On the design and effectiveness of targeted expenditure programs*

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Abstract

We study targeted expenditure programs financed by a donor and implemented by recipients who want to divert transfers made by the donor to meet their own objectives. We analyze two economies. In the first one, the donor commits to a program budget for each period. In the second economy, the donor commits to a program budget for two periods. This introduces intertemporal competition among recipient officials. We show that intertemporal competition may weaken the recipients’ incentives to divert funds from the programs. Furthermore, we show that this may occur even in the presence of regional competition among recipients.

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1 Introduction

We study donor-recipient relationships, a special form of a wider class of agency problems. The donor finances programs that are executed by recipients. The objectives of the donor and the recipients are different: Recipients may prefer to allocate funds they receive for the program to other uses, or may be unwilling to exert effort to implement the program. These relationships exist in most large or multilevel countries where targeted expenditure programs are financed by the central government (often with external assistance), but implemented by local governments. In these programs, the moral hazard problem may be severe. For example, in their study of education transfer programs in Uganda, Reinikka and Svensson (2004, p. 679) conclude that “schools, on average, received only 13 percent of the grants. Most schools received nothing. The bulk of the school grant was captured by local officials (and politicians).” A similar problem exists when an international agency or donor country provides financing for special purposes to be implemented in a recipient country (for a literature review, see Drazen 2000, and World Bank 2005).

The donor would like to provide incentives to make recipients follow his interests. A typical response is for the donor to make future transfers conditional to past performance (conditionality). However, in practice, funds distributed by the donor are often independent of the past success of the program.\(^1\) Svensson (2000, 2003) explains that this is the case because of the spending-the-budget problem. Typically, in the donor organization, the allocation and disbursement decisions are separated. For example, in many countries, general guidelines are set by the parliament while the disbursement decision may depend on a project manager. Project managers may not want to reduce disbursements in order to punish recipients for previous bad performances. A former chief economist of the Swedish aid agency, Edgren (1996 p. 11), concludes from his experience that “both donor and recipient have incentive systems which reward reaching a high volume of resource transfer, measured in relation to a predefined ceiling....Non-disbursed amounts will be

\(^1\)In a review of the literature, World Bank (2005, p. i) concludes: “The literature identified a number of cases where (a) recipient governments accept the conditions attached to aid in anticipation that they will renge, (b) donors fail to apply sanctions stipulated in the conditionality contract, and (c) recipient governments also anticipate that it will be granted funding in subsequent periods despite previous slippages.”
noted by executive boards or parliamentary committees and may result in reduced allocations
for the next fiscal year.” Similarly, Kanbur (2000, p. 5), concludes from his experience as a
representative of the World Bank that bilateral donors have “‘fiscal year’ concerns—they feared
the consequences within their agencies of not releasing the funds in the fiscal year for which
they were slated.” Thus, even when ex ante (i.e., before observing a recipient’s performance)
the donor would like to make future transfers conditional on performance, ex post (i.e., after
observing past performances) he wants to disburse all available funds.2

As in Svensson (2003), we model the spending-the-budget problem by assuming that condi-
tionality is not possible: The donor cannot commit to condition aid on past performances when
it is not ex-post optimal for him to do so. We present a model in which the donor takes the
program budget as given and derives utility only from the output of the program. Thus, it is
optimal for the donor to disburse all available funds. However, if the donor’s budget constraint
allows for the redistribution of funds across districts or across periods, this introduces an op-
portunity cost of assigning funds to a particular district in a particular period. Consequently,
it may be optimal for the donor to “punish” a recipient after poor performances by allocating
funds to other district or other period.

First, we present a benchmark model without competition. The donor has a separate budget
for each district and for each period. Thus, even if ex ante the donor would like to make future
funding conditional on past performance, funds distributed by the donor are independent of the
success of the program in the past. Ex post, the donor does not want to punish recipients.
Consequently, recipients choose to divert resources from the program that, therefore, is unlikely
to succeed.3

Second, following Svensson (2003), we introduce regional competition into the model: We

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2 This contrast with the tradeoff in the most commonly studied agency relationships in which, ex post (i.e.,
after observing a worker’s performance), the employer is better off when he punishes the worker by decreasing
his salary.

3 This is frequently the case according to the empirical aid literature. On average, there is no relationship
between aid (meaning grants or concessional loans) and growth, or aid and alleviation of poverty (see, for example,
Boone 1996, Burnside and Dollar 2000, and Collier and Dollar 1998). However, Burnside and Dollar (2000) show
that aid has a positive impact on growth in countries with sound macroeconomic policies, while Svensson (1999)
finds that aid has a positive impact on growth in countries with an institutionalized and well functioning check
on governmental power.
allow the donor to decide where to disburse funds—i.e., each period, the donor has a budget that can be used for any district. In equilibrium, the donor assigns funds where he expects funds to be more productive. The perceived expected performance of a recipient depends on his past performance. Recipients want to receive funds from the donor. Thus, recipients may want to improve the performance of the program in order to increase their likelihood of receiving transfers in the future. However, we show that in our model, regional competition is not enough to eliminate the recipients’ incentives to divert resources from the program.

