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Contact address of the editor:  
Research platform "Empirical and Experimental Economics"  
University of Innsbruck  
Universitaetsstrasse 15  
A-6020 Innsbruck  
Austria  
Tel: + 43 512 507 7171  
Fax: + 43 512 507 2970  
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# Provision of Public Goods: Unconditional and Conditional Donations from Outsiders

Provisional draft – Please do not cite

Esther Blanco<sup>a,c</sup>

Tobias Haller<sup>a,†</sup>

James M. Walker<sup>b,c</sup>

*<sup>a</sup>Department of Public Finance, University of Innsbruck, Austria.*

*Universitaetsstrasse 15, 6020, Innsbruck, Austria.*

*<sup>b</sup>Department of Economics, Indiana University, USA. Wylie Hall 105. Indiana University. Bloomington, IN 47405.*

*<sup>c</sup>The Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis, Indiana University, USA.*

† Corresponding author: Telephone: +43(0)512 507 7171. Fax: +43(0)512 507 2788. e-mail: tobias.haller@uibk.ac.at

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## Abstract

The provision of public goods often benefits a larger group than those who actively provide the public good. In an experimental setting, this paper addresses institutional arrangements between subjects who can provide a public good (insiders) and subjects who benefit from the public good but cannot provide it (outsiders). We compare a setting of passive outsiders to situations where outsiders can either make unconditional transfers (donations) or conditional transfers (contracts) to the insiders. The primary behavioral question is to what extent outsiders will respond to the opportunity to subsidize the contributions of insiders and will insiders use such subsidies to increase contributions or simply substitute them for their own contributions. The results suggest the latter. In fact, once conditional or unconditional transfers are allowed, insiders decrease contributions to the public good relative to the baseline condition without transfers.

Keywords: Public goods, Institution, Externality, Laboratory Experiment.

JEL Classification: D70, H41, C92

# 1 Introduction

The provision of many public goods originates in a subset of a population that is smaller than the total population who benefits from the public good once provided. This is the case both at a global and local scale. On a global level, one prominent example is how the conservation of forests avoids green-house gas emissions from deforestation, limiting in turn the impact from climate change. Forest landowners or users of forest commons provide the mitigation of emissions that result in benefits for other individuals on a global scale. In addition, forest conservation may generate local public goods such as water retention or avalanche control that benefit a wider local population than the one directly involved in forest management. Other examples at the global level include epidemic disease control (such as Ebola), where control efforts by some results in global health safety benefits. At the local level, there are numerous examples of volunteer public services, such as fire protection and neighborhood security. The key feature of all these examples is the existence of groups of individuals who benefit from the provision of the public good but cannot directly participate in the provision for physical, institutional or other reasons. We refer to these individuals as "outsiders", as opposed to "insiders" who can actively provide the public good.

In some cases outsiders are completely passive bystanders. Previous experimental research has investigated the influence on provision levels from the presence of such outsiders (Engel and Rockenbach (2011), Delaney and Jacobson (2014)). However, in some cases it is clear that outsiders have the opportunity to interact and support the actions of insiders. This paper focuses on two institutions that can shape such interactions, namely unconditional transfers that are de facto donations and conditional transfers whereby realized transfers are contingent upon the level of the

public goods provision by the insiders. The design of the baseline game with passive outsiders is motivated to create situations whereby insiders and outsiders (for physical or institutional reasons) cannot simply form a larger group to provide the public good. The design of the two institutions aims at exploring the ramifications of restrictions that limit transfers to binding constraints contingent upon insiders' provision of the public good, as opposed to unconditional donations. The primary research question is to what extent outsiders choose to facilitate the provision of the public good by insiders, and how insiders respond to the decisions of outsiders. To the best of our knowledge this is the first experimental study designed to analyze the behavioral properties of institutional variations of this type.

## **2 Related literature**

Relative to the large literature on various forms of social dilemma interactions, there are few studies of the type examined here, which involve externalities from one group of agents to a second group of agents. This results in strategic interactions both between the members of groups and across groups. Engel and Rockenbach (2011) examine public goods settings where contributions impose negative, positive, or zero externalities on a passive group of outsiders while maintaining the condition that provision is pro-social for the overall group. The sign of the externality varies in combination with the initial endowment of outsiders such that insiders might be initially richer, poorer or equally endowed as outsiders. The results of this study suggest that the presence of an outside group aggravates the social dilemma and significantly reduces insiders' provision levels if they face a risk of falling behind outsiders in terms of individual payoffs. The authors attribute this finding to an interaction of conditional cooperation and inequity aversion.

Delaney and Jacobson (2014) focus on settings where insiders' contributions to the public good impose negative externalities on outsiders, and these are sufficiently large such that overall provision becomes anti-social. The authors examine the influence of the social distance between insiders and outsiders by varying the degree of contact between outsiders and insiders. Greater contact results in a reduction in public goods provision by insiders (and thus negative externalities on outsiders are reduced).<sup>2</sup>

Finally, in a somewhat related study, Hauser, Rand, Peysakhovich, and Nowak (2014) examine an intergenerational common pool resource game where a given generation can extract a resource to exhaustion to maximize their own payoff, or leave some portion of the resource for the next generation (outsiders). Their primary finding is that a minority of subjects extract at high levels resulting in resource exhaustion and inefficiencies in an intergenerational context.

From the perspective of institutional analysis, the experimental literature on payments for ecosystem services is motivated by questions similar to those that motivate our study. In this literature, exogenous “payments” entail rewarding certain strategies based on pre-established institutional rules. Group composition is restricted to subjects who can actively provide the public good (insiders in our terminology).

In some studies, payments are tied to individual performance of players (Vollan (2008), Narloch, Pascual, and Drucker (2012), Handberg and Angelsen (2015), Midler, Pascual, Drucker, Narloch, and Soto (2015), Alpízar, Nordén, Pfaff, and Robalino (2015)), while in others the rewards are in form of collective payments to

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<sup>2</sup> Schwartz-Shea and Simmons (1990) examine a similar issue in the context of a prisoner's dilemma game in which cooperation by insiders imposes costs on outsiders, examining the role of communication as an institutional change to impact behavior.



the group based on group contributions (Narloch et al. (2012), Midler et al. (2015)). Narloch et al. (2012) and Midler et al. (2015) argue that when payments are conditional on group cooperation, payments might not only increase the potential payoffs an individual can earn, but also the expectations of cooperation levels by other group members. Similarly, matters of fairness come into play in defining the sharing rules of collective payments among individuals. According to these authors, depending on the context and the presence of social norms, payments conditional on group performance can further intensify the free-riding problem, leading to crowding-out effects, and potentially undermine pro-social norms of cooperation.

