

# Designing Feedback in Voluntary Contribution Games - The Role of Transparency

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## Abstract

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We analyze the effects of limited feedback on beliefs and contributions in a repeated public goods game setting. In a first experiment, we test whether exogenously determined feedback about a good example (i.e., the maximum contribution in a period) in contrast to a bad example (i.e., the minimum contribution in a period) induces higher contributions. We find that when the type of feedback is not transparent to the group members, good examples boost cooperation while bad examples hamper it. There is no difference when the type of feedback is transparent. In a second experiment, feedback is endogenously chosen by a group leader. The results show that a large majority of the group leaders count on the positive effect of providing a good example. This is true regardless whether they choose the feedback type to be transparent or non-transparent. Half of the group leaders make the type of feedback transparent. With endogenously chosen feedback about good examples no difference in contributions can be observed among transparent and non-transparent feedback selection. In both experiments feedback shapes subjects' beliefs. With exogenously chosen feedback, transparent feedback tends to reduce beliefs when good examples are provided as feedback and tends to increase beliefs in when bad examples are provided as feedback compared to the respective non-transparent cases. Our results shed new light on the design of feedback provision in public goods settings.

**JEL-Classification:** H41; C92; D82

**Keywords:** Feedback Design, Transparency, Public Goods, Imperfect Conditional Cooperation, Experiment

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# Designing Feedback in Voluntary Contribution Games – The Role of Transparency

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## Abstract

We analyze the effects of limited feedback on beliefs and contributions in a repeated public goods game setting. In a first experiment, we test whether exogenously determined feedback about a good example (i.e., the maximum contribution in a period) in contrast to a bad example (i.e., the minimum contribution in a period) induces higher contributions. We find that when the type of feedback is not transparent to the group members, good examples boost cooperation while bad examples hamper it. There is no difference when the type of feedback is transparent. In a second experiment, feedback is endogenously chosen by a group leader. The results show that a large majority of the group leaders count on the positive effect of providing a good example. This is true regardless whether they choose the feedback type to be transparent or non-transparent. Half of the group leaders make the type of feedback transparent. With endogenously chosen feedback about good examples no difference in contributions can be observed among transparent and non-transparent feedback selection. In both experiments feedback shapes subjects' beliefs. With exogenously chosen feedback, transparent feedback tends to reduce beliefs when good examples are provided as feedback and tends to increase beliefs in when bad examples are provided as feedback compared to the respective non-transparent cases. Our results shed new light on the design of feedback provision in public goods settings.

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# 1 Introduction

How should feedback provision be designed to foster cooperation in repeated public goods settings? One of the most established observations in experimental research on repeated public goods games is that the behavior of a majority of individuals can be described as ‘conditionally’ cooperative, i.e., individuals cooperate when others do likewise (Fischbacher et al., 2001). Furthermore, Fischbacher and Gächter (2010), Neugebauer et al. (2009), and Muller et al. (2008) find that subjects do not perfectly match the other players’ behavior. More precisely, they tend to contribute a bit less compared to what *they think* others do. As a result, contributions go down as the game is repeated. Such behavior is called ‘imperfect conditional cooperation’.<sup>1</sup> To understand how this behavioral tendency unfolds, it is important to learn more about how information on others’ contributions influences the decision to contribute.<sup>2</sup>

In this paper, we systematically investigate how selectively providing feedback on others’ behavior influences contribution behavior. Disclosing behavioral regularities under different feedback designs is of high practical relevance for environments such as teamwork in firms, the maintenance of community goods, or donations to charity. Think, for example, of teamwork. The individual efforts of the team-members might not be easily observable when the team-members are working in different places or at different times. Or, imagine the attempt of a city community to preserve the cleanliness of its public parks or train stations. In such locations, it is typically hardly observable what other community members contribute to sustain the common goods. Likewise, in many charity- or nonprofit-crowdfunding initiatives, donors might not be aware of what others donated. A common feature of these examples is a typical lack of transparency regarding others’ behavior. Workers, citizens, or donors often do not receive complete informative feedback on how others behave. Thus, they are not able to perfectly condition their behavior on others’ contributions. Furthermore, if they learn about single instances of behavior, they typically cannot unambiguously assess how representative these examples are.

Firms provide employees with feedback on their peers’ efforts via public performance postings or public recognition programs like ‘Employee of the month’ (e.g., Johnson and Dickinson, 2010; Luthans, 2000; Nordstrom et al., 1991). Communities initiate campaigns that selectively highlight appropriate behaviors or exemplary citizens to facilitate cooperation.<sup>3</sup> Charity and crowdfunding organizations post exemplary donations on their websites. For their readers, however, it is not transparent how these examples have been selected.<sup>4</sup> Despite the fact that the feedback systems are in place, their impact on contributions is not well understood. In particular, what subjects (can) exactly learn about their peers’ behavior, and subjects’ beliefs – presumably shaped by the feedback on their peers’ behavior – might play a crucial role in such dynamics. So far, however, little systematic evidence is available on how (selected) feedback about

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<sup>1</sup>Neugebauer et al. (2009) use the term ‘selfishly-biased conditional cooperation’. Because the underlying motive of not perfectly cooperating could have several reasons, we stick to the term ‘imperfect conditional cooperation’ throughout the paper.

<sup>2</sup>Previously, experimental economists put huge efforts into investigating mechanisms that stabilize contribution behavior over time. Chaudhuri (2011) provides an excellent survey of laboratory experiments on this topic. Research focuses on punishment (Xiao and Houser, 2011; Fehr and Gächter, 2000; Gülerk et al., 2006), incentives (Bracht et al., 2008), communication (Bochet et al., 2006; Isaac and Walker, 1988), sorting and group formation (Ahn et al., 2009; Gächter and Thöni, 2005; Page et al., 2005), moral suasion (Masclot et al., 2003), and recommendations (Chaudhuri and Paichayontvijit, 2010) affecting contribution levels.

<sup>3</sup>See, for example, the City of London’s ‘Clean City Awards Scheme’ initiative ([www.cityoflondon.gov.uk](http://www.cityoflondon.gov.uk)). In addition, consider the field experiment by Costa and Kahn (2013), where households receive tailored feedback about the energy consumption of their neighbors.

<sup>4</sup>See, e.g., npENGAGE, a platform for nonprofit fundraising ([www.npengage.com](http://www.npengage.com), see Figure A.1 in the Appendix for a screenshot), INDIEGOGO or Crowdfunder, two major crowdfunding platforms ([www.indiegogo.com](http://www.indiegogo.com), [www.crowdfunder.co.uk](http://www.crowdfunder.co.uk), see Figure A.2 and A.3 for screenshots).

others' behavior affects cooperation in repeated settings.<sup>5</sup>

To narrow this gap, we report on two repeated public goods experiments with feedback. In the first experiment, feedback is provided *exogenously* (i.e., by the experimenters) to the group of contributors. Subjects receive feedback about a single contribution in the group. We vary the way in which this particular contribution is selected as feedback and focus on two simple feedback selection rules: good and bad examples, i.e., subjects receive feedback either about the maximum contribution (MAX) or the minimum contribution (MIN) provided in the previous period in the group. As a control, subjects receive feedback about a randomly selected contribution (RAND). Additional to the feedback selection rule, we alter the subjects' knowledge of which rule is applied, i.e., the awareness of the feedback selection rule (*transparent* or *non-transparent*). In our first experiment, we study how i) good and bad examples of behavior influence agents' inclination to cooperate and ii) the transparency about how the feedback was selected shapes the agents' inclination to contribute. In our second experiment, feedback is selected *endogenously*, i.e., by a participant of the experiment. To this end, we add a group leader to the group who benefits from the group members' contributions. The group leader has an incentive to elicit high total contributions. In addition, we make the available feedback rules salient to the group members.<sup>6</sup> In the second experiment, we additionally study i) which feedback rules group leaders choose, ii) whether they make the feedback rule transparent or not, and iii) how the group members respond to endogenously implemented feedback regimes. In both experiments, we analyze the dynamics of feedback, agents' beliefs and contributions over time.

