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Article

Decisions on Extending Group Membership—Evidence from a Public Good Experiment

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Abstract: We experimentally compare the consequences for group cooperation of two decision mechanisms involving the extension of group membership. We analyze an exogenous decision (random draw) and an endogenous decision (made by a particular group member) mechanism to extend a temporary agent's group membership. Our results reveal that the prospect of group membership extension affects not only the temporary but also the permanent group members' contributions with an endogenous mechanism.

Keywords: cooperation; public good game; group membership; experiment

1. Introduction

Cooperation in groups has been well studied in the field of economics, as the level of cooperative behavior determines the success of work results and of the whole organization. In economic lab experiments, group members in cooperation settings are frequently assumed to be homogeneous. However, in real firms, group members are often heterogeneous, e.g., with respect to demographic characteristics [1,2], cultural background [3,4], abilities [5,6], or endowment distribution [7–10]. These characteristics may impact an individual's tendency to cooperate.

Frequently, group members in organizations differ in one aspect, which is very crucial for cooperation, and that is the time horizon of their group membership. Some group members may have temporary employment contracts, work for a specific span of time in projects, or the whole organization is based on teams, and some team members will always switch between teams. All examples imply that certainty and duration of group membership vary among group members.

In this study, we analyze how the decision to extend a temporary group membership affects cooperation. We focus on potential incentive effects before the extension decision is made and on subsequent effects of the extension on further cooperation. In our setting, group members repeatedly interact with each other for a given period of time in a public good game. One member in each group has a temporary group membership, i.e., she does not know whether her membership will end after an ex-ante specified number of rounds or will be continued. Two motivational facets must be distinguished: First, remaining in the group may affect motivation because the opportunity costs of becoming unemployed are high. Here, getting a group membership extension is of monetary utility. Second, receiving the opportunity to remain in the group may also be regarded as a form of interpersonal social approval. In our experimental design, we want to disentangle both effects. We, therefore, differentiate between two settings: (i) one of the group members is given the right to (endogenously) decide whether the group membership of the temporary member will be extended for an additional period or whether the temporary group member will be replaced by a new member, and (ii) an exogenous random mechanism determines whether to extend the temporary worker's group membership. The introduced concept of a random draw permits us to disentangle the monetary utility effect of "group membership extension" from the effect of social approval, where one person allows the temporary member to stay in the group.

Only a few studies address the effect of differences in the time horizon of group membership on the group level. However, previous research does not focus on the effects of an endogenous or an exogenous decision mechanism in heterogeneous groups for motivating group contributions. This lack is striking because some effects, such as a decrease in cooperation rates, are likely to be caused by heterogeneity in terms of group membership duration and mechanisms which determine group composition.

We conjecture that the prospect of membership extension may influence the behavior of temporary and also permanent group members, both of them knowing about the different group membership horizons involved. The temporary group member may have a monetary incentive to stay in the group and may cooperate more to enhance his chance of group membership extension. Moreover, permanent group members may react towards a temporary member's cooperation efforts reciprocally and may be willing to keep the temporary group member in the group. Our contribution to the literature is to analyze the incentive effects of an endogenous decision to extend group membership in a group of permanent and temporary group members. Further, we analyze the aftermath of group membership extension or replacement of a temporary group member for individual and group cooperation.

The remainder of this paper is organized as follows: We present related literature in Section 2, describe our experimental setup in Section 3, state our hypotheses in Section 4, and present our results in Section 5. Section 6 concludes.

2. Related Literature

Some experimental studies use social dilemma games[1] to compare cooperation behavior in groups of either "strangers", i.e., participants who are assigned to new groups in each round and who are temporary members of the group for one round, or "partners", i.e., participants who permanently stay with the same group for a given number of rounds [11,13]. They show mixed results concerning the comparison of cooperation levels between partners and strangers. However, they focus on homogeneous groups where members all have the same type of group membership duration.