Our study moves the literature on payments for ecosystem services away from exogenous payments provided by an external authority to voluntary endogenous payments provided by the outsiders who benefit from the actions of the insiders. This line of research allows us to begin to understand the behavioral response by both insiders and outsiders to institutional changes that allow for cooperative building behavior, in settings in which there are individual incentives to free ride on the actions of others.

In this sense, our work is also related to the experimental literature on gift exchange games (e.g. Akerlof (1982)) and trust games (e.g. Berg, Dickhaut, and McCabe (1995)) where the sequential nature of the game provides opportunities for cooperation and reciprocity, but equilibrium predictions based on self-regarding preferences predict suboptimal use of the institutional arrangement. Our implementation of conditional transfers extends the one-to-one setting found in both the gift-exchange and trust-game literatures to a group-to-group public goods setting. This change results in strategic uncertainty by outsiders regarding the actions of other outsiders (within group strategic uncertainty) as well as regarding the action of

insiders (between group strategic uncertainty). Thus, free-riding incentives for insiders exist with respect to contributions to the public good and for outsiders with respect to contributions to transfers.

### **3 Decision settings and parameters**

We introduce a linear public good game in which provision of the public good creates positive externalities to both insiders and outsiders. In all decision making groups there are two randomly assigned types of players,  $n_I$  insiders and  $n_O$  outsiders, where  $n_I = n_O = 4$ , for a group size of 8 players. Types remain unchanged during the experiment.

All groups begin the experiment with a baseline condition of 5 decision rounds (Part 1) where insiders make provision decisions and outsiders are inactive, only receiving information on insiders' decisions. Part 1 is important because we are interested in institutional changes to environments in which there is a history in which insiders' contribution decisions affect outsiders. In addition, Part 1 allows subjects to become familiar with the decision setting in its simplest form, and allows for statistical control of group specific effects. In Part 2 subjects play the game for additional 10 decision rounds where the action set of outsiders varies across treatments. In the baseline treatment (*BL*) outsiders remain inactive and continue to only receive information on insiders' decisions. In the donation treatment (*Donation*) outsiders have the option to make non-contingent monetary transfers to insiders. Finally, in the contract treatment (*Contract*) outsiders can make monetary transfers to insiders that are contingent on insiders' aggregate contributions to the public good.

All players receive an endowment of  $w = 100$  Experimental Currency Units (ECUs) placed in their "Private Fund" in each round. Each insider  $i$  privately decides

how many ECUs of his endowment,  $g_i$ , to contribute to a “Group Fund”. Each ECU left in the “Private Fund” earns the individual one ECU. Every ECU contributed to the Group Fund yields a return of  $a = 0.4$  ECUs for each insider and each outsider. This defines the Group Fund as a pure public good with symmetric benefits to all subjects.

Insiders’ payoff function for the *BL* condition is given by a standard linear public goods game, as defined in equation 1. This describes a global social dilemma for self-interested payoff-maximizing agents for  $a < 1$  and  $(n_i + n_o)a > 1$ .

$$\pi_{i_i}^{BL} = w - g_i + aG \quad \text{where } G = \sum_1^{n_i} g_i \text{ and } g_i \in [0, w] \quad (1)$$

Outsiders are inactive in the Baseline. Their payoff function is given by:

$$\pi_{o_j}^{BL} = w + aG \quad (2)$$

### 3.1. Donation Treatment

Once the potential for transfers is included, the decision setting is a two-stage game. In the first stage each outsider  $j$  can make non-binding transfers,  $t_j$ , to the group of insiders. All transfers by outsiders are added together in a Transfer Fund of size  $T = \sum_1^{n_o} t_j$ , which is then equally split among insiders. As in BL, individual insiders have the opportunity to free-ride on the public good contributions of other insiders and thereby receive a return  $a$  for each ECU in the public good. In addition, in this treatments insiders receive  $\left(\frac{1}{n_i}\right)T$  independent of their own contribution. In the second stage, insiders observe the value of  $T$  and make their contribution decisions. By design, transfers received by insiders cannot be directly used for contributions to the Group Fund. Of course, unless insiders are contributing their full endowments to the Group Fund, transfers and endowment tokens are fungible, allowing insiders to respond to transfers by increasing the level of their contributions.

The resulting payoff functions for insiders and outsiders are given in equation (3) and (4):

$$\pi_{Ii}^{Donation} = w - g_i + aG + \frac{1}{n_i} T \quad (3)$$

$$\pi_{Oj}^{Donation} = w + aG - t_j \quad (4)$$

The decisions by outsiders can be viewed as contributions to a second-level public good, where the returns from transfers to insiders are uncertain. That is, outsiders face uncertainty with regard to how insiders will respond to the transfers. On the one hand, these unconditional transfers constitute a donation and might be understood as a signal of trust for which outsiders might expect reciprocal behavior of insiders by increasing contributions to the first-level public good. On the other hand, if insiders interpret observed transfers from outsiders as being “insufficient,” the reaction could be to lower their own contributions to the public good. It is in this sense that the opportunity for outsiders to subsidize public goods contributions by insiders could have either a negative or positive effect in a repeated game context.

In addition, note that for outsiders there exist incentives for a second-level free rider problem. Outsiders may prefer to free-ride on the transfers of fellow outsiders.

