model.[29]

IV. Concluding Remarks

According to Easterly (2001), the ultimate reason behind many of the failures of developmental efforts is that aid policies often "did not take the heed of the basic principle of economics: people respond to incentives" (p. 143). From that point of view, developmental assistance is deemed to fail if it does not, at least to some extent, take into account the reaction of recipient governments to foreign aid. Starting from this assumption, we analyzed the relative effectiveness of budget support and project aid, and showed that the relative costs and benefits of these two alternative forms of conveying aid depend upon the social preferences and the relative resources of the recipient. On the one hand, the distortions stemming from the fact that in a budget support program not all recipients' actions are perfectly monitorable decrease as recipients' preferences become closer to those of the donors. On the other hand, aid fungibility in project financing increases with the amount of the recipient's own resources. Then, from the donor's point of view, project aid is preferable for recipients characterized by small amounts of own resources and developmental preferences far apart from those of the donor; budget support is instead preferable for recipients with relatively large own resources and preferences relatively close to those of the donor.

The framework presented in this paper has some limitations. First, we assumed that the donor community only cares about development, and, thus, that its motivations are purely altruistic. In the model, it is only the recipients' "fault," if aid increases unproductive public consumption. Of course, this is not necessarily the case. Indeed, there is some evidence that aid policies have often been motivated by reasons other than poverty alleviation. For instance, Alesina and Dollar (2000) find considerable evidence that aid patterns are dictated by political and strategic considerations, and that donor governments differ substantially in their degree of altruism. In this respect, the flavor of our analysis is more normative than positive: It does not address questions related to the motivations behind actual (or past) aid disbursements; it addresses the question of how aid should be disbursed in order to maximize the donor's objectives – whatever such objective are – provided that they are not perfectly aligned with those of the recipient. This caveat becomes crucial in interpreting our empirical findings. Indeed, it is only to the extent that economic growth in the recipient country is a major concern for the donor that our empirical strategy is meaningful.

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[28]This issue is discussed in detail in Hansen and Tarp (2001).

[29]Note that, in this case, data requirements force us to drop all the observations pertaining to the outlier countries.

A second important point is that by restricting our attention to how to disburse a given amount of aid to one country, we explicitly disregarded the problem of how to allocate aid across different countries (Collier and Dollar, 2002). Also, by assuming a single donor, we abstracted from problems arising in the presence of multiple principals with conflicting objectives, studied by Murshed and Sen (1995), as well as from donors' coordination issues. From that point of view, our analysis is probably more pertinent to developmental aid packages managed by multilateral organizations than to bilateral aid.

Finally, a natural solution to the trade-off between conditional budget support and project aid examined in this paper would be to make aid conditional on the track record of recipient governments. In that context, conditionality would still involve distortions, but only to the extent that the government policies could not be fully evaluated by assessing their results. Such "ex-post" conditionality would, therefore, be more efficient than the one studied in our framework. However, with resource-constrained recipient countries, this ex-post conditionality could potentially lead to a "Catch-22" situation, whereby aid would be disbursed if developmental expenditures were substantially increased, but developmental expenditures could not be increased if aid were not disbursed first. Furthermore, as Svensson (2000) points out, ex-post conditionality would likely be time inconsistent on the donor's part (especially for more altruistic donors), since to deny relief to countries with a bad track record, but in desperate need of aid, would constitute a non credible threat.

The framework developed in this paper could be easily applied to the analysis of debt relief policies. In that context, the general agreement in the donor community is that the benefits of unconditional debt relief in terms of poverty alleviation might be limited, and thus some form of conditionality should be imposed. According to CISDE-Caritas International (1999) "Because not all governments can be counted on to use resources freed through debt relief to invest in the poor and marginalized sectors of society, there is a case for making a strong link between investment in human development and debt cancellation." Our analysis is consistent with that view. Furthermore, as any debt reduction is intrinsically a budget support instrument, and as many indebted countries seem to have preferences far apart from those of the creditor community, the results in this paper suggest that it would be unwise to grant these countries new resources, through debt relief, without also providing them with a system of incentives to guarantee a "proper" allocation of those resources.[30] Our findings also suggest that, in the absence of such system of incentives, creditor countries would do better by focusing on other forms of aid policy.