The results are as follows: In the first experiment, where the feedback selection rule is exogenously determined, we observe that good examples have a lasting positive effect on average contributions when the feedback rule is non-transparent compared to the control. The positive effect of good examples is not observed when the feedback selection rule is transparent. For bad examples, we find the opposite effect: when bad examples are provided as feedback and the feedback selection rule is non-transparent, cooperation is lower compared to the control. The former is also lower compared to a situation where it is transparent that the provided feedback is the minimum contribution.

In the second experiment, we observe that most group leaders choose to provide the maximum contribution as feedback. About half of them make their choice of this feedback rule transparent. If the group leaders decide to keep the feedback selection rule non-transparent, they more often display the maximum contribution as compared to when they decide to make the feedback rule transparent. Most importantly, when the group leaders choose the maximum contribution as feedback, no difference in contributions can be observed between the cases when the leaders make this feedback rule transparent or not.

Our analysis on the dynamics of feedback, beliefs, and contributions reveals that most individuals are imperfect conditional cooperators, who contribute a little less than what they believe others do. Feedback shapes subjects' beliefs and beliefs and contributions are highly correlated, independent of the feedback rule. When the type of feedback is exogenously selected beliefs in the transparent case are lower (higher) in MAX (MIN) compared to the non-transparent case. The same difference between transparent and non-transparent is not observed when the feedback is endogenously chosen. At least this is true for the MAX case. For the other cases we have too small numbers of observations in the endogenous case since those who choose the feedback predominantly select MAX. Presumably this is because they expect providing

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<sup>5</sup>One recent exception is Thomas and Thornock (2015) who study the role of feedback in team production.

<sup>6</sup>As argued above, in many environments people have only limited information on the contributions of others and the used feedback rules. They might only be able to suspect what others do or which feedback rules are implemented by whom. To control for this suspicion, we make the available feedback rules salient.

good examples to be effective in enhancing cooperation. Recipients of feedback, however, seem to expect that good examples are chosen as feedback in the endogenous cases. As a result providing good examples as feedback is only effective when the recipients of feedback are not aware of the available feedback rules and that the feedback actually stems from good examples.

The paper is organized as follows: Section 2 describes the design of our two experiments. The results are presented in Section 3. In Section 4, we offer an interpretation of our results, link them to the existing literature, and present potential implications for the design of feedback institutions.

## 2 Experimental implementation

Our experiments are based on a computerized ten-period standard linear public goods game with partner matching. All group members are endowed with 20 points in each period. Points may be allocated to the public good or kept in the private account. The payoff  $\pi_i$  for each group member in each period is determined by

$$\pi_i = 20 - c_i + 0.4 \cdot \sum_{j=1}^4 c_j,$$

where  $c_i$  represents the amount contributed by individual  $i$ .<sup>7</sup> Keeping the money yields a private marginal return of one, while contributing to the public good delivers a marginal per capita return of 0.4 for each of the four group members. Thus, it is a dominant strategy not to contribute if one assumes selfish, myopic and purely money-maximizing preferences and common rationality. Based on this framework, in the first experiment, we implement six treatments with different exogenously determined feedback. In the second experiment, feedback is endogenously determined.

Both experiments were conducted at the Cologne Laboratory for Economic Research (CLER). The first experiment comprised nine sessions, the second experiment included eight sessions. A session lasted for about one hour. The experiments were computerized with the software z-Tree (Fischbacher, 2007). One point was worth 0.04 €. In total, 515 subjects were recruited online with the software ORSEE (Greiner, 2015). Individuals' earnings from each period were summed up and paid out at the end. Subjects earned 12.76 (12.18) € on average, including a 2.5 € show-up fee, in the first (second) experiment with exogenously (endogenously) determined feedback.

### 2.1 Exogenous feedback selection

In our experiment with *exogenous* feedback selection, one period consists of three different stages presented on three separate computer screens. First, a group member has to decide about the number of points that she is willing to contribute. On a second screen, she is asked to state her belief about the average contribution of the other three group members in the current period.<sup>8</sup> In a third stage, all members in a group receive the same feedback about a single contribution from one group member. They receive no further information.<sup>9</sup> In the instructions and on the screens it is clearly indicated that all subjects in the group of four receive the same feedback and that the shown contribution can potentially be their own.

<sup>7</sup>Experimental instructions and quiz questions are taken from Fehr and Gächter (2000) and adapted to our experiment. Original instructions were in German. These and an English translation are available from the authors upon request.

<sup>8</sup>Belief elicitation is incentivized in our experiment. If subjects either correctly predict the average of the other three participants or their predictions lie in a  $\pm 0.5$  range of the real average, they additionally receive 5 points. Since feedback about the accuracy of their estimation may influence subjects' decisions in the following periods, we deliver feedback about the accuracy of their predictions only after the final period.

<sup>9</sup>In our experiment, feedback on earnings in the period is provided at the end of the last period.

Table 1: Overview of treatments, feedback rules, subjects and groups

Treatments	Rule	Subjects	Groups
<i>Exogenous feedback selection</i>			
<i>Non-transparent</i>			
MAX	$\max(c_1, \dots, c_4)$	48	12
MIN	$\min(c_1, \dots, c_4)$	40	10
RAND	$\text{rand}(c_1, \dots, c_4)$	48	12
<i>Transparent</i>			
MAX	$\max(c_1, \dots, c_4)$	48	12
MIN	$\min(c_1, \dots, c_4)$	48	12
RAND	$\text{rand}(c_1, \dots, c_4)$	48	12
<i>Endogenous feedback selection</i>			
<i>Non-transparent</i>			
MAX	$\max(c_1, \dots, c_4)$	95	19
MIN	$\min(c_1, \dots, c_4)$	5	1
RAND	$\text{rand}(c_1, \dots, c_4)$	5	1
<i>Transparent</i>			
MAX	$\max(c_1, \dots, c_4)$	80	16
MIN	$\min(c_1, \dots, c_4)$	20	4
RAND	$\text{rand}(c_1, \dots, c_4)$	30	6

Notes: This table provides an overview on the treatments with exogenous or endogenous feedback selection. Columns of subjects and groups display the number of involved subjects and groups. In MIN, under exogenous non-transparent feedback selection, we are lacking two observations due to subjects not showing up to the experiment. In the treatment with endogenous feedback selection, the numbers of subjects and groups differ across rows corresponding to the group leaders' decisions.



We implement six treatments with exogenous feedback selection using a  $3 \times 2$  factorial design. We exogenously vary the feedback selection rule and the transparency of the selection rule. We employ three feedback selection rules. Subjects receive feedback either about the *maximum* (MAX) or the *minimum* (MIN) contribution in a group. In addition, in a reference treatment, subjects receive feedback about a *randomly selected* contribution (RAND). We employ each of the feedback selection rules *non-transparently*, i.e., subjects are not informed how the feedback is selected, as well as *transparently*, i.e., subjects know how the feedback is selected. The type of feedback and the type of transparency stays the same in all periods.<sup>10</sup> An overview of the treatments with exogenous feedback selection is displayed in the upper panel of Table 1.

## 2.2 Endogenous feedback selection

In the experiment with *endogenous* feedback selection groups consist of five subjects. We randomly select one player to be the group leader. The group leader does not receive any endowment in any of the periods and does not contribute. The payoff  $\pi_l$  for the group leader in each period is given by

$$\pi_l = 0.4 \cdot \sum_{j=1}^4 c_j,$$

where  $\sum_{j=1}^4 c_j$  represents the total amount contributed by the other four group members. Hence, the group leader's payoff is determined solely by the contributions of the other group members. The payoff of the other group members is calculated like in our exogenous feedback selection experiment.