### *3.2. Contract Treatment*

In the Contract treatment outsiders can make individual transfers to the Transfer Account but the share of the transfer that is received by the group of insiders depends on their collective provision level. We thus differentiate between transfers offered by the group of outsiders  $T = \sum_1^{n_o} t_j$  and transfers received by the group of insiders  $T'$ , the latter being contingent on contributions to the first-level public good.  $T$  can be understood as a pool of available funds to reward the group of insiders for each unit contributed and defines the maximum aggregate reward insiders can receive. As long

as funds are available, every insider receives an equal share of  $\frac{1}{n_1}$  ECUs for each token the group of insiders contributes to the first-level public good. Once the Transfer Account is depleted, additional contributions to the first-level public good are not rewarded. Thus, for  $T > G$ ,  $T' = G$  and for  $T \leq G$ ,  $T' = T$ . By design, the availability of funds in the Transfer Account does not require that all transfers will be used. If  $T > G$  the remaining available funds are returned to outsiders in proportion to their individual transfers,  $(T - G) \frac{t_j}{T}$ .

Note that as in the Donation treatment, individual insiders have the opportunity to free-ride on the contributions of other insiders by benefiting from the first-level public good and in addition obtain  $\left(\frac{1}{n_1}\right) T'$  independent of their own contribution. Yet, given the contingency of transfers in the *Contract* treatment, the value of  $T'$  depends on each insiders' contribution decision as long as  $T > G$ .

Individual payoffs are represented as:

$$\text{if } T > G \quad \begin{cases} \pi_{Ii}^{Contract} = e_i - g_i + aG + \frac{1}{n_1} T' \\ \pi_{Oj}^{Contract} = e_o + aG - t_j + (T - G) \frac{t_j}{T} \end{cases} \quad (5)$$

$$\text{if } T \leq G \quad \begin{cases} \pi_{Ii}^{Contract} = e_i - g_i + aG + \frac{1}{n_1} T \\ \pi_{Oj}^{Contract} = e_o + aG - t_j \end{cases} \quad (7)$$

The conditional transfers in the Contract treatment are less risky for outsiders relative to the Donation treatment in the sense that outsiders' transfers are only rewarding insiders if insiders' actions warrant the transfer. Of course, the total impact of transfers depends on how insiders respond to the transfers offered. Suppose, after observing an offer of transfers  $T^1$  by outsiders, insiders contribute  $G = T^1$ . In this case, insiders could view transfers from outsiders strictly as a substitute for their contributions to the first-level public good. Alternatively, in this case, suppose

insiders' contributions are  $G = 2T^1$ . Then, insiders and outsiders share the costs of the provision of the first-level public good equally. Ultimately, the impact transfers have on total contributions depends on the responsiveness of insiders to transfers offered by outsiders. Similar to the Donation treatment, contributions to the Transfer Account can be viewed as contributions to a second-level public good, where free-riding incentives on other outsiders emerge.

Given our parameterization of  $a = 0.4$ , in the Contract treatment, the individual marginal value of contributions to the first-order public good for insiders is 0.65 and the group marginal value is 2.6 as long as  $T \geq G$ . Thus, if the group of insiders were made up of a single person, that individual would have a dominant strategy to contribute an amount equal to the offered transfers. So, in the Contracts treatment we would never see contributions less than offered transfers, and maybe greater if we build in the notion that contributions greater than transfers might induce greater transfers in future rounds. The incorporation of a group of insiders with multiple subjects induces free-riding incentives.

## **4 Experimental procedures**

To guarantee common information, the instructions for both insiders and outsiders were read out loud. At the beginning of the experiment, subjects were told there would be two parts, but were only informed about the details of Part 2 after the completion of Part 1. The language used in the experiment was neutral. There were two groups, Type A and Type B. Type A subjects made allocations to a Group Account. In Part 2, for the Donation and Contract treatments, Type B subjects made transfers to the group of Type A subjects, and this was common information. By design, Type A and B subjects did not make simultaneous decisions. In order to

guarantee anonymity, inactive subjects typed in the number of ECUs they expected the other subjects to allocate to the Group Account (transfer to the Transfer Account). These forecasts were not incentivized. After every decision round both insiders and outsiders received feedback on the insiders' total allocation to the Group Account, own individual earnings, and – if applicable – the amount of transfers allocated to the Transfer Account and distributed among the insiders. Before making decisions in Part 1 or Part 2, subjects answered quizzes to check their understanding of the games (see Supplementary Materials for instructions).

Sessions were conducted at the University of Innsbruck EconLab in June 2015 using z-Tree (Fischbacher, 2007). Each session included 3 independent groups of 8 subjects, apart from one session in the Donation treatment where there were only two groups. Table 1 summarizes the composition of the experiment. At the conclusion of the experiment subjects were asked to answer a short questionnaire before they were paid privately in Euros using a conversion rate of € 1 for every 200 ECUs. Sessions lasted for about an hour and participants earned an average of 12.24 Euros.

**Table 1.** Summary of experimental sessions

Treatment	Number of subjects	Number of groups	Number of sessions
Baseline	72	9	3
Donation	64	8	3
Contract	72	9	3
	208	26	9

## 5 Results

Pooling across individual decisions, Figure 1 shows the evolution of average contributions (solid lines) and transfers (dashed lines) in the baseline and the two treatment conditions for Parts 1 and 2. We focus the analysis on transfers offered  $T$ , to capture the intent of outsiders in the Contract treatment.

Despite Part 1 being the same for all treatments, we observe an initially significant difference in contributions between the groups in the Donation treatment and the other two treatments, which diminishes over time. We attribute these differences to specific group effects, as all subjects were recruited from the same subject pool, and there were no differences in how Part 1 was presented to the subjects. In addition, experimental sessions alternated across treatments. Importantly, at the end of Part 1 (rounds 4 and 5) we do not observe significant differences in contributions across the treatments.<sup>3</sup> In summary, the initial group specific effects disappear with repetition of the baseline game.

In Part 2, in both the Donation and Contract treatments, outsiders are observed to utilize the opportunity to make transfers to the insiders, with significantly higher transfers observed in the Contract treatment ( $p=0.00$ ). In both treatments, however, transfers decay across decision rounds from an average of 30.3% of outsiders' endowment to 6.7% in the Donation treatment, and from 37.6% to 12.3% in the Contract treatment.