Third, we propose an additional mechanism for increasing the effectiveness of programs: Introducing competition across time. We show that if instead of committing to a program budget for each period, the donor commits to a budget for several periods, intertemporal competition weakens the recipients’ incentives to divert funds from the program. Thus, we illustrate the advantages of giving the donor flexibility to decide when (and not only where) to disburse his funds. It is further shown that, even in the presence of regional competition, intertemporal competition can help to improve the effectiveness of programs. While regional competition may help, it may not be sufficient to eliminate completely incentives to divert central funds. Moreover, in cases where the donor is not willing to redistribute funds among districts, intertemporal competition may be the only choice. This suggests that, in general, even when other incentives are in place, intertemporal competition may still play an important role.

The rest of this paper is organized as follows. Section 2 presents the model. Section 3 discusses equilibrium learning. Section 4 studies a benchmark without competition. Section 5 introduces regional competition. Section 6 studies intertemporal competition. Section 7 presents

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4 We follow the literature on career concerns (see, for example, Holmstrom’s (1999) seminal paper and Persson’s and Tabellini’s (2000) rent-seeking models of career concerns), which studies agency problems in which the agent’s decisions are influenced by his aspiration of affecting the beliefs about his future productivity. Svensson (2003) follows an alternative approach. In his model, the recipient exerts “reform effort” and the donor, after observing the success of the reform, decides the funds that will be distributed to the recipient—if the reform is successful the program is more likely to be successful. In our model, competition does not help the program to be successful by inducing some observable reform outside the program, but by changing the unobservable recipient’s behavior.

5 Regional competition can be related with the World Bank selectivity policy—giving aid where aid is expected to be more effective (see Drazen, 1999). “The donors thus abandon ex ante conditionality to adopt ex post conditionality” (World Bank, 2005, p. ii). Our paper suggests that it could be useful for donors to be selective in another dimension. Donors could channel aid when aid is expected to be effective. We show that intertemporal selectivity could be useful even when regional selectivity is in place.
a robustness exercise. Section 8 discusses implications of our analysis. Section 9 concludes.

2 The model

In order to highlight the incentives generated by intertemporal competition, we use a stylized three-period model. Donor-recipient relationships present multi-tier agency problems: In general, conflicts of interests exist also both within the donor and within recipients. However, following Svensson (2000, 2003), we focus on the conflicts between the donor and the recipients and, therefore, we treat the donor and the recipients as single decision units. We present a game played by the donor and the recipients in two districts, \( A \) and \( B \).

At the beginning of each period \( t \in \{1, 2, 3\} \), the donor decides on the funds that will be available for the program in each district \( j \in \{A, B\} \), \( \tau_{jt} \), subject to a budget constraint. This paper studies the effects of different donor’s budget constraints. Specific assumptions on these budget constraints are presented in sections 4, 5, and 6.

After the donor decides on \( \tau_{jt} \), a recipient may decide either to use \( \tau_{jt} \) for the designated program or to divert some of these funds, \( r_{jt} \), for something else. As indicated by the World Bank (1998, p. 80), “donors should take it for granted that their financing is fungible because that is reality.” For expositional simplicity, recipients are restricted to use either all funds or a fraction \( 1 - F \) of the funds in the program. Thus, \( r_{jt} \in \{0, F \tau_{jt}\} \).

We shall characterize equilibrium when recipients can divert a high fraction of the budget. In particular, we assume that \( F \in \left(\frac{1}{2}, 1\right) \)—assuming \( F \in \left(\frac{1}{2}, 1\right) \) allows us to focus on environments with a unique equilibrium (see the proofs of Lemma 4 and Proposition 3).

After recipients decide on the funds that will be used for a program, the output of the program, \( g_{jt} \), is determined as a function of the recipient’s effectiveness, \( \eta_{jt} \), and the funds available for the

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\(^6\)In models of career concerns, for finding the agent’s equilibrium strategy, a fixed point problem needs to be solved (the action expected by the principal needs to be equal to the action chosen by the agent given the principal’s expectation). By considering a model with a discrete number of actions for the recipient, we facilitate solving these problems and avoid discussing uninteresting technical details (Martinez 2005 and 2008 discusses models of career concerns in which the agent chooses his action from a continuum). In a model in which recipients can choose how much funds to divert from a continuum, instead of showing that diversion can be eliminated with intertemporal competition, we would show that diversion can be reduced. This is the message we are trying to convey.
program, $\tau_{jt} - r_{jt}$. In particular, $g_{jt} = (\tau_{jt} - r_{jt}) \eta_{jt}$ (this is the technology used by Persson and Tabellini 2000, Ch. 4). Note that there is no noise in the production function and, therefore, a recipient’s type can be learned perfectly after one observation of his performance. This is a common assumption in agency models (see, for example, Rogoff 1990, and Shi and Svensson 2006). Martinez (2005) discusses the effects of relaxing this assumption.