Before the first period of the public goods game, the group leader determines which feedback group members receive in each of the ten following periods. The group leader can choose between different feedback selection rules, i.e. show the *maximum* (MAX), the *minimum* (MIN), or a *randomly selected* contribution (RAND). Moreover, the group leader decides whether feedback is provided *non-transparent*, i.e., group members are not informed about the specific feedback selection rule, or *transparent*, i.e., subjects are informed about the feedback selection rule. The choice-set of the group leader mirrors our treatments with exogenous feedback selection, i.e., the group leader can implement six different feedback regimes. In contrast to our treatments with exogenous feedback selection, the action space of the group leader is common information, i.e., the subjects deciding as group members and group leaders received identical experimental instructions. Thus, the group members are aware that the group leader either intentionally opts for or against transparency in combination with an implemented feedback rule.

For the group leader, one period consists of two stages presented on two separate computer screens. On the first screen, the group leader is asked to state his belief about the average contribution of the four group members during this period. On the second screen, the group leader receives feedback about a single contribution from one group member according to the feedback selection rule he chose in the beginning. No further information is provided. For a group member, the sequence of events and questions for each period is identical to the experiment with exogenous feedback selection. An overview of the experiment with endogenous feedback selection is shown in the lower panel of Table 1.

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<sup>10</sup>When the feedback selection rule is non-transparent the wording of the feedback on the screen was “A contribution of one person was: XX”, whereas when transparent feedback was presented the sentence “The person with the maximum (minimum) contribution has contributed: XX” was displayed. For the feedback selection rule RAND it said “A randomly drawn contribution of one person was: XX”.

## 2.3 Research hypotheses

How does feedback influence contributions? To answer this question we ask how feedback influences beliefs and how beliefs affect contributions? How do different feedback rules and transparency interact? Does transparency of feedback affect beliefs in different ways when it is exogenously or endogenously provided? In the following, we lay out theoretical considerations that guided the design of our experiment and led to our hypotheses and the subsequent analyses of the results.

Assuming myopic, self-regarding, purely money-maximizing preferences and common rationality, a classical subgame-perfect equilibrium analysis yields that group members contribute nothing irrespective of the feedback provided. Consequently, the group leader's decision on the feedback has no impact on cooperation in groups. Hence, the group leader is also indifferent with regard to the application of the different feedback rules.

A look at previous experiments on cooperation in public goods games, however, shows that the above prediction on group members' behavior is refuted by a plethora of empirical evidence. Many studies have highlighted that most group members can be characterized as 'imperfect conditional cooperators' (e.g., Hartig et al., 2015; Fischbacher and Gächter, 2010; Neugebauer et al., 2009). This means that group members try to match the contributions of the other group members but contribute slightly less. To do so, they first form beliefs about the other group members' contributions based on the feedback they receive. Then they calibrate their own contributions to these beliefs. Following this logic, the implemented feedback mechanism is likely to have a direct impact on the belief formation – and an indirect impact on contribution choices. The fact that beliefs are crucial for (imperfect) conditional cooperation to unfold constitutes the basis for our experiments and the relevance of distinct feedback. Consequently, we formulate our first hypothesis on feedback and belief formation:

**Hypothesis 1 (Feedback and beliefs):** Group members' beliefs increase with the feedback they receive about contributions.

In the exogenous, non-transparent treatments it is difficult for the group members to guess whether the feedback pertains to the highest, lowest or a random contribution. Contrarily, in the transparent treatments group members know that either the maximum, the minimum or a random contribution is provided in all periods. In particular group members in the MAX - Transparent treatment know that feedback comes from the upper end of the contributions. Analogously, group members in the MIN - Transparent treatment know that feedback comes from the lower end. Thus, when exogenously selected, feedback in MAX and in MIN should influence beliefs differently in the transparent compared to the non-transparent treatments. In MAX - Transparent beliefs should be lower and in MIN-Transparent beliefs should be higher compared to the non-transparent case. In RAND - Transparent beliefs should not be different than in the non-transparent case since feedback comes from the whole range of contributions. For exogenous feedback selection, we therefore derive our second hypothesis on the impact of transparency on belief formation:

**Hypothesis 2 (Transparency and exogenous feedback selection):** With exogenous feedback selection group members' beliefs are lower (higher) in MAX (MIN) when the feedback selection rule is transparent compared to when it is non-transparent.

We hypothesize that in the endogenous cases the group leaders predominantly choose MAX, irrespective whether feedback is transparent or non-transparent. The reason is that the group leaders are interested in

high contributions and, according to our first hypothesis, the contribution amount provided as feedback positively influences group members' beliefs. With endogenous non-transparent feedback, group members know all the possible feedback options. Therefore, we also hypothesize that in this case group members are likely to assume that the group leader chooses MAX as feedback. Consequently, in the endogenous case for MAX we expect no difference in the effect of feedback on beliefs in the transparent and the non-transparent cases, since we expect group members to anticipate the selection of MAX even when feedback is not transparent. Thus, we state our third hypothesis on the impact of transparency on beliefs when feedback selection is endogenous:

**Hypothesis 3 (Transparency and endogenous feedback selection):** With endogenous feedback selection group members' beliefs are not different in MAX when the feedback selection rule is transparent compared to when it is non-transparent.

Once beliefs are formed based on the feedback, 'imperfect conditional cooperators' calibrate their own contributions relative to their beliefs by contributing slightly less. We therefore formulate our fourth hypothesis on imperfect conditional cooperation:

**Hypothesis 4 (Imperfect conditional cooperation):** Group members contribute slightly less compared to what they believe other group members contribute.

## 3 Results

We first focus on the contributions of the group members in both experiments. In the experiment with endogenous feedback selection, we also analyze the feedback selection choices of the group leaders. To gain a broader understanding of how transparent and non-transparent feedback rules affect subjects' behavior, we finally analyze the dynamic interplay of provided feedback, subjects' beliefs, and contributions over periods.<sup>11</sup>

### 3.1 Contributions

#### 3.1.1 Exogenous feedback selection

The upper panel of Table 2 depicts the average contributions for exogenous feedback selection. In the treatments with *non-transparent* feedback, average contributions in MAX are by 9.53 (5.02) points higher than in MIN (RAND). These differences are highly significant ( $p=.001$ ,  $p=.004$ , respectively). In the treatments with *transparent* feedback, we find no statistically significant differences between average contributions.

A particular feedback selection rule appears to have different effects on contributions depending on whether this selection rule is transparent or not. Comparing transparent against non-transparent feedback selection reveals that contributions in the former are 4.27 points lower than in the latter when the feedback selection rule is MAX ( $p=.021$ ). We also find that contributions for MIN are lower by 4.50 points when

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<sup>11</sup>If not denoted otherwise, all reported significance levels are based on two-sided Mann-Whitney U tests. Moreover, non-parametric comparisons are conducted with group averages as independent observations. Standard errors in our regressions are clustered on independent subject groups.