[30]From this point of view the HIPC initiative seems to be a step in the right direction.

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PROOFS

Proof of Lemma 1

Consider $\alpha \in [0,1)$. (i) Since for any $k > k^{NC}$ conditionality is binding,

$$\frac{\partial U}{\partial k}\Big|_{k>k^{NC},} = \alpha s_k(\cdot)V'(s(k,\widehat{e}(k))) - (1-\alpha)\,V'(G+A-k-\widehat{e}(k)) < 0. \qquad \text{(A-1)}$$

Suppose $\widehat{e}(k) > k^{NC}$. Since $V'(0) > 0$, and $V''(.) < 0$, a necessary condition for $\widehat{e}(k) > k$ is that

$$\frac{\partial U}{\partial e}\Big|_{e(k)=k,}\ \alpha s_e(\cdot)V'(s(k\widehat{e}(k))) - (1-\alpha)\,V'(G+A-k-\widehat{e}(k)) > 0.$$

However, because of the symmetry of the production function, at $e(k) = k > k^{NC}$ the latter expression can be written as

$$\frac{\partial U}{\partial e}\Big|_{e(k)=k>k^{NC}}\ \alpha s_k(\cdot)V'(s\,(k,\widehat{e}(k))) - (1-\alpha)\,V'(G+A-k-\widehat{e}(k)) > 0,$$

which contradicts (A-1).

(ii) Now, consider the best response of the recipient under conditionality:

$$\max_{e}\left[\alpha V(s(k,e)) + (1-\alpha)\,V\,(G+A-k-e)\right],$$

yielding the first order condition[31]

$$\alpha s_e(\cdot)V'(s(k,\widehat{e}\,(k))) - (1-\alpha)\,V'\,(G+A-k-\widehat{e}\,(k)) = 0. \qquad \text{(A-2)}$$

Totally differentiating (A-2), we obtain

$$\frac{d\widehat{e}\,(k)}{dk} = -\frac{\alpha V''(\cdot)s_k(\cdot)s_e(\cdot) + \alpha V'(\cdot)s_{ek}(\cdot) + (1-\alpha)\,V''\,(G+A-k-\widehat{e}\,(k))}{\alpha V''(\cdot)(s_e(\cdot))^2 + \alpha V'(\cdot)s_{ee}(\cdot) + (1-\alpha)\,V''\,(G+A-k-\widehat{e}\,(k))}. \qquad \text{(A-3)}$$

Since, at equilibrium, $\widehat{e}\,(k) \leq k$,then it should be that $s_k(\cdot) \leq s_e(\cdot)$ Hence, since $s_{ek}(\cdot) > s_{ee}(\cdot)$, from (A-3) we have that for $\alpha > 0$,

$$\frac{d\widehat{e}\,(k)}{dk} > -1. \qquad \text{(A-4)}$$

Now consider the donor's first order conditions

$$\frac{d\,(s(\widehat{e}\,(k)\,,k))}{dk} = s_k\,(\cdot) + s_e\,(\cdot)\,\frac{d\widehat{e}\,(k)}{dk} = 0. \qquad \text{(A-5)}$$

[31]Note that the Inada conditions on $V(\cdot)$ guarantee that the first order conditions can always be satisfied for a $k < G + A$, so that a corner solution is excluded.