On the one hand, the donor can only provide incentives if recipient officials are concerned about the future. For expositional simplicity, we introduce this in the model by assuming that in each district, recipient officials in charge of the program during period one will remain in charge of the program during period two.

On the other hand, for intertemporal competition to work, we need that recipient officials prefer to receive the program funds as soon as possible. This is the case because recipient officials presently in charge of the program may not be in charge of the program in the future (political leaders face elections, and government officials may be reassigned to different responsibilities) and they prefer the funds to be assigned to the program while they are in charge.\footnote{In our model, recipient officials benefit from diverting resources from the program while they are in charge. Alternatively, officials may prefer the program to produce results while they are in charge because this may help them build their reputations. This may help elected officials improve their reelection chances, and may help bureaucrats to advance in the government promotion ladder or find better positions elsewhere. Empirical studies on economic voting show that voting depends on performance (for a review, see Lewis-Beck and Stegmaier 2000). For example, Brender (2003, p. 2197) finds that “the incremental student success rate during the mayor’s term had a significant positive effect on his reelection chances.”}

We model this by assuming that a recipient official only derives utility from $r_{jt}$ if he is in charge of the program in period $t$, and that recipient officials in charge of the program during period two will not be in charge during period three (we relax this assumption in Section 7). This would be the case, for example, of a governor whose term finishes after period two and who is facing a term limit. Thus, the district-$j$ official in charge of the program in period one (who is also in charge in period two but is not in charge in period three) derives utility from $r_{j1}$ and $r_{j2}$ but not from $r_{j3}$.

A conflict of interest between the donor and the recipients exists because recipients may prefer to use funds for something different from the program. That is, recipients derive more utility from $r_{jt}$ than from $g_{jt}$. For simplicity, we assume that a recipient derives utility only from the
funds he diverts from the program, \( r_{jt} \). In particular, his utility is equal to \( r_{jt} \). Moreover, we assume that there is no discounting. Thus, in period one, recipient \( j \) maximizes \( r_{j1} + r_{j2} \); in period two, recipient \( j \) maximizes \( r_{j2} \); and in period three, recipient \( j \) maximizes \( r_{j3} \).

We assume that the donor is concerned about the success of the program in both districts and in every period. His utility is given by \( U = \sum_{t=1}^{3} (g_{At} + g_{Bt}) \).

We assume that the donor and the recipients do not know the effectiveness of a new recipient. The assumption that the agent (the recipient) does not know his own effectiveness greatly facilitates the analysis and it is standard in models of career concerns (see, for example, Holmstrom’s 1999 seminal paper). This construct allows us to consider situations where a recipient may be ignorant of his effectiveness when faced with new tasks. This assumption also deepens the understanding of situations in which a recipient’s success depends not only on an individual official’s effectiveness, but on the effectiveness of a group of people working together. A recipient’s resulting effectiveness is a random variable with a uniform distribution with positive support between zero and one. Because the period-one recipients are the period-two recipients, \( \eta_{j2} = \eta_{j1} \). The donor and the recipient do not observe a recipient’s effectiveness directly, but they do observe output. Only a recipient observes the funds he takes from the program.

The donor and the recipients maximize their expected utility subject to their budget constraint, taking future equilibrium actions as given. We focus on pure strategies.

### 3 Equilibrium learning

The donor learns about a recipient’s ability using the recipient’s performance \( (g_{jt}) \) and the recipient’s equilibrium strategy.\(^8\) Let \( r_{jt}^{*} \) denote the equilibrium action of recipient \( j \) at time \( t \). The period-one effectiveness inferred by the donor is given by

\[
\eta_{j1d} \equiv \frac{g_{j1}}{ \tau_{j1} - r_{j1}^{*} } = \frac{\eta_{j1} \left( \tau_{j1} - r_{j1} \right)}{ \tau_{j1} - r_{j1}^{*} }.
\]

\(^8\)The donor is rational and understands the game. Therefore, he is able to compute the recipient’s equilibrium strategy.
Note that \( \eta_{j1d} \) is decreasing with respect to \( r_{j1} \). Consequently, recipient \( j \) may want to choose a lower \( r_{j1} \) if he benefits from making the donor belief he was more effective in period one.\(^9\)

4 A benchmark without competition

Let us assume that for each district \( j \), and for each period \( t \), the donor’s budget constraint is given by \( \tau_{jt} \leq T \). That is, the donor cannot redistribute funds across districts or across periods.

With this budgeting framework, there is no cost of transferring funds to a given recipient in a given period and, therefore, the donor always gives all available funds to the recipients. That is, \( \tau_{jt}^* = T \) for all \( j \in \{A, B\} \) and all \( t \in \{1, 2, 3\} \). Since future transfers are independent of past performance, recipients always divert the maximum possible amount from the program. That is, \( r_{jt}^* = F\tau_{jt} \) for all \( j \in \{A, B\} \) and all \( t \in \{1, 2, 3\} \). The following proposition summarizes these results:

**Proposition 1** In the unique pure-strategy equilibrium without competition, the donor’s funding strategies are such that \( \tau_{jt}^* = T \). Recipients’ diversion strategies are given by \( r_{jt}^* = F\tau_{jt} \).