Table 2: Group members' average contributions, beliefs, and provided feedback

Treatments	$N$	Avg. Contribution	Avg. Belief	Avg. Feedback
<i>Exogenous feedback selection</i>				
<i>Non-transparent</i>				
MAX	12	13.03	15.58	18.89
MIN	10	3.50	2.72	0.66
RAND	12	8.01	8.89	8.64
<i>Transparent</i>				
MAX	12	8.76	10.57	14.38
MIN	12	8.00	7.93	4.02
RAND	12	6.87	6.62	5.73
<i>Endogenous feedback selection</i>				
<i>Non-transparent</i>				
MAX	19	10.17	13.28	17.76
MIN	1	4.15	3.9	1.3
RAND	1	5.78	5.86	2.5
<i>Transparent</i>				
MAX	16	10.07	11.86	15.29
MIN	4	6.22	6.15	2.65
RAND	6	10.73	11.69	11.18

Notes: Contributions, beliefs and provided feedback are averages over all ten periods and all groups in the respective treatment.  $N$  denotes the number of groups, each representing one independent observation.

subjects do not know the feedback selection rule ( $p=.010$ ). No significant difference can be found when comparing both RAND feedback selection mechanisms.<sup>12</sup>

The upper panel of Figure 1 shows the development of contributions over time. Contributions initially start at around 10 points in all treatments and then tend to decline as the game proceeds.<sup>13</sup> There is, however, one exception: when the maximum is displayed and the feedback selection rule is non-transparent, contributions are relatively stable over time and exhibit only slight endgame effects. To test this statistically, we consider the average contribution from every group from periods one to five and six to ten, respectively. We compare the distribution of these averages with a Wilcoxon signed rank test for matched pairs for all six treatments separately. All tests yield  $p$ -values smaller than .009, except for non-transparent feedback selection in MAX. Here, we cannot reject the hypothesis that the average contributions between those two parts of the experiment are similar ( $p=.239$ ). Thus, leaving the feedback mechanism non-transparent seems to have a stabilizing effect on contributions when the feedback selection is MAX.

### 3.1.2 Endogenous feedback selection

As hypothesized in the experiment with endogenous feedback selection, a clear majority of 74.47% of the group leaders choose MAX. The lower panel of Table 2 shows that there is almost an equal split between group leaders keeping their feedback rule non-transparent (44.68%) or making it transparent (55.32%). A Fisher exact test reveals that if the group leader keeps the feedback rule non-transparent, she more often chooses the MAX feedback rule as compared to when the feedback rule is made transparent ( $p=.042$ , Fisher exact test).

The lower panel of Table 2 depicts the average contributions. When the group leader does not make the feedback rule transparent, average contributions in MAX are 10.17. The contributions under MAX seem higher than under MIN (4.51) and RAND (5.78).<sup>14</sup> In situations with transparent feedback, we find no pairwise differences between MAX (10.07), MIN (6.22), and RAND (10.73).<sup>15</sup> Furthermore, when the feedback rule is endogenously chosen, transparency appears not to induce different contributions compared to non-transparency for each of the respective feedback rules.

The lower panel of Figure 1 displays the development of contributions over time. Contributions average around 11 in the first period and then tend to decline over the course of the game.<sup>16</sup> To dig again deeper, we take the average contribution from every group from periods one to five and six to ten, respectively, and compare the distribution of these averages with a Wilcoxon signed rank test for matched pairs for every feedback selection separately. For MAX, there is a significant decline when comparing both parts of the experiment (non-transparent:  $p=.009$ , transparent:  $p=.002$ ). In MIN and RAND, we observe the same tendency when those rules are made transparent ( $p=.144$ ,  $p=.116$ ).<sup>17</sup>

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<sup>12</sup>For pairwise comparisons between the treatments regarding group average contributions, beliefs and feedback for all periods, the first and last period, see Table A.1 in the Appendix.

<sup>13</sup>According to a Kruskal Wallis test, we find no difference in the distribution of subjects' first period contributions between the feedback selection rules for non-transparent ( $p=.140$ ) and transparent ( $p=.720$ ) feedback selection.

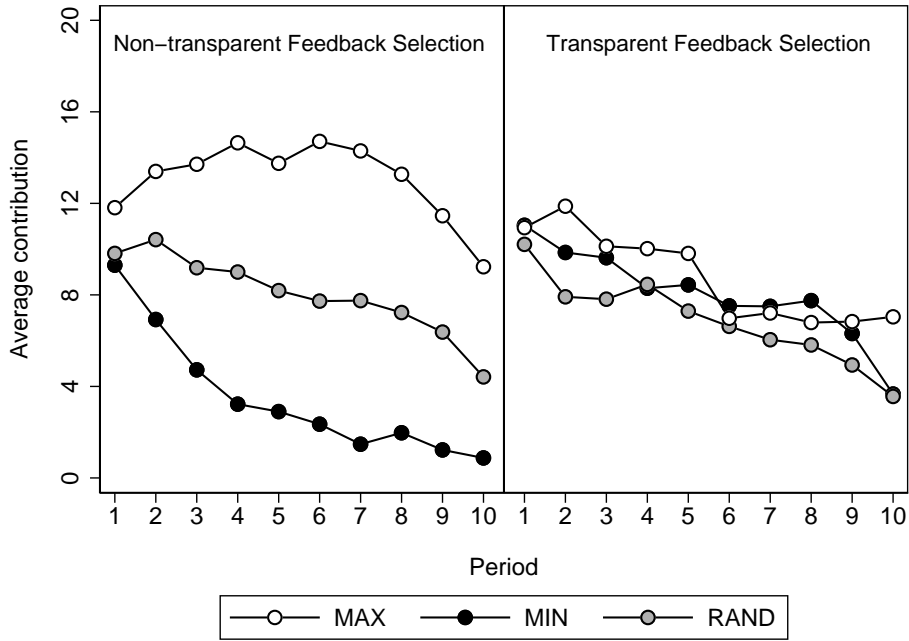
<sup>14</sup>Due to only one observation for MIN and RAND feedback selections, respectively, we refrain from running statistical tests.

<sup>15</sup>This also holds if the data from MIN and RAND are pooled. All pairwise comparisons for endogenous feedback selection can be found in Table A.2 in the Appendix.

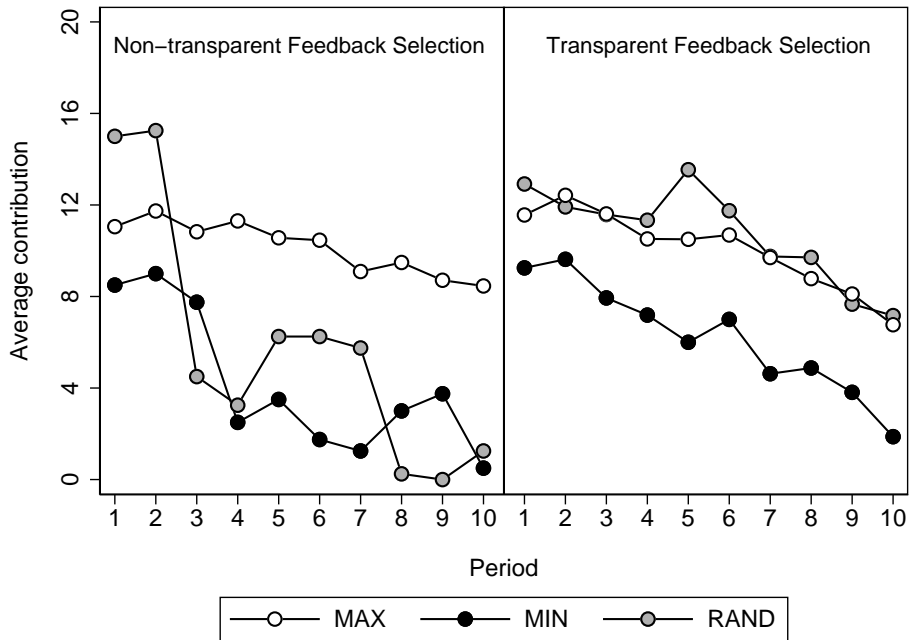
<sup>16</sup>According to a Kruskal Wallis test, we find no difference in the distribution of subjects' first period contributions between the feedback selection rules for non-transparent ( $p=.303$ ) and transparent ( $p=.452$ ) feedback selection.

<sup>17</sup>For the feedback rules MIN and RAND, we cannot make such comparison when they are not made transparent because of the low number of observations.