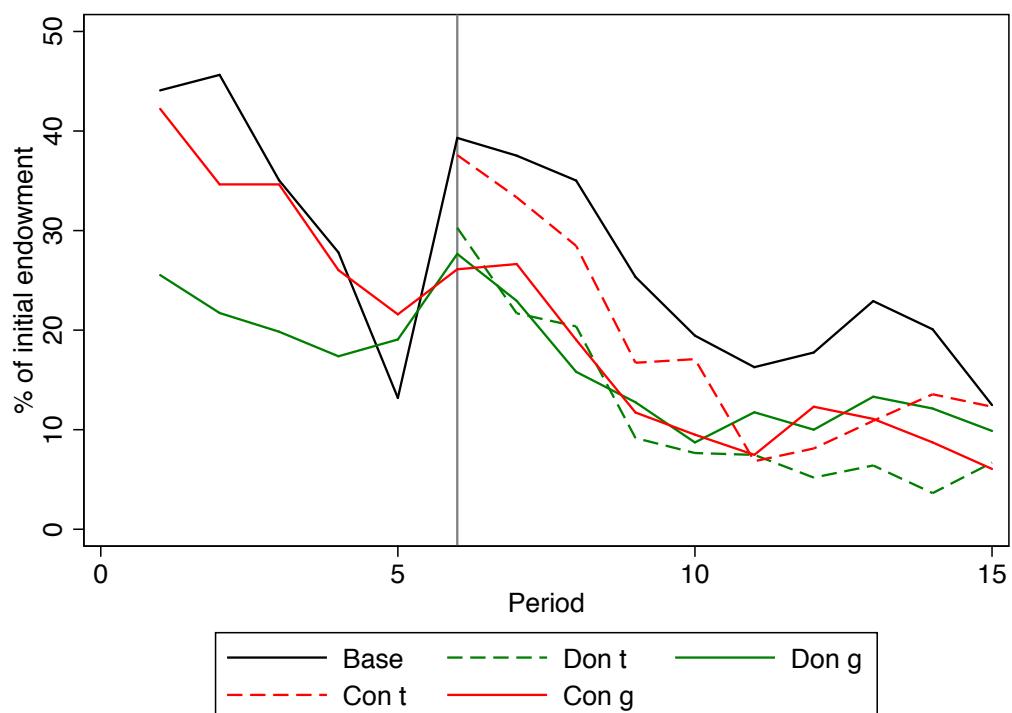
Concurrently, contributions to the Group Account follow a declining trend with a restart effect at the beginning of Part 2, a phenomena common in public good experiments (see e.g. Andreoni (1988), R. Croson, Fatas, and Neugebauer (2005), R. T. Croson (1996)). Importantly, in Part 2, across decision rounds, average contributions in the Baseline exceed contributions in the two treatments that allow for transfers ( $p=0.00$  for both comparisons). Average contributions in the Baseline start at 39.1% of insiders' endowment of 100 tokens in period 6 and decline to 12.5% in

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<sup>3</sup> Unless noted, unpaired t-tests are used for the comparison of means. For period 4 and 5 the respective p-values for differences between Baseline and Donation are 0.17 and 0.42.



the last period, while in the Donation (Contract) treatment contributions decline from 27.7% (26.1%) to 9.9% (6.1%). Contributions in the Donation and Contract treatments are not significantly different ( $p=0.73$ ).<sup>4</sup> Broadly speaking, there is very little evidence of reciprocal increases in contributions by insiders to the offer of transfers  $T$  observed prior to insiders' decisions. In only 40% (34%) of the decision rounds contributions exceed transfers offered in the Donation (Contract) treatment on the group level. The decisions from the first round of Part 2 are indicative to what was to follow. In only 50% (11%) of the groups in the Donation (Contract) treatment did contributions exceed transfers offered.



**Fig. 1** Average individual contributions and transfers offered over time

<sup>4</sup> Comparing Baseline to Donation, p-values for unpaired t-tests are significant at the 5% level in round 8. Comparing Baseline to Contract, p-values for unpaired t-tests are significant at the 5% level in rounds 8, 9, and 14.

Table 1 presents results from GLS regressions with random effects on individual insiders' contributions and individual outsiders' transfers offered. These results are consistent with those reported above for the group level data. Contributions to the Group Account are significantly lower in the Donation and Contract treatments relative to the Baseline. A post-estimation Wald-test confirms that the difference in contributions between the Donation and Contract treatments is not statistically significant ( $p=0.99$ ). Moreover, column 2 shows that the difference in individual transfers offered between the reference category Donation and the Contract treatment is marginally insignificant (with a  $p$ -value of 0.11).

**Table 2.** Random effects GLS: Individual contributions and transfers

	(1) Contributions (Insiders)	(2) Transfers (Outsiders)
Donation	-9.697* (0.088)	NA (.)
Contract	-9.675** (0.049)	6.792 (0.114)
Period	-2.143*** (0.000)	-2.772*** (0.000)
Constant	41.73*** (0.008)	36.80*** (0.000)
<i>N</i>	1040	680
Number of clusters	104	68
R-squared (overall)	0.0945	0.109

*p*-values in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

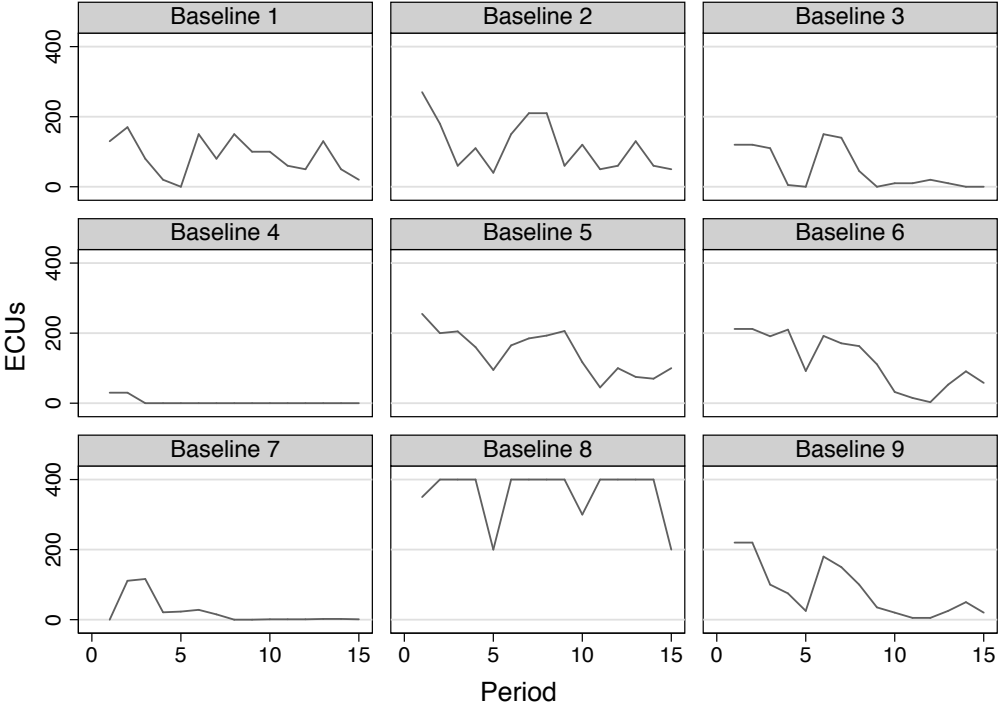
Baseline and Donation is the reference category for (1) and (2) respectively.