With this budgeting framework, equilibrium output is given by \( g_{jt}^* = T(1-F)\eta_{jt} \). If recipients can extract enough funds from the program (\( F \) is high enough), the model predicts that very little output is obtained.

The budgeting framework considered in this section is commonly used, and the results presented here are consistent with two facts found in the empirical literature on foreign aid. First, funds are not systematically channeled where programs are more likely to be successful. Second, special purpose programs seldom seem to influence recipients’ decisions.\(^{10}\)

\(^9\)If a recipient diverts from the budget less than what he would divert in equilibrium, the effectiveness inferred by the donor may be higher than one. For evaluating these situations, we assume that if the effectiveness inferred by the donor is higher than one, the donor believes the recipient’s effectiveness is one (the main results are independent of this assumption).

\(^{10}\)Foreign aid has not been systematically channeled to countries where programs are more likely to be successful. Collier and Dollar (1998) estimate that if aid is redirected toward poor countries with good policies, more than twice the number of people could be lifted out of poverty for the same aggregate level of foreign aid. Collier (1997) and Dollar and Svensson (1998) conclude that aid does not seem to influence policy.
5 Regional competition

As in the model of regional competition proposed by Svensson (2003), we assume that in each period, the donor can decide the way his budget is distributed between the two districts. That is, the funds assigned to each of the two districts in Section 4 are combined. For each period $t$, the donor’s budget constraint is given by $\tau_{At} + \tau_{Bt} \leq 2T$. Thus, we respect the nature of the spending-the-budget problem keeping the donor’s pressure to spend his budget, but we allow the donor to decide where to spend it. This introduces an opportunity cost of assigning funds to a district (not assigning these funds to the other district). We show that this opportunity cost allows the donor to make transfers conditional on past performance.

The model is solved using backward induction. In period three, recipients are in the last period of their relationship with the donor. Therefore, they have no incentives to support the donor’s interests and $r^*_j = F\tau_j$.

Each period, it is optimal for the donor to give all available funds to the recipient who is expected to be more effective. Let us assume that if the donor is indifferent between transferring funds to districts $A$ or $B$, he assigns the same transfers to both districts. This is the case in period three, when officials of unknown effectiveness are in charge of the program and choose $r^*_j = F\tau_j$. Therefore, $\tau^*_j = T$.

As in period three, in period two, recipient officials are in the last period of their relationship with the donor. Therefore, $r^*_j = F\tau_j$.

At the beginning of period two, the donor assigns all available funds (2T) where he expects these funds to be more productive. Since $r^*_j = F\tau_j$, the period-one effectiveness inferred by the donor is sufficient for determining the period-two productivity of the funds in each district. Thus, $\tau^*_j (\eta_{A1d}, \eta_{B1d}) = 2T$ if the donor believes recipient $A$ is the most effective ($\eta_{A1d} > \eta_{B1d}$); $\tau^*_j (\eta_{A1d}, \eta_{B1d}) = T$ if the donor believes the recipients in the two districts have the same effectiveness; and $\tau^*_j (\eta_{A1d}, \eta_{B1d}) = 0$ if the donor believes recipient $B$ is the most effective—and $\tau^*_j (\eta_{A1d}, \eta_{B1d}) = 2T - \tau^*_j (\eta_{A1d}, \eta_{B1d})$. That is, transfers are conditional on past performance.

The following lemma summarizes this discussion:

**Lemma 1** With regional competition, the donor’s funding strategies are such that $\tau^*_j = T$;
If the donor believes recipient $j$ is the most effective; $\tau^*_{j2}(\eta_{A1d}, \eta_{B1d}) = 2T$ if the donor believes the recipients in the two districts have the same effectiveness; and $\tau^*_{j2}(\eta_{A1d}, \eta_{B1d}) = 0$ if the donor believes recipient $j$ is the least effective. Recipients’ diversion strategies are such that $r^*_{j2} = F\tau_{j2}$ and $r^*_{j3} = F\tau_{j3}$.

Incentives from regional competition appear because $\eta_{j1d}$ is decreasing with respect to $r_{j1}$, and $\tau^*_{j2}$ is (weakly) increasing with respect to $\eta_{j1d}$. That is, if a recipient decreases the funds he diverts from the program in period one, he appears to be more effective and may receive more from the donor in period two. However, the next lemma shows that, in our framework, incentives generated by regional competition are not sufficient to induce recipients to utilize all available transfers in the program.