Concerning the effect of different time horizons of agents, a small branch of literature explicitly examines the effects of varying time horizons. Anderhub et al. [14] show that short-term contracts significantly reduce the investment rates of agents. Angelova et al. [15] analyze heterogeneous agents with economic experiments. In a principal-agent setting, temporary members (strangers) switch groups after every period, whereas a principal and a permanent member (partner) interact during the experiment. Their experimental results indicate that principals tend to discriminate against temporary agents, which, in turn, negatively affects the efforts of the temporary agent.

We are aware of only three studies analyzing heterogeneous groups with predetermined group membership duration: Grund et al. [16] conduct an experiment implementing a one-shot public good game with partners and strangers in the same group and observe lower cooperation rates in groups with a higher number of temporary group members. Furthermore, Grund et al. [17] analyze mixed

1 Public good games are a prominent example for social dilemmas and illustrate inefficient allocations of individual contributions compared to socially desired outcomes [11,12]. Pubic goods may represent various goods, e.g., public health, air pollution, or other outcomes of groups [12]. We implement the public good game in an experimental setting to focus on cooperation levels within a group of individuals.

groups of strangers and partners in a repeated public good setting, and their results indicate that a specific group composition may induce spillover effects and may, thus, impact cooperation behavior in subsequent groups with permanent members only. Particularly, they show that past experience affects cooperation in a partner setting when a group formerly consisted of three partners and only one stranger. Moreover, Angelova et al. [18] examine leading by example in a public good game. Within the sequential version, either permanent or temporary agents contribute first, whereby the temporary agents switch groups after each round. Results indicate lower contributions in groups with permanent or temporary leaders compared to simultaneous public good games with homogenous group members. In contrast to Grund et al. [16,17] and Angelova et al. [18], our novel study focuses on groups of partners and strangers who interact in the same group formation for a finite and ex-ante known number of rounds in lieu of rotating temporary group members every round. This more realistic approach enables us to reveal the effects of the common history of cooperation on subsequent group behavior with heterogeneous agents.

Partners and strangers, as implemented in experiments such as described above, may simulate permanent and temporary workers. However, strangers in these studies typically switch groups after every period and are never able to become permanent group members. However, the opportunity to receive a group membership extension may serve as an incentive for the temporary group member. Next to the mere fact of a group membership being extended or not, the decision mechanism is likely to affect cooperation behavior in groups.[2] Extension decisions can be endogenous or exogenous. Studies focusing on endogenous group formation in public good games use various entry or exit rules. Experiments of Ahn et al. [26] and Ahn et al. [27] analyze free or restricted entry and exit possibilities and show that restricted entry increases contributions to the public good compared to a restricted exit rule. Further, Charness and Yang [28] introduce a voluntary voting mechanism to exclude peers, exit one's own group, or to merge groups. Results imply higher cooperation in the voluntary regrouping treatment. In contrast to our study, all group members can be subject to renewing group membership with various group sizes.

Further, effects of exclusion mechanisms on group members have been shown in the experimental literature on ostracism: Masclet [29] and Maier-Rigaud et al. [30] report public good games with group members who decide endogenously about their peers' group membership, and results show higher cooperation rates compared to standard public good games. Croson et al. [31] introduce an exogenous rule to determine group members' extension: the lowest contributor in a team production setting is excluded from her group. Further, their analyses indicate exclusion as an effective mechanism, in particular in voluntary contribution games and best-shot games. In other studies, the introduction of either a costless or a voluntary exclusion mechanism leads to higher cooperation levels of individuals and groups and a tendency to downsize groups [32]. In contrast to our contribution, group size is automatically affected by decisions. Previous research did not compare differences between exogenous decision (random draw) and endogenous decision (made by a group member)[3] mechanisms with regard to group membership extension/replacement.[4]

The aim of this study is to advance our understanding of the dynamics of mixed workgroups by adding the possibility that group memberships can be converted from temporary to permanent without full information on preceding individual contributions.