Figure 1: Development of average contributions over periods



(a) Exogenous feedback selection



(b) Endogenous feedback selection

Table 3: Estimating belief formation and contribution choices

Independent variables	Dependent variables:					
	Pooled		Exogenous		Endogenous	
	(1)	(2)	(3)	(4)	(5)	(6)
	Belief <sub>i,t</sub>	Contr <sub>i,t</sub>	Belief <sub>i,t</sub>	Contr <sub>i,t</sub>	Belief <sub>i,t</sub>	Contr <sub>i,t</sub>
Feedback <sub>t-1</sub>	0.341*** (0.018)		0.377*** (0.025)		0.311*** (0.039)	
Belief <sub>i,t-1</sub>	0.583*** (0.024)		0.560*** (0.032)		0.646*** (0.040)	
Belief <sub>i,t</sub>		0.505*** (0.072)		0.587*** (0.081)		0.110 (0.154)
Belief <sub>i,t</sub> <sup>2</sup>		0.014*** (0.003)		0.013*** (0.004)		0.025*** (0.007)
MAX - Transparent	-1.593*** (0.258)	0.103 (0.455)	-1.410*** (0.295)	0.695 (0.538)	-1.056 (0.672)	-1.662 (1.193)
MIN - Transparent	0.700*** (0.224)	0.772 (0.637)	0.886*** (0.287)	0.580 (0.550)		
RAND - Transparent	0.113 (0.287)	0.262 (0.478)	0.250 (0.335)	0.394 (0.417)		
MAX - Transparent x Feedback <sub>t-1</sub>	0.062*** (0.018)		0.026 (0.027)		0.053 (0.038)	
MIN - Transparent x Feedback <sub>t-1</sub>	0.092*** (0.028)		0.073** (0.033)			
RAND - Transparent x Feedback <sub>t-1</sub>	0.021 (0.033)		-0.040 (0.041)			
MAX - Transparent x Belief <sub>i,t</sub>		-0.002 (0.050)		-0.114** (0.058)		0.191* (0.099)
MIN - Transparent x Belief <sub>i,t</sub>		0.044 (0.090)		0.040 (0.072)		
RAND - Transparent x Belief <sub>i,t</sub>		0.110* (0.057)		0.092 (0.069)		
Period	-0.110*** (0.020)	-0.326*** (0.032)	-0.101*** (0.030)	-0.276*** (0.038)	-0.166*** (0.032)	-0.433*** (0.068)
Constant	0.722*** (0.180)	3.132*** (0.393)	0.685*** (0.254)	2.608*** (0.410)	0.426 (0.547)	5.980*** (1.118)
Observations	4,212	4,680	2,520	2,800	1,260	1,400
R <sup>2</sup>	.807	.574	.821	.609	.713	.495

Notes: GLS regressions with robust standard errors (clustered on groups) in parentheses. Reference category: Non-transparent feedback selection. Models 1, 3, and 5 contain data from period 2 to 10. Models 2, 4, and 6 contain data from period 1 to 10. In Model 1 and 2 we pool data from all experiments. In Model 3 and 4 we use the data from Exogenous feedback selection. In Model 5 and 6 we use data from Endogenous feedback selection but we restrict our analysis to MAX due to the lack of observations for MIN and RAND. \*\*\* Sig. at  $p < .01$ , \*\* Sig. at  $p < .05$ , \* Sig. at  $p < .1$ .

## 3.2 The dynamic interplay of feedback, beliefs and contributions

To investigate how feedback influences contributions, we proceed in three steps. First, we confirm the relationship between previously provided feedback and contributions. To better understand this relationship, we secondly examine how feedback influences beliefs with a focus on different transparency conditions. Third, we assess the link between beliefs and contributions.

### 3.2.1 Feedback and contributions

We first establish the relationship between previously provided feedback and contributions. Pooling data from both experiments and explaining contributions in period  $t$  (“Contribution $_{i;t}$ ”) with previously provided feedback (“Feedback $_{t-1}$ ”) and a constant shows a positive and significant relationship (see Table A.3 in the Appendix). This is also true when controlling for the endogenous choice of the feedback (“Endogenous”), the three transparent feedback selection rules (e.g., “MAX - Transparent”) and their interactions with feedback from period  $t - 1$  (e.g. “MAX - Transparent x Feedback $_{t-1}$ ”). Depending on the specification coefficients of feedback from period  $t - 1$  in GLS regressions range from .378 to .456 in magnitude and all are highly significant.

### 3.2.2 Feedback and beliefs

To examine the link between provided feedback and beliefs, we estimate subjects’ belief formation by again pooling data from both experiments. In our regression models, we follow Fischbacher and Gächter (2010). To explain beliefs in period  $t$  (“Belief $_{i;t}$ ”), we use the previous belief (“Belief $_{i;t-1}$ ”), the feedback subjects received (“Feedback $_{t-1}$ ”) and the period  $t$  (“Period”). Additionally, we include dummy variables to capture the effect of the different feedback selection rules (e.g., “MAX - Transparent”) as well as variables that capture their respective interactions with received feedback (e.g., “MAX - Transparent x Feedback $_{t-1}$ ”<sup>18</sup>). We treat the data from all non-transparent treatments as the reference category. The results are displayed in model (1) from Table 3. We find that the coefficient for “Feedback $_{t-1}$ ” is highly significantly positive.<sup>19</sup> This result lends support for Hypothesis 1, as it establishes a positive relationship between provided feedback and subjects’ beliefs.

To examine our hypotheses about how transparent feedback affects beliefs compared to non-transparent feedback we run two additional regressions where we separate the data from exogenous and endogenous feedback selection. For exogenous feedback selection we pool all data. For endogenous feedback selection, we restrict our analysis to MAX due to the lack of observations for MIN and RAND. Results are displayed in columns (3) and (5) of Table 3, respectively. Both models confirm Hypothesis 1 as the coefficients for “Feedback $_{t-1}$ ” are highly significantly positive. We also find that in the treatments with exogenous feedback selection the coefficients of “MAX (MIN) - Transparent” are highly significantly negative (positive) as conjectured in Hypothesis 2. In the treatment with endogenous feedback selection the coefficient of “MAX - Transparent” is not significant, suggesting that with endogenous feedback there is no difference in how

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<sup>18</sup>The interaction terms “XXX - Transparent x Feedback $_{t-1}$ ” capture the influence of feedback from the previous period with the respective feedback selection rule relative to the reference category (here: non-transparent feedback selection) on contributions. A positive coefficient of “XXX - Transparent x Feedback $_{t-1}$ ” indicates that a change of previous period’s feedback by one unit increases the contribution by the coefficient in XXX-Transparent in addition to the change in contribution caused by the feedback change in the reference category.

<sup>19</sup>We also find that the coefficient for “Belief $_{i;t-1}$ ” is highly significantly positive. It has to be noted that in Fischbacher and Gächter (2010) the feedback subjects received during their experiment consisted of the sum of contributions from all group members. Nevertheless, in their regressions the coefficients of previous beliefs (“Belief $_{i;t-1}$ ”) and feedback (“Feedback $_{t-1}$ ”) appear to be very similar to ours (see p. 548, Table 1).



feedback influences beliefs in the transparent compared to the non-transparent case. This observation is in line with Hypothesis 3.

Interestingly, in the pooled regression in model (1) in Table 3 the coefficients of the interaction terms “MAX - Transparent x Feedback $_{t-1}$ ” and “MIN - Transparent x Feedback $_{t-1}$ ” are both significantly positive while the coefficient of “RAND - Transparent x Feedback $_{t-1}$ ” is not significant. This seems to suggest that transparent feedback in MIN and MAX has a stronger impact on subjects’ beliefs compared to non-transparent feedback. This result, however, only survives for “MIN - Transparent x Feedback $_{t-1}$ ” in the exogenous case when one considers the exogenous and endogenous feedback rules separately as can be seen from columns (3) and (5) of Table 3, respectively. The coefficients of “MAX - Transparent x Feedback $_{t-1}$ ” turn out to be insignificant in both regressions for the exogenous and the endogenous cases.