At k^{NC}, we have $\widehat{e}\left(k^{NC}\right) = k^{NC}$. Hence, from (A-5) it follows that

$$\left.\frac{d\left(s(\widehat{e}\left(k\right),k)\right)}{dk}\right|_{k=k^{NC}} = s_k\left(\cdot\right) + s_e\left(\cdot\right)\frac{d\widehat{e}\left(k\right)}{dk} = s_k\left(\cdot\right)\left(1+\frac{d\widehat{e}\left(k\right)}{dk}\right),$$

which is positive because of (A-4). Hence, a necessary condition for the donor's f.o.c. to be verified is that $\widehat{k} > k^{NC}$. Finally, as for any $A > 0$ the IR constraint is not binding at $k = k^{NC}$, the existence of a $\tilde{k} \in \left(k^{NC}, k^{IR}\right)$, such that $s(\tilde{k}, \widehat{e}(k)) > s(k^{NC}, \widehat{e}(k^{NC}))$, follows directly from a continuity argument. ■

Proof of Proposition 1

First we prove the following lemma

Lemma 2 *(i) For any $\alpha \in (0,1)$, $A > 0$, and $\lambda \in (0,1]$ there is a $\widetilde{G}$ such that for $G > \widetilde{G}$, project aid is not preferred to unconditional budget support. (ii) For any $A > 0$, and $G > 0$, there is a $\widetilde{\alpha}$ such that for $\alpha > \widetilde{\alpha}$, project aid is not preferred to unconditional budget support.*

Proof: Define as $2x_\alpha^{A+G}$ the amount of resources that a government with preferences α and budget $A+G$ would devote to developmental programs. That is

$$\mathbf{x}_\alpha^{A+G} = \{\mathbf{x} : \alpha V'(s(\mathbf{x}))s_{\mathbf{x}}(\mathbf{x}) - (1-\alpha)V'\left(G+A-2x\right) = 0\}$$

where $\mathbf{x}_\alpha^{A+G} = (x_\alpha^{A+G}, x_\alpha^{A+G})$. For any $\alpha \in (0,1)$, and $A > 0$, we have that: for $G = 0$, $x_\alpha^{A+G} < A/2$; for $G \to \infty$, $\lim_{G\to\infty} x_\alpha^{A+G} = \infty > A/2$. Hence, since $\frac{dx_\alpha^{A+G}}{dG} > 0$, there exists a $\widetilde{G}$ such that $x_\alpha^{A+G} > A/2 \Leftrightarrow G > \widetilde{G}$. Similarly, for any $A > 0$, and $G > 0$, we have that $x_{\alpha=0}^{A+G} = 0$, and $x_{\alpha=1}^{A+G} = \frac{A+G}{2}$. Hence, since $\frac{dx_\alpha^{A+G}}{d\alpha} > 0$, there exists a $\widetilde{\alpha}$ such that $x_\alpha^{A+G} > A/2 \Leftrightarrow \alpha > \widetilde{\alpha}$.

Then, for $x_\alpha^{A+G} > A/2$, we can write $\mathbf{x}_\alpha^{A+G} = \frac{\mathbf{A}}{2} + \mathbf{y}_\alpha^{A+G}$, with $\mathbf{y}_\alpha^{A+G} = (y_\alpha^{A+G}, y_\alpha^{A+G})$, so that the first order conditions for the recipient government become

$$\alpha V'(s(\mathbf{A}/2 + \mathbf{y}_\alpha^{A+G}))s_{\mathbf{y}}(\mathbf{A}/2 + \mathbf{y}_\alpha^{A+G}) - (1-\alpha)V'\left(G - 2y_\alpha^{A+G}\right) = 0. \tag{A-6}$$