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[2] There are interesting experimental studies analyzing the impact of different decision mechanisms on cooperation behavior, such as direct democracy [19,20], election delegation [21,22], or leadership [23,24]. In our experiment, we do not set the in-group decision-maker as leader of the group. Moreover, the results of Ibanez and Schaffland [25] reveal that leaders who are members of the group do not affect contributions in a public good game.

[3] In contrast to other experimental studies, we focus on an endogenous decision mechanism which sets a randomly chosen permanent group member by default. See, for endogenous institutions chosen by the group members [33–35].

[4] Kamei [36] analyzes effects of an endogenous versus an exogenous setup in a public good game where subjects democratically vote to play (1) under partner matching or (2) under random matching. Most individuals prefer to play under partner matching protocol and higher cooperation levels are achieved.

3. Material and Methods (Experimental Setup)

The purpose of this study is to understand how the mechanism to extend group membership affects cooperation behavior in groups before and after the decision. We introduce two kinds of group members, thereby distinguishing between temporary and permanent members. To analyze cooperation in groups, we use a version of the standard public good game of Fehr and Gächter [13] (see Appendix A). In groups of four, each individual is endowed with 20 tokens and decides how many tokens they want to contribute to a public good project or how many tokens they want to save in their private account. Investments of all four group members into the project are multiplied by 1.6 and equally reallocated to the group members, which implies a marginal per capita return of 0.4. In the Nash equilibrium, (free-riding) participants will contribute zero to the public good with an individual payoff of 20, while subjects receive 32 tokens when all group members contribute fully.[5]

In total, 20 rounds of the same public good game are played with a restart after 10 rounds. Subjects are randomly assigned to three different player types before round 1: permanent (*P*), temporary (*T*), and (potential) newcomer (*N*). Subjects of the player type *P* represent permanent group members and remain in both treatments for the entire 20 rounds in the same group without any uncertainty about their own group membership. Players of type *T* represent temporary employees who remain in the same group during the first 10 rounds (part I) and are uncertain about their group membership after the first part. They can either belong to the group for the second half of the experiment or be replaced by newcomers (*N*).

The main aim of our study is to analyze how the decision mechanism (exogenous versus endogenous) on extending a temporary group member's membership affects cooperation. In order to disentangle between the monetary utility effect of group membership or of being employed and the social status effect of having group membership extended, we introduce two treatments. The treatments differ with respect to the decision mechanism. The decision about the subsequent group membership of *T* is either exogenous (*Exo*) or endogenous (*Endo*) in order to examine the effect of endogenous decisions themselves in comparison to an exogenous mechanism. If decisions after part I are made exogenously, a random draw decides whether *T* will be replaced by *N* (*Exo_Rep*) or whether *T*'s group membership will be extended (*Exo_Ext*).[6] If decisions after part I are made endogenously, one randomly chosen player of type *P* decides whether *T* will be replaced by *N* (*Endo_Rep*) or will remain in the group (*Endo_Ext*). In *Exo*, the randomly chosen player of type *P* is informed about her right to decide about *T*'s group membership extension or *T*'s replacement after part I and before the second part starts. The decision-maker is determined exogenously after part I to prevent effects on cooperation behavior beforehand and to ensure comparability between treatments. Players of type *N* are initially not allocated to any group and may replace temporary group members (*T*) after the first part of the experiment.

Before the experiment starts, subjects are informed about their own player type and the group composition. Furthermore, subjects who receive the information about whether a random draw or a player of type *P* will decide about the group composition in part II. In the first 10 rounds, a group consists of four members in both treatments: three players of type *P* and one player of type *T*. In part I, all four members–*P*s and *T*–know that they will interact for 10 rounds. While *P*s and *T* decide simultaneously about their contributions to the project in each round of part I, *N* does not join the group and has the opportunity to read comics.

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5 Note that participants in the subgame perfect equilibrium derived via backward induction in this finitely repeated game also contribute 0 to the public good in each stage game. This prediction is independent of the different types of players and the endogeneity of the replacement/extension decision.