All regressions include controls for age and gender which are not found to be statistically significant

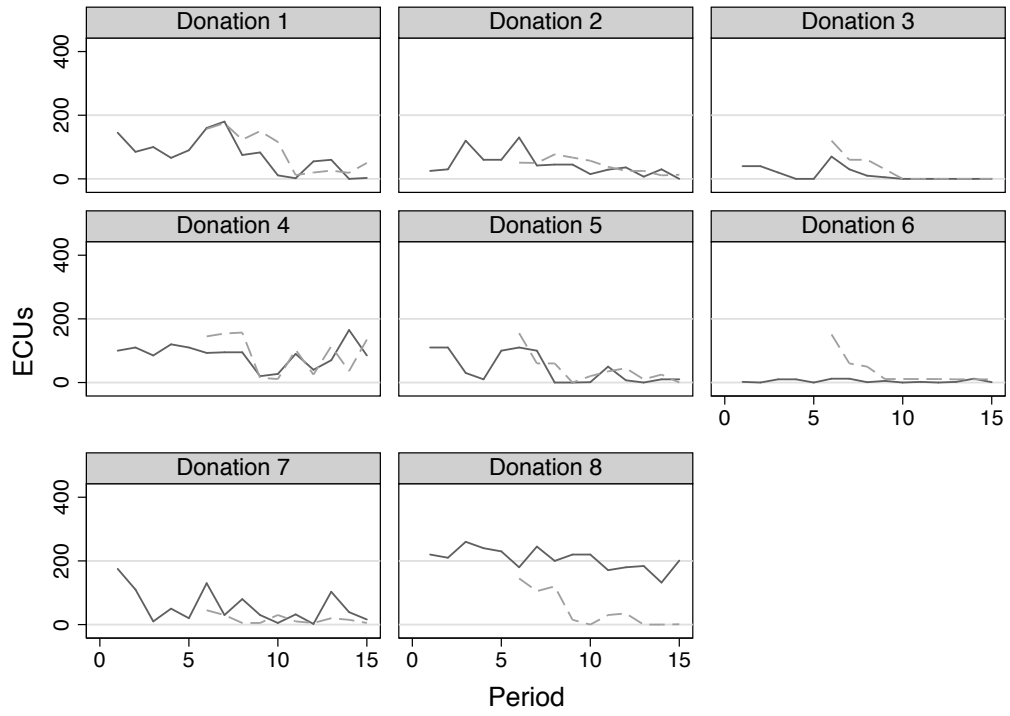
We next turn to an examination of individual group effects across treatment conditions. Figures 2A, 2B and 2C display group contributions and transfers for the Baseline, Donation, and Contract treatments respectively.<sup>5</sup> As shown, in all three

<sup>5</sup> Groups 7 and 8 in the Donation treatment were in the session where there are only these two groups.

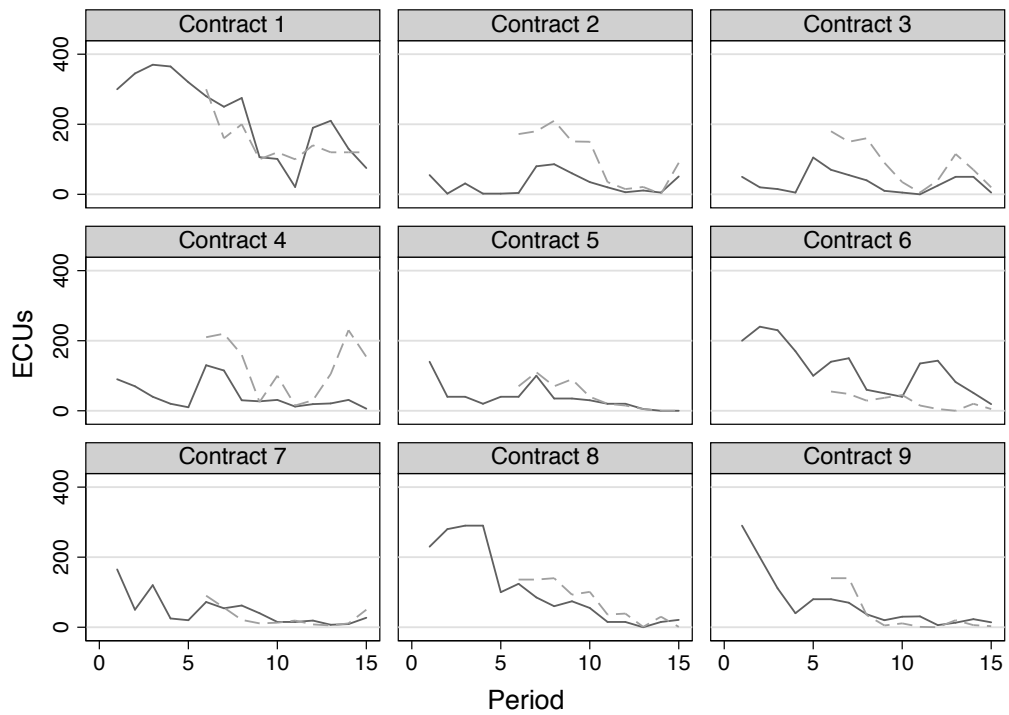
treatment conditions, there is considerable between-group variation, with some groups sustaining relatively high contribution levels while others contributing close to zero across decision rounds. See for example group 8 as compared to 4 in the Baseline treatment, 8 and 6 in the Donation treatment, and 1 and 5 in the Contract treatment.