The first order conditions for a government receiving A in project financing are

$$\alpha V'(\lambda s(\mathbf{A}/2) + s(\widetilde{\mathbf{y}}))s_{\mathbf{y}}(\widetilde{\mathbf{y}}) - (1-\alpha)V'\left(G - 2\widetilde{y}\right) = 0, \tag{A-7}$$

with $\widetilde{\mathbf{y}} = (\widetilde{y}, \widetilde{y})$. Now, for any $A > 0$, remembering that $s(\cdot)$ is a linear homogeneous function, a necessary and sufficient condition for project aid to be preferred to unconditional budget support is

$$\frac{\mathbf{A}}{2} + \mathbf{y}_\alpha^{A+G} < \lambda\frac{\mathbf{A}}{2} + \widetilde{\mathbf{y}}; \tag{A-8}$$

which implies

$$\mathbf{y}_\alpha^{A+G} < \widetilde{\mathbf{y}}. \tag{A-9}$$

Assume that (A-9) holds true. Then, since the production function is linear homogeneous, $s_{\mathbf{y}}(\widetilde{\mathbf{y}}) = s_{\mathbf{y}}(\mathbf{A}/2 + \mathbf{y}_{\alpha}^{A+G})$. Then, from the concavity of $V(\cdot)$, we have that

$$\alpha V'(s(\mathbf{A}/2+\mathbf{y}_{\alpha}^{A+G}))s_{\mathbf{y}}(\cdot)-(1-\alpha)\,V'\left(G-2y_{\alpha}^{A+G}\right) > \alpha V'(\lambda s(\mathbf{A}/2)+s(\widetilde{\mathbf{y}}))s_{\mathbf{y}}(\cdot)-(1-\alpha)\,V'\left(G-2\widetilde{y}\right),$$

so that it cannot be the case that both (A-6) and (A-7) hold true. This in turn implies that (A-9) cannot be verified when $G > \widetilde{G}$, and $\alpha > \widetilde{\alpha}$. ■

From the same argument as in the proof of Lemma 2, it follows that, for any $G < \widetilde{G}$ or $\alpha < \widetilde{\alpha}$, it needs to be $\widetilde{\mathbf{y}} = 0$. Hence, we have $\frac{ds^{PA}}{dG} = 0$ for $G < \widetilde{G}$, and $\frac{ds^{PA}}{d\alpha} = 0$, for $\alpha < \widetilde{\alpha}$.

Now, we can prove the main proposition.

(i) We know that $s^{PA} \geq \lambda s(\frac{\mathbf{A}}{2})$, with the superscript PA denoting the project aid scenario. Thus, for any $\alpha < 1$, at $G = 0$, two cases are possible depending upon the value of λ. First, for λ large enough, $s^{PA} = \lambda s(\frac{\mathbf{A}}{2}) > s^{C} > s^{NC}$. In this case, from Lemmas 1 and 2, we know that for any $G > \widetilde{G}$, $s^{PA} < s^{NC} < s^{C}$. Since s^{C}, and s^{PA} are continuous functions, there exists a $\widehat{G} \in (0, \widetilde{G})$ such that, if $G < \widehat{G}$, $s^{C} < s^{PA}$. The uniqueness of $\widehat{G}$ follows from the fact that $\frac{ds^{C}}{dG} > 0$, and that, for any $G \in (0, \widetilde{G})$, $\frac{ds^{PA}}{dG} = 0$. Second, for small values of λ, at $G = 0$, $s^{PA} = \lambda s(\frac{\mathbf{A}}{2}) < s^{C}$. In that case $\widehat{G} = 0$.

(ii) For $\alpha = 0$, $s^{C} = 0 < s^{PA} = \lambda s(\frac{\mathbf{A}}{2})$. From Lemmas 1 and 2, we know that for any $\alpha > \widetilde{\alpha}$, $s^{PA} < s^{NC} < s^{C}$. Since s^{C}, and s^{PA} are continuous functions, there exists a $\alpha \in (0, \widetilde{\alpha})$ such that if $\alpha > \widehat{\alpha}$, $s^{C} > s^{PA}$. The uniqueness of $\widehat{\alpha}$ follows from the fact that $\frac{ds^{C}}{d\alpha} > 0$, and that, for any $\widehat{\alpha} \in (0, \widetilde{\alpha})$, $\frac{ds^{PA}}{d\alpha} = 0$.■

Proof of Corollary 1.