6 Subjects who are assigned to the role of group member *T* are not informed about the likelihood of replacement. In general, the probability of extending group membership or replacing the temporary agent is 50%. Due to non-attendance of some subjects, we were unable to split *Exo* into two equal groups of extension or replacement.

Before the second part starts, in *Exo* the random draw decides about group composition in part II. In *Endo*, one randomly chosen player of type *P* is informed that she may decide about the group composition. In both treatments, subjects receive information about whether *T* will remain in the group or will be replaced before part II starts. As in reality, individual contributions to the team output are usually not observable; we reflect this also in the experimental setting: The endogenous decision-maker does not receive full information on individual cooperation levels and, hence, cannot directly sanction free riders.

They again decide simultaneously about their contributions to the project in each round of part II. Replaced *T*s or non-allocated *N*s do not join groups but have the opportunity to read comics. They receive a lump sum of 12 tokens in each round. In the vast majority of cases, the lump sum of 12 tokens is worse for a player, *T* or *N*, compared to the payoff from the public good game. If only one of the four players contributes 20 tokens to the public good, that player will take a payoff of 8 tokens, whereas that player will receive a payoff of 32 tokens if all group members contribute 20 tokens each to the public good, and that player will receive a payoff of 44 tokens if she is the only group member who shirks and the other group members contribute 20 tokens to the public good. Figure 1 illustrates our experimental setup.

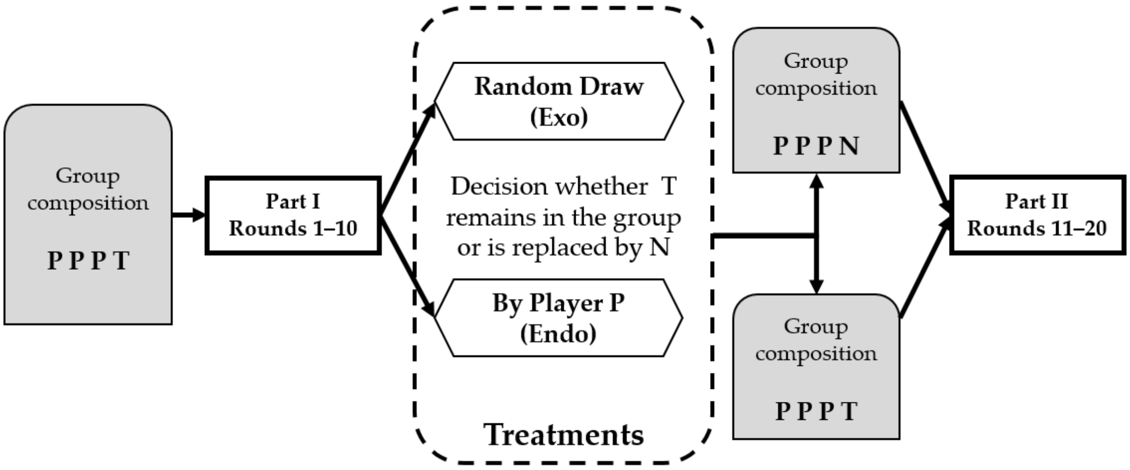

Figure 1. Experimental design. Notation: *P*—permanent group member, *T*—temporary group member, *N*—newcomer in a group.

Prior to the experiment, subjects are asked to answer test-questions to ensure that they have understood the design. Moreover, we elicited beliefs in line with Fischbacher et al. [37].[7] Subjects are asked for their unconditional and conditional contributions in an incentivized one-shot public good game. First, we asked subjects to state their contribution to the public good independent of other group members' contributions. Second, subjects decide about their own contributions conditional on the average contribution of other group members (integers from 0 to 20).[8] No information about the decisions of others or about payoffs derived from this pretest is provided. We use this first decision to distinguish certain types of players with regard to their degrees of conditional cooperativeness [37]. Afterward, the actual experiment starts and subjects are randomly assigned to (new) groups and player types. Before the start of each part, we elicit subjects' beliefs to verify expected contributions made by their group members in the first round of each part. After each round, subjects are informed about

[7] Elicitation of beliefs may reveal underlining preferences and constraints of group members towards other group members' contributions [38], in particular we are interested to gain more insights in differences between player types and effects of beliefs on the following contributions.