**Fig. 2A** Baseline: group contributions



**Fig. 2B** Donation: group contributions (solid lines) and transfers (dashed lines)



**Fig. 2C** Contract: group contributions (solid lines) and transfers (dashed lines)

Turning to the interaction between transfers and contributions in the Donation treatment, Figure 2B shows that for most groups, there is a remarkably close correlation between transfers and contributions. That is, there is very little evidence that insiders contribute more than what they receive from outsiders. The exception is group 8 in the Donation treatment, where cooperation was high in Part 1, and where outsiders find transfers incapable to stimulate further cooperation. Similarly, as shown in Figure 2C, transfers offered by outsiders in the contract treatment are generally above contributions made by insiders, resulting in a large number of decision rounds in which a proportion of the transfers offered is returned to the outsiders. Thus, despite the increase in marginal value of contributions to the first-order public good when there are transfers available under contracts, insiders do not substantially respond to that.

This visual analysis, however, does not allow one to examine the period by period response by individual insiders to transfers offered in the Donation and Contract treatments. Focusing on individual contributions, Table 3 presents the results from a GLS analyses designed to examine the temporal dynamics of contributions and their relation to outsiders' transfers. The independent variables includes the difference between the individual contribution and the average of the other insiders contribution in one's group in the previous round and an even share of the amount of transfers offered by outsiders.

As shown in Table 3, there is evidence that individuals respond similarly to transfers in the Donation and Contract treatments. In particular, there is a significant positive correlation between transfers offered and contributions in both treatments. Notice that the positive correlation is not a construct of the institution itself, as

insiders have the option, but not the obligation, in the Contract treatment to increase contributions to the first-level public good as offers of transfers increase.

The lagged difference between own and other insiders' contributions is significant only in the Contract treatment. Positive deviations from the average contribution level in the previous round further increase individual contributions.

**Table 3.** Individual Contributions: Response to transfers

	(1) Donation	(2) Contract
Lagged difference between own and other insiders' contribution	0.0653 (0.428)	0.165* (0.068)
Individual share of transfers (offered)	0.337** (0.021)	0.357*** (0.000)
Period	-0.678 (0.152)	-1.036*** (0.002)
Constant	-13.47 (0.472)	37.07*** (0.009)
<i>N</i>	320	360
Number of clusters	32	36
R-squared (overall)	0.133	0.280

*p*-values in parentheses

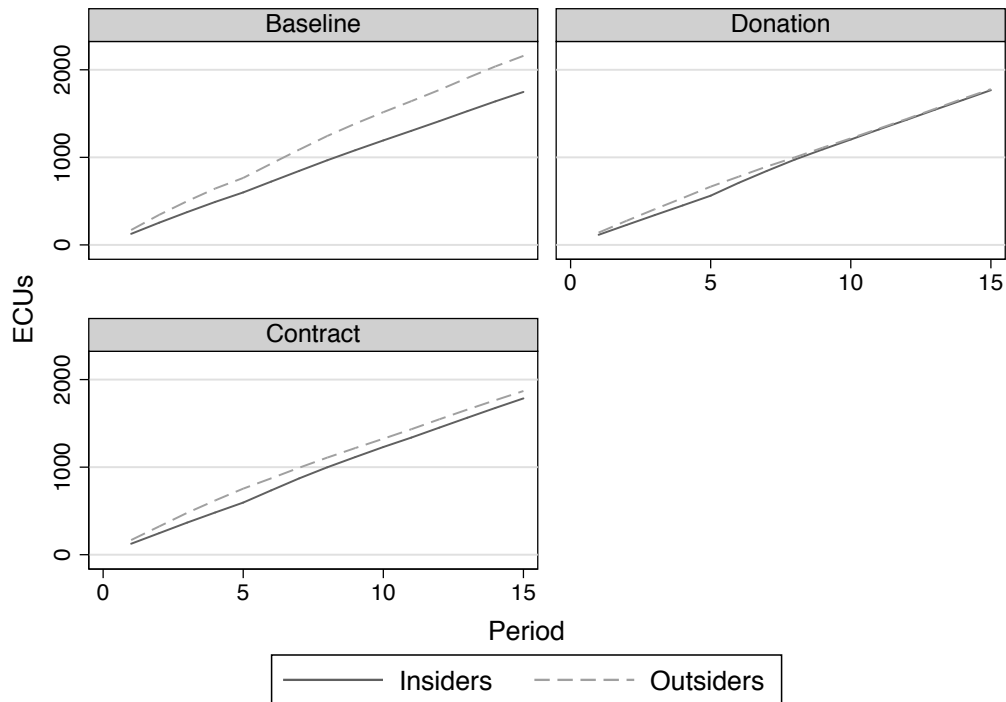
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

All regressions include controls for age and gender.