**Lemma 2** With regional competition, $r^*_{j1} = 0$ cannot be part of a pure-strategy equilibrium.

**Proof.** Let us suppose the equilibrium is such that $r^*_{A1} = 0$. The expected utility of recipient $A$ if he diverts zero in period one equals the equilibrium probability of he being perceived more effective than the other recipient, 0.5, multiplied by his period-two utility in this case, $2FT$. Thus, his expected utility equals $FT$.

Let us suppose that recipient $A$ decides to divert $F\tau_{A1}$ in the first period. In period one, officials of unknown effectiveness are in charge of both districts. If $r^*_{B1} = 0$ (and the donor expects $r_{B1} = 0$), the expected productivity of the funds is the same in both districts, and $\tau_{A1} = T$. If $r^*_{B1} = F\tau_{B1}$, $\tau_{A1} = 2T$. Therefore, $F\tau_{A1} \geq FT$. Moreover, with probability

$$P[\eta_{A1}(1 - F) > \eta_{B1}] = \frac{1 - F}{2} > 0,$$

the donor believes that recipient $A$ is more effective than recipient $B$ ($\eta_{A1d} > \eta_{B1d}$). Therefore, with probability $P[\eta_{A1}(1 - F) > \eta_{B1}]$, recipient $A$ receives $2FT$ in period two. Thus, his expected utility is higher than $FT$.

Consequently, the expected utility of recipient $A$ is higher if $r_{A1} = FT$ than if $r_{A1} = 0$. Therefore, $r^*_{A1} = 0$ cannot be part of the equilibrium. The same logic applies for $r^*_{B1} = 0$. ■

The reasoning behind this result is simple. Diverting zero in period one in order to have a 50 percent probability of receiving in period two at most twice as much as what can be taken in period one is not good for a recipient. This is the case because even if a recipient decides to
divert all available transfers from the program in period one, it may still be possible for him to receive funds in period two. The next proposition shows that regional competition is not enough to reduce funds diversion ($r_{j1}^* = FT$).\footnote{Even though regional competition does not reduce funds diversion, one can expect regional competition will help improve the result of the program—the expected utility of the donor is higher—with respect to the benchmark in Section 4. This is the case because in period two the donor assigns the entire period-two budget to the most effective recipient.}

**Proposition 2** In the unique pure-strategy equilibrium with regional competition, the donor’s funding strategies are such that $\tau_{j1}^* = \tau_{j3}^* = T$; $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 2T$ if the donor believes recipient $j$ is the most effective; $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = T$ if the donor believes the recipients in the two districts have the same effectiveness; and $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 0$ if the donor believes recipient $j$ is the least effective. Recipients’ diversion strategies are given by $r_{jt}^* = F \tau_{jt}$.

**Proof.** Lemma 1 determines $\tau_{j3}^*$, $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d})$, $r_{j2}^*$, and $r_{j3}^*$. Let us focus on period-one strategies. Suppose that the equilibrium is such that, for each district $j$, $r_{j1}^* = F \tau_{j1}$. In period one, officials of unknown effectiveness are in charge of both districts. The donor expects $r_{j1} = r_{j1}^* = F \tau_{j1}$. Therefore, the expected productivity of the funds is the same in both districts, and $\tau_{j1}^* = T$. If recipient $j$ chooses $r_{j1} = FT$, his expected utility equals $2FT$ ($FT$ in period one plus a 50 percent probability of having $2FT$ in period two). Thus, recipient $j$ cannot improve by choosing $r_{j1} = 0$ (the probability of getting $2FT$ in period two is less than one). Lemma 2 shows that an equilibrium where one of the recipient chooses $r_{j1} = 0$ does not exist. ■

6 **Intertemporal competition**

In this section, in period two, the donor has a budget of $4T$ and can decide to give any fraction of this budget either to district $A$ or $B$ in either period two or three. That is, the donor’s budget constraint for periods two and three is given by $\tau_{A2} + \tau_{B2} + \tau_{A3} + \tau_{B3} \leq 4T$. This introduces an additional opportunity cost of assigning funds to a district in period two (not assigning these funds in the future). We shall show how giving the donor flexibility to decide when (and not only where) to disburse his funds may improve aid effectiveness. For simplicity, we assume that the donor has a separate budget for period one.\footnote{Otherwise the donor would choose to distribute a minimum amount in period one and to use the rest of the funds in the other periods. This is the case because the donor would prefer to learn the recipients’ effectiveness} The donor’s period-one budget constraint is given by $\tau_{A1} + \tau_{B1} \leq 2T$. 
This budgeting framework introduces intertemporal competition between the period-one (and period-two) recipients and the period-three recipients. In period two, in order to ensure continuing receipt of funds from the donor, a recipient needs to convince the donor that he is more effective than the other recipient (regional competition), and more effective than an average recipient (intertemporal competition). The donor would prefer to wait to give the funds to a new recipient (of average expected effectiveness) in period three instead of giving the funds to a recipient with below-average expected effectiveness in period two.