[8] Subjects were randomly assigned to groups of four and received a payoff as described above.

their individual payoff from the project and their private account but only receive information about cumulative contributions to the public good. Hence, individual contributions cannot be traced back to group members. Ultimately, the total individual payoff consists of payoffs from one randomly chosen round out of part I and part II, from the pretest to determine player types, and from the estimations of beliefs.[9] After the experiment, subjects are asked to complete a questionnaire (see Appendix B).

In total, eleven sessions with a sum of 320 subjects (68 groups) were conducted and took place in July and November 2018 in a laboratory of a German university. The subjects, mostly students (mean age: 23.97, 0.34 female[10]), were recruited with "ORSEE" [39], and the experiment was programmed with "z-Tree" [40]. As shown in Table 1, 90 subjects were randomly assigned to the *Exo_Rep* variation and 80 to the *Exo_Ext* variation. In *Exo_Rep*, 72 of the 90 subjects contributed to the public good in part I and part II because in each of the 18 groups, one player of type *N* was assigned as a potential replacement without actually participating in the public good game. Due to the exogenously set membership extension of the temporary group members in the *Exo_Ext* sessions, no subject was assigned as a player type *N*, and all 80 subjects contributed to the public good. In *Exo_Ext* and in *Exo_Rep*, subjects received the same treatment information and, therefore, did not know actual differences in group size (in *Exo_Ext*: 4; in *Endo_Ext*: 5). Furthermore, from the total number of subjects in the lab, it is difficult to imply precise treatment variation.

Table 1. Allocation of subjects to treatments.

Treatment (Variation)	No. of Groups	No. of Individuals	No. of Players		
			P	***T***	***N***
Exo					
All	38	170	114	38	18
Exo_Rep	18	90	54	18	18
Exo_Ext	20	80	60	20	-
Endo					
All	30	150	90	30	30
Endo_Rep	19	95	57	19	19
Endo_Ext	11	55	33	11	11

In total, 150 subjects were assigned to the *Endo* treatment, from which 120 subjects contributed to the public good in each part (I and II). Almost two-thirds of decisions were in favor of replacement, so that 95 subjects were part of *Endo_Rep* and 55 of *Endo_Ext* in part II. The average duration of the experiment was 1.5 h, and the subjects earned, on average, 13.69 Euros each.

4. Hypotheses

From a (standard) theoretic perspective, participants should always contribute 0 in the subgame perfect equilibrium in the finitely repeated public goods game. However, many previous experiments have shown that behavior may differ from this prediction as individuals may, for example, be motivated by reciprocity or social approval. These behavioral explanations are the basis for deriving our hypotheses in the following.

We are going to focus on three research questions and hypotheses. First, we analyze whether the opportunity of having one's group membership (endogenously) extended by a group member may serve as an incentive to cooperate more compared to a situation where the extension decision

9 Following Gächter and Renner [38], we ask the subjects for the individual contributions of all other group members (in tokens) and compute the mean contribution of the other three group members. Further, the payoffs from the beliefs are based on a subject's guess about average contributions, i.e., whether she does not misestimate the mean contribution by 10 tokens. However, losses are not possible.

10 All subsequent results are robust by including a female dummy.

is arbitrary and clearly independent of own effort. Without an endogenous decision, there is no incentive to cooperate for T to avoid becoming unemployed. With an endogenous decision mechanism, social approval or reciprocity may also contribute to the explanation of higher cooperation levels after the decision.