### 5.1 Additional experiments as a robustness check

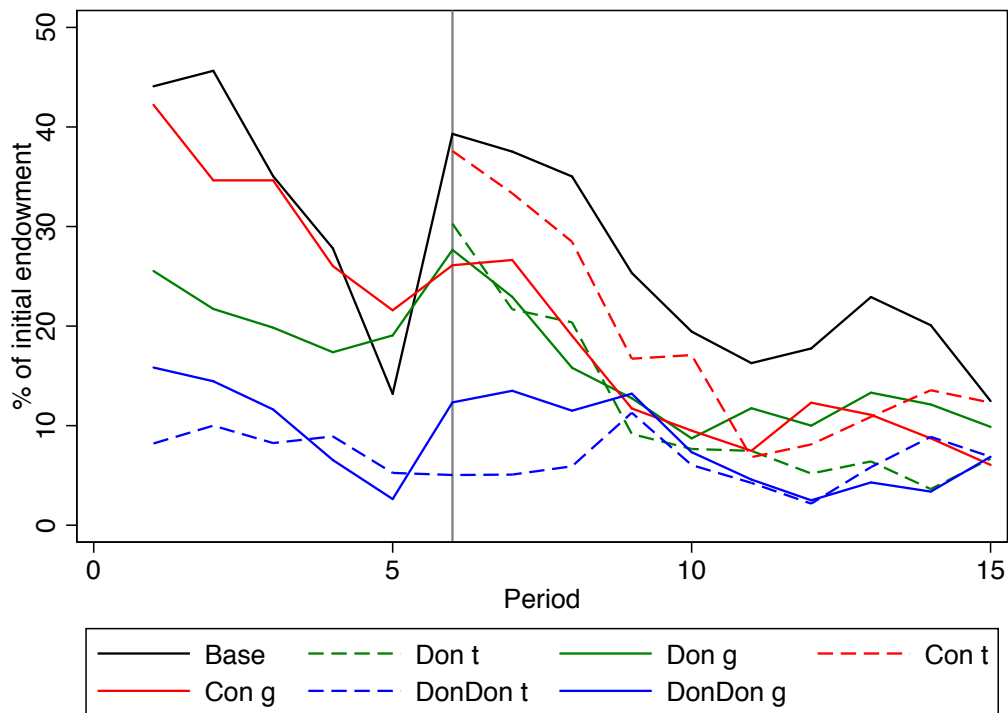
Are the results driven by payoff-differences induced during the experiment? Engel and Rockenbach (2011) provide evidence that low cooperation levels for insiders in a setting with positive externalities for outsiders can be an aversion to "being behind" in terms of payoffs. In our experimental design, insiders and outsiders begin the game with the same endowment, but start part 2 of the sessions with differences in payoffs. During part 1 outsiders are passive by-standers that benefit from the contribution efforts of insiders to the public good. Thus, insiders are solely responsible for provision of the public good. Average aggregate payoffs at the end of Part 1 are 731

ECUs for outsiders and 587 ECUs for insiders. In part 2, this inequality grows in the Baseline (see Figure 3). In the Donation treatment, there is a tendency for insiders to balance payoff differences. They do so by contributing individually on average only slightly more to the public good (14 ECUs) than what they receive in transfers (12 ECUs) and thereby shifting the main burden of provision onto outsiders. On the other hand, average individual contributions to the Group Account in the Contracts treatment are the same as for the Donation treatment (14 ECUs) while higher transfers are available (18 ECUs). Thus, insiders are leaving some rewards in the Transfer Account that are returned to outsiders and do not increase insiders' payoffs.



**Fig. 3** Average individual payoffs for each treatment for insiders and outsiders separately.

In order to examine whether the five decision rounds of Part 1 played a role overall on behavior, we conducted two additional sessions where outsiders were active from the beginning.<sup>6</sup> Beginning with decision round 1, outsiders had the option to offer transfers to insiders. We refer to this robustness treatment as Donation-Donation. Figure 4 presents the data in Figure 1 and additionally includes average contributions and transfers offered in Donation-Donation. As shown, both contributions and transfers are at levels similar (or lower) than those observed in part 2 of the original Donation treatment.



**Fig 4.** Average individual contributions and transfers offered over time including the additional Donation-Donation session.

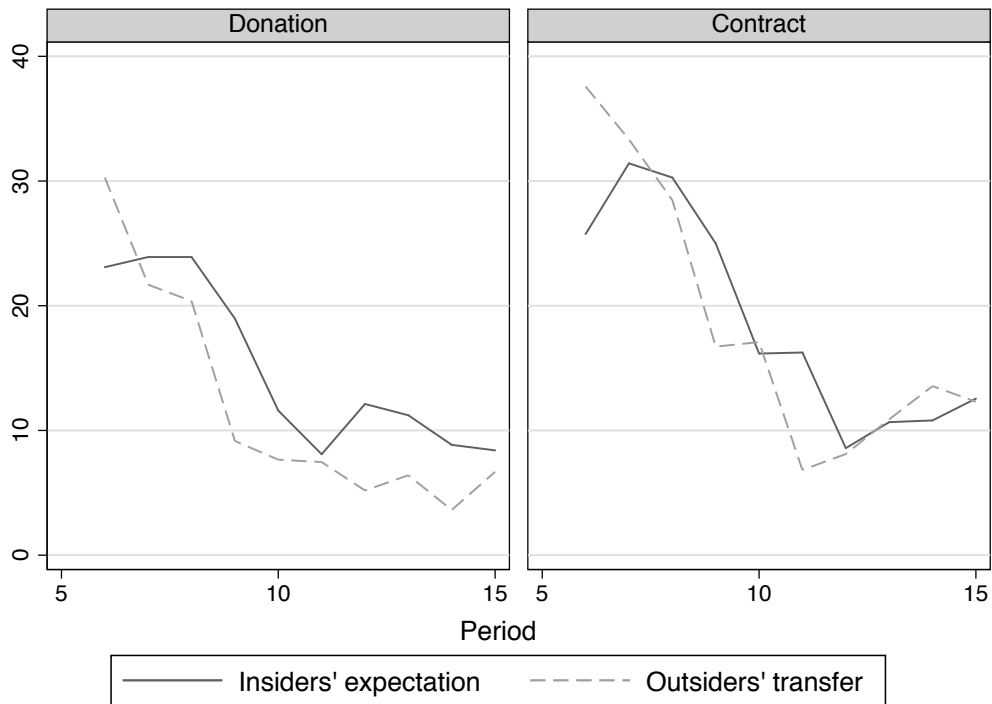
<sup>6</sup> For consistency with the initial treatments, the instructions included a Part 1 and a Part 2. Subjects were told at the end of part 1 that the game would continue for 10 more rounds. In one of the sessions in addition to distributing and collecting control questions we publicly reviewed the correct answers. Contributions and transfers in the two sessions are not significantly different.



### *5.2. The role of unfulfilled expectations*

One potential explanation for why the transfer treatments do not generate increases in public goods provision relates to unfulfilled expectations of insiders regarding the size of transfers. If these are considered to be too low, insiders might reduce cooperation levels. This might result from an erosion of norms for cooperation and reciprocity, or a desire to limit the benefits that outsiders derive from own actions by insiders. Previous studies have shown that subjects in laboratory experiments are more cooperative with other subjects who display strategies perceived to be fair (Fischbacher, Gächter, and Fehr (2001)), and use opportunities for costly punishment to punish norm violators (Fehr and Gächter (2000)). Further, in experiments with costly punishment, subjects have been shown to display counter-punishment strategies (Nikiforakis (2008)). In our experiment, counter-punishment could lead to a cycle of declining transfers accommodated by declining public goods provision.