As in previous sections, in period three, \( r_{j3}^* = F \tau_{j3} \), and available funds are distributed equally between the two recipients. In this case,

\[
\tau_{j3}^* = \frac{4T - \tau_{A2} - \tau_{B2}}{2}.
\]

In period two, recipient officials are also in the last period of their relationship with the donor, and \( r_{j2}^* = F \tau_{j2} \).

At the beginning of period two the donor assigns available funds considering the expected productivity of the funds in districts \( A \) and \( B \), and in periods two and three. Since \( r_{jt}^* = F \tau_{jt} \) for all \( t \in \{2, 3\} \) and all \( j \in \{A, B\} \), the recipients’ expected effectiveness is sufficient for determining expected productivities. Let us assume that for the same expected productivity, the donor assigns the transfers in period two. Thus, \( \tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 4T \) if the donor believes recipient \( j \) is the most effective period-two recipient, and he believes recipient \( j \) is at least as effective as the average recipient (\( \eta_{j1d} \geq 0.5 \)); \( \tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 2T \) if the donor believes the recipients in the two districts have the same effectiveness, and this effectiveness is at least the average effectiveness (\( \eta_{A1d} = \eta_{B1d} \geq 0.5 \)); and \( \tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 0 \) if the donor believes recipient \( j \) is the least effective period-two recipient, or he believes recipient \( j \) is less effective than the average recipient (\( \eta_{j1d} < 0.5 \)). This discussion is summarized in the following lemma:

**Lemma 3** With regional and intertemporal competition, in periods two and three, the donor’s funding strategies are such that \( \tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 4T \) if the donor believes recipient \( j \) is the most effective period-two recipient, and he believes recipient \( j \) is at least as effective as the average recipient; \( \tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 2T \) if the donor believes the recipients in the two districts have the
same effectiveness, and this effectiveness is at least the average effectiveness; \( \tau_{j2}^*(\eta_{A1d}, \eta_{B1d}) = 0 \) if the donor believes recipient \( j \) is the least effective period-two recipient, or he believes recipient \( j \) is less effective than the average recipient; and

\[
\tau_{j3}^* = \frac{4T - \tau_{A2} - \tau_{B2}}{2};
\]

Recipients’ diversion strategies are given by \( r_{j2}^* = F\tau_{j2} \) and \( r_{j3}^* = F\tau_{j3} \).

The next lemma shows that, if incentives generated by regional and intertemporal competition are combined, there is no pure-strategy equilibrium in which a recipient takes resources from the program in period one.

**Lemma 4** With regional and intertemporal competition, \( r_{j1}^* = F\tau_{j1} \) cannot be part of a pure-strategy equilibrium.

**Proof.** Suppose that the equilibrium is such that \( r_{A1}^* = F\tau_{A1} \). If recipient \( A \) chooses \( r_{A1} = F\tau_{A1} \), his expected utility equals the probability that he will receive the funds next period (0.375) multiplied by his period-two utility in this case (4\( FT \)), plus the funds he takes in the first period (\( F\tau_{A1} \)). Thus, his expected utility equals \( F\tau_{A1} + 1.5FT \). If the equilibrium is such that \( r_{B1}^* = F\tau_{B1} \), then \( \tau_{A1} = T \). If the equilibrium is such that \( r_{B1}^* = 0 \), then \( \tau_{A1} = 0 \). Consequently, \( F\tau_{A1} + 1.5FT \leq 2.5FT \).

If recipient \( A \) chooses \( r_{A1} = 0 \), his expected utility equals the probability that he will receive the funds next period,

\[
P \left[ \frac{\eta_{A1}}{1 - F} > \frac{1}{2} \text{ and } \frac{\eta_{A1}}{1 - F} > \eta_{B1} \right] = \frac{3 + 5F}{8},
\]

multiplied by his period-two utility in this case, 4\( FT \). Thus, his expected utility equals \( 1.5FT + 2.5F^2T \). Since \( F > \frac{1}{2} \), \( 1.5FT + 2.5F^2T > 2.5FT \).

Consequently, the expected utility of recipient \( A \) is higher if \( r_{A1} = 0 \) than if \( r_{A1} = F\tau_{A1} \). Therefore, \( r_{A1}^* = F\tau_{A1} \) cannot be part of the equilibrium. The same logic applies for \( r_{B1}^* = F\tau_{B1} \).

Section 5 shows that, when the donor’s budget only allows for regional competition, there is a unique equilibrium with \( r_{j1}^* = F\tau_{j1} \). In contrast, when intertemporal competition is introduced, \( r_{j1}^* = F\tau_{j1} \) cannot be part of an equilibrium. Why is diverting funds from the program less
attractive with intertemporal competition? The benefit from diverting less money from the program is given by the increase in the probability of receiving funds in the future multiplied by the future funds. Both components of this benefit are higher when intertemporal competition is introduced. First, the probability of receiving funds in period two is more sensitive to the funds diverted from the program in period one. Second, the recipient anticipates that if he receives funds in period two, he will receive $4T$—instead of receiving $2T$ as in Section 5.