The proof descends directly from the fact that $\widehat{\alpha} < \widetilde{\alpha}$ and $\widehat{G} < \widetilde{G}$, or in loose words, from the fact that s^{C} intersects s^{PA} in its "flat" portion. Hence, at $\widehat{\alpha}$, $\frac{ds^{PA}}{d\alpha} = 0$, while for any α, $\frac{ds^{C}}{d\alpha} > 0$. Then, as $\frac{ds^{C}}{dG} > 0$, it has to be that $\frac{d\alpha}{dG} < 0$. Similarly, we have that at $\widehat{G}$, $\frac{ds^{PA}}{dG} = 0$, while for any G, $\frac{ds^{C}}{dG} > 0$. Hence, as $\frac{ds^{C}}{d\alpha} > 0$, it has to be that $\frac{dG}{d\alpha} < 0$. The proof of part (ii) is straightforward.■

Table 1: Growth Regression with Individual Policy Variables
The coefficients for the constant and the time fixed effects are not reported. Robust standard errors are below coefficients.
Initial GDP per capita in logs.

Dependent variable: Per Capita GDP Growth	OLS	OLS	2SLS
Initial GDP	-0.88	-0.84 *	-1.36 **
	(0.42)	*(0.46)*	*(0.59)*
IMF program	-1.32 **	-1.33 **	-1.19 **
	(0.53)	*(0.52)*	*(0.55)*
Ethnic fractionalization	-0.02	-0.01	-0.37
	(1.02)	*(1.02)*	*(1.09)*
Assassinations	-0.44	-0.44	-0.43
	(0.32)	*(0.32)*	*(0.32)*
Ethnic fract X Assassinations	0.74	0.74	0.71
	(0.67)	*(0.67)*	*(0.68)*
Institutional Quality	0.59 ***	0.59 ***	0.59 ***
	(0.20)	*(0.20)*	*(0.20)*
M2/GDP (lagged)	0.01	0.01	0.02
	(0.02)	*(0.02)*	*(0.02)*
Sub-Saharan Africa	-2.04 ***	-2.07 ***	-1.66 **
	(0.76)	*(0.89)*	*(0.84)*
East Asia	0.35	0.37	0.10
	(0.88)	*(0.89)*	*(0.92)*
Budget Surplus	6.86 **	6.99 **	5.19
	(3.38)	*(3.45)*	*(3.72)*
Inflation	-1.20 **	-1.21 **	-1.14 **
	(0.52)	*(0.52)*	*(0.53)*
Openness	2.06 ***	2.04 ***	2.37 ***
	(0.64)	*(0.65)*	*(0.71)*
AID/GDP	-	0.01	-0.14
	-	*(0.05)*	*(0.11)*
Hausman Test $\chi(17)$	-		2.2
Adj. R2	0.32	0.32	0.32
Observations	227	227	227

***Statistically significant at the 1%, **5%, *10%.

Table 2: Growth Regressions Using the Policy Index – OLS

The coefficients for the constant and the time fixed effects are not reported. Robust standard errors are below coefficients. Initial GDP per capita in logs.