### 3.2.3 Beliefs and contributions

Next, we consider the relationship between beliefs and contributions. Model (2) in Table 3 - where we pool data from both experiments - contains the variables “Period”, “Belief $_{i;t}$ ”, and “Belief $_{i;t}^2$ ”.<sup>20</sup> Additionally, we include dummy variables to capture the effect of the different feedback selection rules (e.g., “MAX - Transparent”). We also include interaction terms that display a potentially different impact of the same belief depending on the underlying feedback rule (e.g., “MAX - Transparent x Belief $_{i;t}$ ”). The results show that the coefficient for “Belief $_{i;t}$ ” is positively and highly significantly associated with contributions but is smaller than one. This kind of “imperfect conditional cooperation” was hypothesized by our Hypothesis 4. The hypothesis is partly confirmed when looking at the two cases of exogenous and endogenous feedback separately. Model (4) in Table 3 showing the regression with the exogenous data conveys that subjects’ beliefs are positively associated with contributions. In all three models - model (2) in Table 3 with the pooled data and models (4) and (6) in Table 3 with the exogenous and endogenous data - the coefficients for “Belief $_{i;t}^2$ ” are significantly positive. This coefficient captures a potentially non-linear impact of beliefs on contributions indicating that higher beliefs have a higher impact on contributions than lower beliefs. Dummy variables measuring the effect of different transparent feedback selection rules remain insignificant. The positive and significant coefficient of “RAND - Transparent x Belief $_{i;t}$ ” in the pooled data regression in model (2) in Table 3 suggests that the influence of beliefs on contributions in this treatment is mildly significantly larger as compared to the non-transparent treatments. The corresponding coefficient in the regression with the exogenous data in model (4) of Table 3, however, is not significant. The coefficients “MAX - Transparent x Belief $_{i;t}$ ” are negatively significant in the exogenous data model (4) and weakly positively significant in the endogenous data model (6) in Table 3. This suggests that the influence of beliefs on contributions in the MAX - Transparent case is significantly lower (larger) as compared to the non-transparent case in the exogenous (endogenous) data.

## 4 Discussion

In this part, we reflect upon our experimental results. We start by providing a behavioral interpretation of our findings and relate them to the debate on feedback and cooperation. After that, we will discuss possible implications for the design of effective feedback institutions.

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<sup>20</sup>The latter variable captures a potentially non-linear impact of beliefs on contributions. We thank an anonymous referee for suggesting to include this variable.

Table 4: Comparing belief formation for feedback selection MAX between exogenous and endogenous experiments

Independent variables	Dependent variable: Belief <sub><i>i,t</i></sub>
<i>Exogenous</i>	
MAX - Non-transparent	0.696*** (0.235)
<i>Endogenous</i>	
MAX - Non-transparent	0.183 (0.193)
Feedback <sub><i>t-1</i></sub>	0.359*** (0.024)
Belief <sub><i>i,t-1</i></sub>	0.626*** (0.029)
Period	-0.183*** (0.033)
Constant	-0.245 (0.262)
Observations	2,124
<i>R</i> <sup>2</sup>	.725

Notes: GLS regression with robust standard errors (clustered on groups) in parentheses. All data from all four MAX treatments from periods 2 to 10 are used. Reference category: MAX - Transparent (pooled from exogenous and endogenous feedback selection). \*\*\* Sig. at  $p < .01$ , \*\* Sig. at  $p < .05$ , \* Sig. at  $p < .1$ .

## 4.1 Interpretation of the results

In line with previous research, we find that individuals are imperfect conditional cooperators, who contribute less than what they expect others to do. Feedback influences the beliefs of individuals about others contributions. Under exogenously transparent feedback selection, individuals adjust their beliefs downwards when they are exposed to the maximum contribution. Analogously, they adjust their beliefs upwards, when they are exposed to the minimum contribution. Thereby, in both cases when feedback is transparent they take into account their knowledge that what they observe is the upper/lower bound of the others' contributions. Such adjustments are not possible when the feedback selection is non-transparent, since the feedback selection rule is unknown.

When the feedback is endogenously chosen, MAX is the predominant feedback selection rule. Here, we do not observe a difference in contributions between transparent and non-transparent feedback selection. Since in the exogenous, non-transparent feedback selection individuals are aware of all feedback options they appear to expect that the group leader opts for MAX. This is supported by an additional analysis of belief formation. We pool all data from MAX treatments and explain beliefs in period  $t$  ("Belief $_{i,t}$ ") while again controlling for the feedback subjects received ("Feedback $_{t-1}$ "), the previous belief ("Belief $_{i,t-1}$ "), and the period  $t$  ("Period"). The reference category is MAX - Transparent (pooled from exogenous and endogenous feedback selection, see Table 4). For the non-transparent cases we find significantly higher beliefs when the feedback selection is exogenous ("Exogenous MAX - Non-transparent") which is not true when feedback selection is endogenous ("Endogenous MAX - Non-transparent"). In the latter case beliefs seem to be similarly formed as when the MAX feedback selection is transparent (this finding gets support from Model 5 in 3 which depicts a non-significant influence of "MAX - Transparent" and "MAX - Transparent x Feedback $_{t-1}$ " on beliefs for MAX).

## 4.2 Relation to the literature

The literature on transparency of selective feedback provision is surprisingly sparse. Weimann (1994) manipulates feedback about the behavior of fictitious players in a public goods experiment. One group of participants is exposed to constant high contributions of others, another group is confronted with constant low feedback on others' contributions. Weimann observes no difference in behavior between the two conditions. Thus, his results suggest that feedback about high average contributions does not necessarily promote cooperation. Similarly, in Hoffmann et al. (2013), the feedback subjects receive is exaggerated and does not lead to higher cooperation rates. Bigoni and Suetens (2012) investigate the influence of two seemingly identical formats of feedback. The feedback of their treatments either consists of the contribution of each group member or the earnings of each group member. Despite the fact that these different formats of feedback can easily be converted into each other, contributions are significantly lower when feedback on earnings is provided.<sup>21</sup> In Samak and Sheremeta (2013), the influence of feedback about the identity of certain contributors is tested. In some treatments, in addition to individual contributions pictures of the highest contributors are shown and in other treatments only the pictures of lowest contributors are displayed. Exposing the subject to the pictures of lowest contributors positively influences cooperation relative to treatments where all subjects are shown. Steiger and Zultan (2014) study the influence of various

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<sup>21</sup>Similar to Bigoni and Suetens (2012), Nikiforakis (2010) studies the difference between these feedback formats but includes a punishment option. His results also suggest a negative influence of earnings-feedback on cooperation but no difference in the frequency of punishment. In a real-effort experiment, Thomas and Thornock (2015) vary the feedback free-riders receive. They contrast input (time) vs. output (production output) feedback. They observe that good examples over output feedback impact free-riders efforts more than input feedback.

information structures on cooperativeness in a public goods experiment where group members in each period contribute sequentially. Their treatments vary what group members know about their predecessors' behavior. In their treatments with linear returns of contributions to the public good, transparency induces cooperation in early movers compared to a treatment without feedback. A systematic investigation of the influence of feedback on belief formation was not part of the previously mentioned studies.<sup>22</sup>