The next proposition shows that even in the presence of regional competition, intertemporal competition may help reduce the funds that are diverted from the program: With intertemporal competition, $r_{j1}^* = 0$.

**Proposition 3** In the unique pure-strategy equilibrium with regional and intertemporal competition, the donor’s funding strategies are such that $\tau_{j1}^* = T$; $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 4T$ if the donor believes recipient $j$ is the most effective period-two recipient, and he believes recipient $j$ is at least as effective as the average recipient; $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 2T$ if the donor believes the recipient in the two districts have the same effectiveness, and this effectiveness is at least the average effectiveness; $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d}) = 0$ if the donor believes recipient $j$ is the least effective period-two recipient, or he believes recipient $j$ is less effective than the average recipient; and

$$\tau_{j3}^* = \frac{4T - \tau_{A2} - \tau_{B2}}{2}. $$

Recipients’ diversion strategies are given by $r_{j1}^* = 0$, $r_{j2}^* = F\tau_{j2}$, and $r_{j3}^* = F\tau_{j3}$.

**Proof.** Lemma 3 determines $\tau_{j1}^*$, $\tau_{j2}^* (\eta_{A1d}, \eta_{B1d})$, $r_{j2}^*$, and $r_{j3}^*$. Let us focus on $r_{j1}^*$. Let us suppose that the equilibrium is such that, for each district $j$, $r_{j1}^* = 0$. In period one, officials of unknown effectiveness are in charge of both districts. Therefore, the expected productivity of the funds is the same in both districts, and $\tau_{j1}^* = T$.

If recipient $j$ chooses $r_{j1} = 0$, the expected utility of the incumbent in jurisdiction $j$ equals the probability that $j$ will receive funds in the next period, 0.375, multiplied by his period-two utility in this case, $4FT$. Thus, his expected utility equals $1.5FT$.

Since $F > 0.5$, $P[\eta_{A1}(1-F) > 0.5] = 0$. Thus, if recipient $j$ chooses $r_{j1} = FT$, he will not receive any transfer in period two; his expected utility equals $FT$; and this is not a profitable deviation.

Lemma 4 shows that an equilibrium where one of the recipient chooses $r_{j1} = F\tau_{j1}$ does not exist. ■
We have shown that the incentives generated by intertemporal competition complement the incentives from regional competition: When regional competition is in place, introducing intertemporal competition helps reducing the funds recipients divert from the programs. This suggests that, in general, even when other incentive schemes are in place, intertemporal competition may be important. Moreover, in many situations where the donor is not indifferent among helping different recipients (for example, when the donor wants to help one particular recipient), intertemporal competition could be crucial for the success of the programs.

7 Robustness

This section presents a robustness exercise. The advantage of the stylized model used in the preceding sections is that it allowed us to describe the benefits of intertemporal competition in a simple way. In this section, we depart from one of the stark assumptions of our stylized framework: We assume that the recipient official in charge of the program in period $t$ is also in charge of the program in period $t+1$ with probability $p \in [0, 1]$. This allows us to illustrate the robustness of the message we want to convey: We will show how intertemporal competition can still improve the effectiveness of targeted expenditure programs. Furthermore, we will show that intertemporal competition may also improve the effectiveness of a program in period two.

The exercise presented in this section also illustrates how the study of intertemporal competition becomes significantly more complicated when we depart from the stylized framework analyzed in the preceding sections. The number of subgames one has to consider (with zero, one, and two new recipients, with different abilities of old recipients, and with different budgets to each recipient) increases greatly. Instead of providing a characterization of the equilibrium for all possible subgames, we characterize equilibrium in one subgame that allows us to show that intertemporal competition may improve the effectiveness of a program in period two.

For expositional simplicity, we assume that the donor needs to transfer $T$ to finance a program and that he decides how many programs he wants to finance in each district. For instance, without intertemporal competition, $\tau_{j2} \in \{0, T, 2T\}$, and with intertemporal competition, $\tau_{j2} \in \{0, T, 2T, 3T, 4T\}$. As in previous sections, $r_{j3}^* = F\tau_{j3}$ and, therefore, at the beginning of period
three, all available funds are disburse to the recipient with the highest expected effectiveness. Suppose that in period two, each district has a new official in charge of the program. The next proposition shows that without intertemporal competition, there is no equilibrium in which funds are not diverted from the program in period two.

**Proposition 4** Suppose that in period 2, each district has a new official in charge of the program. Without intertemporal competition, $r_{j2}^* = 0$ cannot be part of a pure-strategy equilibrium.

**Proof.** Suppose the equilibrium is such that $r_{A2}^* = 0$. The expected utility of recipient $A$ if he diverts zero in period two equals the equilibrium probability of receiving funds next period, $0.5p$, multiplied by his period-two utility in this case, $2FT$. Thus, his expected utility is lower than $FT$. Consequently, $r_{A2}^* = 0$ cannot be part of an equilibrium (recipient $A$ can always choose to divert $FT$). The same logic applies for $r_{B1}^* = 0$.