Dependent variable: Per Capita GDP Growth	OLS	OLS	OLS	OLS
Initial GDP	-0.84	-0.95	-0.82	-1.00
	(0.70)	*(0.70)*	*(0.71)*	*(0.72)*
IMF Program	-1.33 **	-1.37 ***	-1.34 **	-1.45 ***
	(0.52)	*(0.52)*	*(0.52)*	*(0.53)*
Ethnic fractionalization	0.001	-0.05	0.01	-0.09
	(0.90)	*(0.91)*	*(0.90)*	*(0.92)*
Assassination	-0.44	-0.41	-0.44	-0.41
	(0.30)	*(0.29)*	*(0.30)*	*(0.30)*
Ethnic fractionaliz.*Assassination	0.74	0.65	0.75	0.66
	(0.49)	*(0.48)*	*(0.49)*	*(0.49)*
Institutional quality	0.59 ***	0.62 ***	0.59 ***	0.64 ***
	(0.20)	*(0.20)*	*(0.20)*	*(0.20)*
M2/GDP lagged	0.01	0.02	0.01	0.02
	(0.01)	*(0.01)*	*(0.01)*	*(0.01)*
Sub-Saharan Africa	-2.06 **	-2.11 **	-2.05 **	-2.04 **
	(0.85)	*(0.84)*	*(0.86)*	*(0.85)*
East Asia	0.35	0.61	0.37	0.62
	(0.66)	*(0.68)*	*(0.66)*	*(0.69)*
Policy Index	1.00 ***	0.63 ***	1.00 ***	0.61 **
	(0.16)	*(0.24)*	*(0.16)*	*(0.24)*
Aid/GDP	0.01	0.02	-	-
	(0.05)	*(0.06)*	-	-
Aid/GDP*Policy Index	-	0.16 **	-	-
	-	*(0.06)*	-	-
$(Aid/GDP)^2$*Policy Index	-	-0.01 **	-	-
	-	*(0.00)*	-	-
Program Aid/GDP	-	-	-0.03	-0.03
	-	-	*(0.09)*	*(0.16)*
Project Aid/GDP	-	-	0.02	0.02
	-	-	*(0.07)*	*(0.08)*
Program Aid/GDP*Policy Index	-	-	-	0.40 *
	-	-	-	*(0.24)*
$(Program\ Aid/GDP)^2$*Policy Index	-	-	-	-0.03 *
	-	-	-	*(0.02)*
Project Aid/GDP*Policy Index	-	-	-	0.16 **
	-	-	-	*(0.07)*
$(Project\ Aid/GDP)^2$*Policy Index	-	-	-	-0.01 ***
	-	-	-	*(0.00)*
Adj. R^2	0.37	0.38	0.37	0.39
Number of observations	227	227	227	227

***Statistically significant at the 1%, **5%, *10%.

Table 3: Policy Sensitivity of Aid Effectiveness

Values represent the difference between the estimated derivative of growth with respect to aid in a country at the 25th percentile and one at the 75th percentile of the *policy* distribution.

Aid Distribution	Difference in Aid Impact	
Percentile	Budget Support	Project Financing
25	0.47	0.17
50	0.47	0.16
75	0.45	0.09

Calculations based on coefficients from Table 2 column 4

Table 4: Growth Regressions Using the Policy Index – GMM
The coefficients for the constant and the time fixed effects are not reported. Robust standard errors are below coefficients. Initial GDP per capita in logs.

Dependent variable: Per Capita GDP Growth	Difference GMM	Difference GMM	System GMM
Initial GDP	-1.20	-0.72	-1.22
	(3.21)	*(2.36)*	*(1.25)*
IMF Program	-2.16 **	-2.42 ***	-1.46
	(1.13)	*(0.93)*	*(1.15)*
Assassination	-0.54	-0.68	0.83
	(0.54)	*(0.49)*	*(1.62)*
Ethnic fractionaliz.*Assassination	1.17	1.46 *	-0.89
	(1.00)	*(0.94)*	*(3.64)*
M2/GDP lagged	-0.06	-0.01	-0.01
	(0.04)	*(0.04)*	*(0.04)*
Policy Index	0.97	1.34 ***	1.22 **
	(0.67)	*(0.53)*	*(0.52)*
Aid/GDP	0.09	-	-
	(0.15)	-	-
Aid/GDP*Policy Index	-0.14	-	-
	(0.14)	-	-
$(Aid/GDP)^2$*Policy Index	0.00	-	-
	(0.00)	-	-
Program Aid/GDP	-	0.29	0.38
	-	*(0.38)*	*(0.43)*
Project Aid/GDP	-	-0.05	-0.27
	-	*(0.20)*	*(0.17)*
Program Aid/GDP*Policy Index	-	0.80 **	0.72 *
	-	*(0.36)*	*(0.39)*
$(Program\ Aid/GDP)^2$*Policy Index	-	-0.04 *	-0.03 *
	-	*(0.02)*	*(0.02)*
Project Aid/GDP*Policy Index	-	-0.09	-0.05
	-	*(0.12)*	*(0.12)*
$(Project\ Aid/GDP)^2$*Policy Index	-	-0.00	-0.00
	-	*(0.00)*	*(0.00)*
Sargan test [a] (*p*-value)	0.17	0.79	0.66
Serial Correlation test [b] (*p*-value)	0.21	0.28	0.16
Number of observations	165	165	210