Figure 5 provides an illustration of insiders' expectations of average individual transfers in comparison to actual transfer decisions taken by outsiders in the two treatments. We observe that in in period 6, average transfers are greater than average expectations. However, following observed contributions by insiders, the outsiders begin to decrease their transfers, which then become lower than expectations until the end of the sessions.



**Fig. 5** Expected and actual transfers

## 6 Discussion of results

The results presented above for both the Donation and Contract treatments present a rather dismal outlook in regard to how outsiders might have a significant positive influence on public goods provision by insiders. Broadly speaking, there is almost no evidence of systematic cooperation between outsiders and insiders, whereby provision of the public good is increased relative to the Baseline as a result of an endogenous reciprocal relationship developing. Importantly, this behavior is relatively consistent across groups and across decision rounds (group 8 in the Donation condition represents a rare exception).

Further, the lack of success of the two institutions is not the result of a cooperative relationship that develops in early rounds and then decays. For the Donation-Donation sessions, cooperation and transfers are below 20% of subjects' endowment from round 1. For the sessions where the institutions come into place in part 2, the

offer of transfers is considerable in early rounds of the treatments (albeit somewhat lower in the Donation treatment). The transfers do decay across rounds, but as shown this mainly results from insiders substituting the amount they receive from transfers for their contributions, without reciprocating in the form of increased contributions. After this happens, cooperation simply decays.

Previous experimental literature examining rewards within groups shows that rewards can have a significant positive effect on promoting cooperation, although the effect is found to decay across time (see for example Sefton, Shupp, and Walker (2007)). This study suggests a different dynamic in an environment where there are strategic interactions between two different groups of subjects and rewards are not tied to individual performance.

The lack of success of the contract institution is particularly remarkable. Insiders do not fully use the transfers outsiders offer, suggesting a problem of free-riding in the insider groups. Insiders' free-riding in the contract treatment seem to be strong enough to preclude increasing contributions by insiders as compared to the donation or baseline treatments, even though insiders' individual marginal value for contributions is 0.65 in the contract treatment and 0.4 in the other two treatments.

Another potential driver of insiders' behavior might stem from crowding-out effects. If contributions to the public good in the baseline are substantially derived from intrinsic motivations and social norms, introducing a notion of monetary compensation (conditional or unconditional) for the action can result in lower performance. Previous literature shows that in environments dominated by social norms, introducing notions of monetary compensation or even simply to prime subjects into monetary thinking can induce lower performance.

## References

- Akerlof, G. A. (1982). Labor contracts as partial gift exchange. *The Quarterly Journal of Economics*, 543-569.
- Alpizar, F., Nordén, A., Pfaff, A., & Robalino, J. (2015). Unintended Effects of Targeting an Environmental Rebate. *Environmental and Resource Economics*, 1-22.
- Andreoni, J. (1988). Why free ride?: Strategies and learning in public goods experiments. *Journal of public Economics*, 37(3), 291-304.
- Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, reciprocity, and social history. *Games and economic behavior*, 10(1), 122-142.
- Croson, R., Fatas, E., & Neugebauer, T. (2005). Reciprocity, matching and conditional cooperation in two public goods games. *Economics Letters*, 87(1), 95-101.
- Croson, R. T. (1996). Partners and strangers revisited. *Economics Letters*, 53(1), 25-32.
- Delaney, J., & Jacobson, S. (2014). Those outsiders: How downstream externalities affect public good provision. *Journal of Environmental Economics and Management*, 67(3), 340-352.
- Engel, C., & Rockenbach, B. (2011). We are not alone: the impact of externalities on public good provision. *MPI Collective Goods Preprint*(2009/29).
- Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review*, 90(4).
- Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics*, 10(2), 171-178.
- Fischbacher, U., Gächter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, 71(3), 397-404.
- Handberg, Ø. N., & Angelsen, A. (2015). Experimental tests of tropical forest conservation measures. *Journal of Economic Behavior & Organization*, 118, 346-359.
- Hauser, O. P., Rand, D. G., Peysakhovich, A., & Nowak, M. A. (2014). Cooperating with the future. *Nature*, 511(7508), 220-223.
- Midler, E., Pascual, U., Drucker, A. G., Narloch, U., & Soto, J. L. (2015). Unraveling the effects of payments for ecosystem services on motivations for collective action. *Ecological Economics*, 120, 394-405.
- Narloch, U., Pascual, U., & Drucker, A. G. (2012). Collective action dynamics under external rewards: experimental insights from Andean farming communities. *World Development*, 40(10), 2096-2107.
- Nikiforakis, N. (2008). Punishment and counter-punishment in public good games: Can we really govern ourselves? *Journal of public Economics*, 92(1), 91-112.
- Schwartz-Shea, P., & Simmons, R. T. (1990). The layered prisoners' dilemma: Ingroup versus macro-efficiency. *Public Choice*, 65(1), 61-83.
- Sefton, M., Shupp, R., & Walker, J. M. (2007). The effect of rewards and sanctions in provision of public goods. *Economic Inquiry*, 45(4), 671-690.
- Vollan, B. (2008). Socio-ecological explanations for crowding-out effects from economic field experiments in southern Africa. *Ecological Economics*, 67(4), 560-573.

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Esther Blanco, Tobias Haller, James M. Walker

Provision of public goods: Unconditional and conditional donations from outsiders

**Abstract**

The provision of public goods often benefits a larger group than those who actively provide the public good. In an experimental setting, this paper addresses institutional arrangements between subjects who can provide a public good (insiders) and subjects who benefit from the public good but cannot provide it (outsiders). We compare a setting of passive outsiders to situations where outsiders can either make unconditional transfers (donations) or conditional transfers (contracts) to the insiders. The primary behavioral question is to what extent outsiders will respond to the opportunity to subsidize the contributions of insiders and will insiders use such subsidies to increase contributions or simply substitute them for their own contributions. The results suggest the latter. In fact, once conditional or unconditional transfers are allowed, insiders decrease contributions to the public good relative to the baseline condition without transfers.

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