In contrast, we show next that reducing diversion from the program is possible when intertemporal competition is introduced. Let us focus on the subgame in which one official receives $T$, and the other official does not receive funds. In particular, suppose (without loss of generality) that the donor does not assign funds to district $A$. The next proposition shows that if $p$ is high enough, there is an equilibrium in which resources are not diverted from the program in period two.

**Proposition 5** Suppose that in period two, each district has a new official in charge of the program, district-B official receives $T$, and district-A official does not receive funds. Then, $r_{B2}^* = 0$ can be part of a pure-strategy equilibrium with intertemporal competition if and only if $p \geq \frac{2}{3}$.

**Proof.** Suppose $r_{B2}^* = 0$. Note that there is no program in district $A$ and, therefore, there is no learning about the ability of recipient $A$. If recipient $B$ chooses $r_{B2} = 0$, the probability of recipient $B$ receiving funds in period three is equal to $0.5p$, which multiplied by his period-three utility in this case, $3FT$, gives us his expected utility, $1.5pFT$. If recipient $B$ chooses $r_{B2} = FT$, his expected utility equals $FT$ (recall that $F > 0.5$ and, therefore, the probability of receiving

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13 We will show that in this subgame, intertemporal competition allows the donor to decrease the funds that are diverted from the program because, by assigning funds to only one district in period two, he assures a budget of $3FT$ for period three. It is easy to show that the donor would choose to do this over assigning funds to both districts in period two.
funds in period three is zero). Consequently, $r^*_{B2} = 0$ can be part of an equilibrium if and only if $p \geq \frac{2}{3}$. ■

8 Discussion

The mechanism studied in this paper suggests that aid effectiveness could be improved by giving more flexibility to the donor official so he can manipulate the intertemporal allocation of transfers. Note that for intertemporal competition to work, the budget period does not need to be particularly long. It is sufficient that the donor can transfer funds to a time at which recipient officials anticipate that they may no longer be in charge of the program. A clear example is that donors could decide to make transfers either before or after an election. But elections are not necessary for the turnover of recipient officials in charge of these programs (typically cabinet ministers or lower ranked bureaucrats) who may be replaced at any time. The possibility of turnover is enough for giving recipient officials a particularly high discount rate against the future (see, for example, Easterly 2002), and for giving the donor incentives to wait for recipient officials with higher expected effectiveness.

For expositional simplicity, we assumed that the donor is indifferent between assigning funds in any period. It would not be a problem to assume that the donor discounts the future. One could even assume that the donor discounts the future more than the recipient does. Similarly, for the intertemporal competition to work, we do not need the expected tenure of donor officials to be higher than the expected tenure of recipient officials—as recipient officials, donor officials also face turnover, they may prefer to expend the budget before the end of their tenure, and this may affect their effective discount rate. In general, as long as the donor cares about the future, he may prefer to wait and assign funds to a recipient of higher expected effectiveness.

One could think that if the recipient knows with certainty that transfers will be available, he could borrow using the promise of these funds as collateral. Thus, the recipient could offset the intertemporal shifts decided by the donor undermining the effectiveness of intertemporal competition. However, this is unlikely. First, if the donor could decide to transfer the funds to another district and/or to another program (regional competition), the recipient would be
uncertain about the funds he will receive. Thus, regional competition could help implement intertemporal competition. Second, governments in developing countries (and offices in these governments) have notorious difficulties to access credit. This is the case because of both the possibility of default, and the high political and economic instability in those countries (consider, for example, the possibilities of devaluations and high inflations).\textsuperscript{14}

It should be mentioned that the mechanism proposed here may appear to condone donor’s manipulations of funds for political reasons: The donor could decide the timing of the transfers considering his political preferences instead of the past performance of the program. However, this problem could be avoided easily with a contract establishing the links between the recipients’ performances and the funds they receive. For example, in the simple framework developed here, this contract would establish that a recipient would receive funds in the second period if and only if in the first period the program in his district produces better results than in the competing district, and the recipient’s performance exceeds certain threshold (given in the model by the average recipient’s performance).

\section{Conclusions}

As documented in the empirical literature and as illustrated in Section 4, if recipients do not have incentives to follow the donor’s interests, targeted expenditure programs can be ineffective. Section 5 suggests that while regional competition may help (as noticed by Svensson 2003), it may not be sufficient to eliminate this problem. Moreover, the donor may not be willing to redistribute funds among jurisdictions and, therefore, utilizing regional competition may be impossible. Section 6 shows that if instead of committing a program budget for each period, the donor commits to a budget for several periods, this weakens the recipients’ incentives to divert funds. We further show that, even in the presence of regional competition, intertemporal competition can help to improve the performance of these programs. This suggests that, in general, even when other incentive schemes are in place, intertemporal competition may play an important role.

\textsuperscript{14}For a discussion of political risk and default risk, see Hatchondo, Martinez, and Sapriza (forthcoming) and the references therein.
References