***Statistically significant at the 1%, **5%, *10%.
a: Ho: regressors are not correlated with the residuals.
b: Ho: errors in the first-difference regression exhibit no second-order serial correlation.

Table 5: Growth Regressions Using the Policy Index, Sensitivity Analysis
The coefficients for the constant and the time fixed effects are not reported. Robust standard errors are below coefficients. Initial GDP per capita in logs.

Dependent variable: Per Capita GDP Growth	OLS	OLS	GMM
Initial GDP	-0.94	-0.95	4.79
	(0.75)	*(0.73)*	*(4.39)*
IMF Program	-1.50 ***	-1.48 ***	-2.27
	(0.54)	*(0.54)*	*(1.47)*
Ethnic fractionalization	-0.08	-0.10	-
	(0.94)	*(0.93)*	-
Assassination	-0.42	-0.42	-0.59
	(0.29)	*(0.29)*	*(0.59)*
Ethnic fractionaliz.*Assassination	0.68	0.68	1.32
	(0.48)	*(0.48)*	*(1.10)*
Institutional quality	0.66 ***	0.67 ***	-
	(0.20)	*(0.20)*	-
M2/GDP lagged	0.02	0.02	-0.03
	(0.01)	*(0.01)*	*(0.06)*
Sub-Saharan Africa	-2.10 **	-2.09 **	-
	(0.87)	*(0.86)*	-
East Asia	0.70	0.70	-
	(0.69)	*(0.69)*	-
Policy Index	0.43 *	0.44 *	2.85 ***
	(0.24)	*(0.24)*	*(0.96)*
Aid/GDP	-	-	-
	-	-	-
Aid/GDP*Policy Index	-	-	-
	-	-	-
$(Aid/GDP)^2$*Policy Index	-	-	-
	-	-	-
Program Aid/GDP	-0.14	-0.16	0.34
	(0.27)	*(0.27)*	*(0.80)*
Project Aid/GDP	0.09	0.09	0.33
	(0.08)	*(0.08)*	*(0.37)*
Program Aid/GDP*Policy Index	0.24	0.32	2.01 *
	(0.36)	*(0.24)*	*(1.22)*
$(Program\ Aid/GDP)^2$*Policy Index	0.02	-	-0.26
	(0.05)	-	*(0.16)*
Project Aid/GDP*Policy Index	0.30 ***	0.30 ***	-0.80 **
	(0.09)	*(0.09)*	*(0.38)*
$(Project\ Aid/GDP)^2$*Policy Index	-0.02 ***	-0.02 ***	0.06 *
	(0.0 0)	*(0.0 0)*	*(0.03)*
Sargan test [a] (*p*-value)	-	-	0.88
Serial Correlation test [b] (*p*-value)	-	-	0.58
Number of observations	223	223	149

***Statistically significant at the 1%, **5%, *10%.
a: Ho: regressors are not correlated with the residuals.
b: Ho: errors in the first-difference regression exhibit no second-order serial correlation.

Table 6: Summary Statistics
(227 observations)

Variable	Mean	Std. Dev	Min	Max
Per Capita GDP growth	0.76	3.57	-12.2	12.27
Policy Index	-0.15	1.23	-5.33	3.15
Program aid (%GDP)	0.48	1.50	0	14.77
Project Aid (%GDP)	3.29	4.10	0	23.34