Providing feedback selectively in order to enhance donations is subject of two field experiments of Frey and Meier (2004) and Croson and Shang (2008). Both studies manipulate the information potential donors receive about previous behavior of other donors. The former study investigates how information about the number of students who previously contributed to a charity organization influences giving. In the experiment of Frey and Meier, one group receives feedback that more than 50% of the students gave money to the charity while the other group knows that less than 50% contributed. They find that students are more likely to give when they are informed that more than 50% of their peers had contributed. Croson and Shang (2008) contact regular donors of a radio station and selectively provide them with different information about the previous contribution of one other donor. Because the researchers know how much the participants had contributed, they are able to check how the contribution of each donor changes with respect to the given feedback. As predicted, if the feedback contribution is higher (lower) than the contribution of the participant, the contribution increases (decreases). However, contributions are much more strongly influenced when the contribution feedback is lower. In a somewhat different but related approach, Huck and Rasul (2011) test how the decision to donate is influenced by the information about a very generous donor. It turns out that the total amount donated is significantly higher when participants are informed about the generous donor compared to when they are not given this information. The most recent approach to provide individuals with selective feedback is carried out by Costa and Kahn (2013) in a field experiment on energy consumption. The researchers provide a random sample of households with feedback about the own households energy consumption and the average energy consumption of one hundred neighbors. This average is, however, not based on all neighbors, but rather on the bottom 20th percentile of electricity usage. Thus, the treated households most of the time see that they consume more energy than the neighbors. They observe a significant reduction of energy in households who receive feedback about neighbors behavior.

As we have stressed in the introduction, in most group interactions and social dilemmas outside the laboratory, individuals face ambiguity about the behavior of their peers. On top of that, organizations explicitly try to guide behavior by selectively providing information to individuals. All of the studies mentioned above consider either the influence of incomplete (or manipulated) feedback or how feedback selection influences behavior. Our study combines the two in a repeated setting as it is often the case outside the laboratory.

### 4.3 Implications for the design of feedback institutions

As illustrated in our opening examples, eliciting cooperation of individuals in repeated public goods settings is of crucial importance, e.g., for companies, communities, or non-profit organizations. Previous experiments have shown that punishment is one promising institution to promote cooperation (e.g., Fehr and Gächter, 2002). Yet, its implementation may be undesirable, impossible or simply too costly. In

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<sup>22</sup>Somewhat related is the experimental literature on leadership in public goods settings (Güth et al., 2007; Potters et al., 2007; Gächter and Renner, 2004). Typically, in these studies one member of the group – the leader – contributes first. All other members – the followers – observe the contribution of the leader and subsequently decide on their own contribution. At the end of a period, all group members receive feedback about all decisions from the group. The results suggest, that followers tend to contribute a bit less than leaders, which, on average, drives contributions down.

contrast, feedback about others' behavior can be considered a more "soft" intervention which might be more acceptable (e.g., Bradler et al., 2013; Kosfeld and Neckermann, 2011) and easier to install. In this regard, the first – rather obvious – implication from our experiments is that individuals follow the feedback that is provided. This is especially true, when we compare our results with a treatment from Neugebauer et al. (2009). In this treatment, group members receive no feedback at all and contributions are stable and remain at initial levels over ten periods of a linear public goods game.<sup>23</sup> Since individuals outside the laboratory typically receive at least *some* information about the behavior of others, designers of institutions should be vigilant in their choice about the feedback institutions.

If workers, community-members, or donors condition their contributions on the voluntary efforts of their peers, and if firm owners, community authorities or charity managers are keen to maximize them, based on our evidence, providing information about the *desired* behavior is preferable. Stressing *undesired* behavior might be less effective. As individuals tend to follow the given examples, it is decisive how these are presented. Good examples can constitute an upper bound of desired behavior. Thus, revealing the specific feedback selection or making it easily predictable might eventually encourage others, who are initially inclined to cooperate, to refrain from good behavior. Our analysis on the dynamics of such feedback systems reveals that people withdraw less strongly if they are not aware of the potentially available and ultimately (seemingly) applied feedback rule. Therefore, showing a good example without revealing that it is the *best* example might be effective for the elicitation of cooperation.

In practice, individuals are often not fully informed about who is providing the feedback, what the provided feedback rule is and what the goal of the feedback is (e.g., with regard to the target group). Feedback may be actually exogenously installed or be *perceived* as exogenously installed, e.g., by a different department, the federal government, or the remote management of a non-profit organization, respectively. On the other hand, there might be good reasons for individuals to believe that provided examples might not represent the maximum or the minimum contribution. Those reasons might include the display of arbitrary examples, political or strategic considerations beyond maximizing contributions (e.g., the objective to promote one specific contributor), or the practical impossibility to capture all contributions for potential examples (e.g., in large teams or communities).<sup>24</sup> In contrast, the endogenous provision of good examples might be less effective when the group members are aware of the available feedback rules (e.g., in smaller firms, communities, or funding groups) and when the intentions of the leaders are more transparent. Taken together, our results are informative for the design of feedback institutions.

As a final remark, we want to admit that we consider two rather extreme cases of disposable feedback rules, either providing the best example or the worst example. We also assume that the feedback selection rule is either completely transparent or completely non-transparent. These are both simplifications. In many cases, the transparency of the applied feedback is not clear cut, i.e., people cannot form substantiated beliefs about whether the maximum, the minimum, or a randomly selected contribution is displayed. The investigation of these partly transparent cases is, however, beyond the scope of this paper and provides an interesting field of further research.

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<sup>23</sup>Sass and Weimann (2012) show in a public goods experiment, conducted with the same participants four times a week, that even when participants receive *no feedback at all*, contributions tend to decline.

<sup>24</sup>To elicit donations, non-profit organizations frequently emphasize donations of previous donors or name previous donors on their websites. For potential new donors, it is often not clear how to classify these examples (see, e.g., our introductory examples). The same argument applies to the provision of average feedback which is typically applied in repeated public goods games.

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## Appendix



Table A.1: Exogenous feedback selection: Group members' average contributions, beliefs, provided feedback

Periods	Feedback selection rule	Avg. Contributions			Avg. Beliefs			Avg. provided feedback										
		MAX		RAND	MIN	MAX		RAND	MIN	MAX		RAND	MIN					
1st-10th	Non-transparent	13.03	>***	8.01	>***	3.50		15.58	>***	8.89	>***	2.27		18.89	>***	8.64	>***	0.66
		∇**		∇		∧**		∇***		∇		∧***		∇**		∇		∧
	Transparent	8.76	>	6.87	<	8.00		10.57	>**	6.62	<	7.93		14.74	>***	5.73	>	4.02
1st	Non-transparent	11.81	>	9.81	<	9.30		10.77	>	9.6	<	9.82		19.17	>***	12.42	>***	2.40
		∇		∧		∧		∇		∇		∧		∇		∇***		∧
	Transparent	10.94	>	10.21	<	11.04		9.63	<	10.02	<	11.25		18.33	>***	6.92	>***	3.33
10th	Non-transparent	9.23	>***	4.42	>	0.88		13.79	>***	6.13	>***	0.33		16.25	>***	3.67	>***	0
		∇		∇		∧*		∇***		∇*		∧***		∇***		∇		∧*
	Transparent	7.04	>**	3.56	<	3.67		8.15	>**	4.29	<	4.63		11.00	>***	2.33	>***	1.25

Notes: In this table we display average values of contributions, beliefs, provided feedback for different time spans. 1st-10th represents the average values over all ten periods. 1st and 10th stand for the average in the respective period. Signs indicate significance levels of a two-sided Mann Whitney U test for which the null hypothesis that there is no difference between both treatments can be rejected. \*\*\* Sig. at  $p < .01$ , \*\* Sig. at  $p < .05$ , \* Sig. at  $p < .1$ .

Table A.2: Endogenous feedback selection: Group members' average contributions, beliefs, provided feedback

Periods	Feedback selection rule	Avg. Contributions			Avg. Beliefs			Avg. provided Feedback								
		MAX	RAND	MIN	MAX	RAND	MIN	MAX	RAND	MIN						
1st-10th	Non-transparent	10.17	>	5.78	>	4.15	13.28	>*	5.86	>	3.9	17.76	>*	2.5	>	1.30
		∨		∧		∧	∨		∧		∧	∨		∧		∧
	Transparent	10.07	<	10.73	>	6.22	11.86	>	11.69	>*	6.15	15.29	>*	11.18	>**	2.65
1st	Non-transparent	11.05	<	15	>	8.5	10.36	<	12.25	>	7.75	19.05	>	15	>	5
		∧		∨		∧	∧		∨		∧	∨**		∨		∨
	Transparent	11.56	<	12.92	>	9.25	11	<	12.17	>	10.78	17.19	>	13.33	>	3.5
10th	Non-transparent	8.46	>	1.25	>	0.5	13.01	>*	1.88	<	2	16.32	>**	0	=	0
		∨		∧		∧	∨*		∧		∧	∨		∧		=
	Transparent	6.77	<	7.17	>	1.88	9.05	<	9.3	>*	2.34	11.62	>**	8	>	0

Notes: In this table we display average values of contributions, beliefs, provided feedback for different time spans. 1st-10th represents the average values over all ten periods. 1st and 10th stand for the average in the respective period. Signs indicate significance levels of a two-sided Mann Whitney U test for which the null hypothesis that there is no difference between both treatments can be rejected. \*\*\* Sig. at  $p < .01$ , \*\* Sig. at  $p < .05$ , \* Sig. at  $p < .1$ .

Table A.3: Estimating contributions with previously provided feedback

Independent variables	Dependent variable: Contribution <sub>i,t</sub>			
	(1)	(2)	(3)	(4)
Feedback <sub>t-1</sub>	0.433*** (0.027)	0.456*** (0.029)	0.392*** (0.029)	0.378*** (0.045)
MAX - Transparent		-0.648 (0.649)	-0.446 (0.699)	-1.035 (1.060)
MIN - Transparent		2.415*** (0.826)	1.847** (0.885)	0.748 (0.864)
RAND - Transparent		1.230** (0.622)	0.925 (0.693)	1.300 (0.819)
MAX - Transparent x Feedback <sub>t-1</sub>				0.039 (0.077)
MIN - Transparent x Feedback <sub>t-1</sub>				0.251*** (0.079)
RAND - Transparent x Feedback <sub>t-1</sub>				-0.055 (0.059)
Endogenous			-0.161 (0.568)	-0.035 (0.560)
Period			-0.426*** (0.038)	-0.422*** (0.039)
Constant	3.609*** (0.353)	2.989*** (0.433)	6.408*** (0.527)	6.503*** (0.595)
Observations	4,212	4,212	4,212	4,212
R <sup>2</sup>	.264	.29	.299	.307

Notes: GLS regressions with robust standard errors (clustered on groups) in parentheses. Reference category: Non-transparent feedback selection. Models contain data from period 2 to 10. \*\*\* Sig. at  $p < .01$ , \*\* Sig. at  $p < .05$ , \* Sig. at  $p < .1$ .

## Appendix - Additional materials

Examples for feedback selection (for Online Appendix)

**Welcome to the Donation Page of Hassan Salem**

Like Be the first of your friends to like this.

0% 20% 40% 60% 80% 100%  
\$12,883 \$20,000

Imagine the impact if we reduce death and disability from cardiovascular diseases and stroke by 20% by 2020! I'm joining the American Heart Association's Heart Walk to promote physical activity to build healthier lives, free of cardiovascular diseases and stroke. Please support me in helping to reach this lifesaving goal by giving a donation today! Thanks in advance for your support.

Join me in my efforts to support American Heart Association - Denver, CO!

**GIVE NOW »**

**\$12,883** Amount Raised

**\$20,000** Fundraising Goal

**28** Generous Supporters

**Honor Roll**

- From Cedric Buchanan In Memory Of Timothy Buchanan
- \$500** From Daniel Yohannes In Support Of Hassan Salem
- From Dave Baker
- From anonymous

Figure A.1: Screenshot of *npengage.com*.

*Note:* This page offers suggestions on how to design online donation campaigns. They also suggest to place “Honor Roll” that display previous donors. On the right side of their homepage they show the honor roll. How they are selected is not obvious to new donors.

*URL:* <http://npengage.com/nonprofit-fundraising/boost-donor-acquisition-online-fundraising/>

*Access date:* 16/05/16



## Oakland Book Festival

The Oakland Book Festival: Read. Debate. Celebrate.

**GO** Tavia Stewart  
Oakland, United States  
[About](#) | [Ask a question](#)

Verified Nonprofit

**\$20,862** USD raised by 70 backers

83% of \$25,000 flexible goal

16 days left

BACK IT



STORY UPDATES COMMENTS **BACKERS (70)**

<b>GO</b>	<b>Michael Baus</b> 3 hours ago	<b>\$10</b> USD
<b>GO</b>	<b>janebrunner</b> 14 hours ago	<b>\$203</b> USD
<b>GO</b>	<b>cj</b> 1 day ago	<b>\$50</b> USD
<b>GO</b>	<b>Hailey Gilmore &amp; ...</b> 3 days ago	<b>\$100</b> USD
<b>GO</b>	<b>Emily Mitchell</b> 4 days ago	<b>\$10</b> USD

PERKS

**FEATURED**

**\$100** USD + Shipping

**Pastoral**

Thank you! Join us for the Festival's opening gala at the Starline Social Club on Friday, May 20th. This is an invite-only soirée where you will get to meet our staff and participating authors. (Tickets are limited.) Your support will be acknowledged in the Festival's printed program, and you'll get an OBF tote bag.

6 out of 100 claimed  
Ships to: United States

ESTIMATED MAY 2016

**\$10** USD

**Protagonist**

Thank you!

2 claimed

Figure A.2: Screenshot of *indiegogo.com*.

*Note:* Indiegogo.com is one of the largest online crowdfunding platforms in the U.S. Here, we display an example of the Oakland Book Festival. Among other information potential donors can observe amounts of previous donors. The webpage displays previous donors seemingly in chronological order.

*URL:* <https://www.indiegogo.com/projects/oakland-book-festival#/backers>

*Access date:* 16/05/16


Crowdfunder.co.uk [Add project](#) [Find project](#) [How it works](#) [Sign up](#) or [Login](#) [Plus](#)

# Aerende – homewares with a social conscience

A Social Enterprise project [Hertfordshire, United Kingdom](#)

[Project home](#) [Updates 1](#) [Comments 1](#) [Backers 51](#) [Message project](#)

## Who's pledged what



£ 2,400 raised of £ 4,500

## The Crowd

- About 13 hours and 35 minutes ago  
[Sally Walker pledged £25](#)
- About 14 hours and 10 minutes ago  
[anonymous pledged £10](#)
- About 20 hours and 48 minutes ago  
[jothehunter pledged £25](#)  
jothehunter also pledged on 1 other project
- About 23 hours and 24 minutes ago  
[Laura Lane pledged £50](#)

**£2,400**  
Raised of £4,500 target

53%

Backers **51** Days left **23**

[Pledge](#)

This project will only be funded if at least £4,500 is pledged by 3:56pm 8th June 2016

**Project owner**

[aerendeshop](#)  
[UK](#)  
[Send message](#)

Aerende is an innovative new retailer in the homeware sector. Our online shop sells  
[– Read more](#)

**Twitter:** [@aerendeshop](#)  
**Facebook:** [aerendeshop](#)

[Choose rewards](#)

Figure A.3: Screenshot of *crowdfunder.co.uk*.

*Note:* Crowdfunding page for Aerende - homeware with a social consciences. The homepage displays previous donors and their donations.

*Url:* <http://www.crowdfunder.co.uk/aerende-life-improving-homewares/backers/>

*Access date:* 16/05/16