Thus, our study intends to examine the effects of endogenous decisions on the group and individual behavior and, therefore, introduces exogenous decisions as a reference measure. While endogenous decisions are likely to be based on preceding (group) performance, exogenous decisions may be perceived as a case of (bad) luck by all group members. With an endogenous decision mechanism, T's contribution is not directly observable; however, T may assume that a decision-maker may ascribe a higher group average contribution to her and, thus, he may extend her group membership. Based on our payoff scheme, there is a monetary incentive for temporary group members to extend group membership and, as a result, she may contribute more to the public good. With an exogenous decision mechanism, T cannot affect the extension decision and, hence, a temporary player has no incentive, as mentioned above, to contribute to the public good– independent of the probability of group membership extension. Further, lower cooperation levels on average are possible. Therefore, an endogenous decision mechanism may have an incentive effect on the temporary agent's motivation, while a random draw may not be able to set an incentive to perform well. The higher the difference between our exogenous and our endogenous treatment in part I, the more relevant the endogeneity of the decision to extend group membership is. Again, note that temporary agents in a setting with an endogenous decision-maker cannot signal their contributions directly but may increase cooperation to avoid termination of group membership, which implies a lower payoff. Hence, we will test the following hypothesis:

Hypothesis 1a: *Cooperation of temporary agents is higher with an endogenous decision mechanism compared to an exogenous decision mechanism.*

Assuming that an extension decision works as an incentive for the temporary group member, he contributes more to the public good with an endogenous decision mechanism compared to an exogenous decision mechanism. Further, even if no other group member decides to contribute, his contributions should be higher with endogenous decision-making and, thus, the average group contribution should be higher. Moreover, as we know that a large share of players in public good games are conditional cooperators [37,41], the cooperation level of permanent group members may be influenced by reciprocal behavior towards high contributions from the temporary agent.

Hypothesis 1b: *Cooperation of permanent agents is higher with an endogenous decision mechanism compared to an exogenous decision mechanism.*

Second, we investigate the determinants of the endogenous decision to extend a temporary agent's group membership. In the endogenous treatment, a randomly chosen group member decides about the temporary agent's membership extension or replacement after a certain time. Previous research [29,42] shows that the decision-maker will be influenced by the group's behavior, i.e., the cooperation level in the group, in the first part before deciding on membership extension or replacement. The decision-maker may, then, signal her (dis)satisfaction with group behavior. In our setting, individual cooperation behavior, in particular contributions of the temporary group member, cannot be observed by the permanent group members and, hence, the extension decision will be based on total group contributions to the public good.

Hypothesis 2 (*Endo*): *The higher the level of a group's cooperation, the higher the probability of extending the temporary group membership.*

Third, our study is expected to shed some light on the effect of extending a group membership or replacing a group member on subsequent cooperation rates of all group members. Different effects seem plausible: In the endogenous setting, the extended agent perceives the extension as a reward or gift for cooperating in the first part and, hence, tends to contribute more than before rather than less. On the other hand, the temporary agent may reduce contributions after membership has been extended, as the incentive to cooperate and to secure extension is no longer effective. Hence, in the absence of an incentive for higher cooperation, we expect lower contributions in the second part compared with the first part after membership extension.

Hypothesis 3a (Endogenous membership extension): *After endogenous membership extension, temporary agents contribute less than before extension.*

Finally, replacing the temporary agent results in a new group composition with a new group member who may perceive the replacement decision as a signal of failed previous group cooperation. Newcomers may react either by choosing a rather moderate cooperation level, as they expect others in the group to contribute only cautiously, based on the previous history of cooperation.[11] Or, assuming that failed cooperation is accompanied by the dissatisfaction of group members, they may react by trying to install a higher level of cooperation and start with high contributions to the public good. Moreover, newcomers may respond to replacement decisions with higher contributions due to reciprocal behavior. Hence, we expect higher contributions of the newcomer compared to her group members.

Hypothesis 3b (Endogenous replacement): *After endogenous replacement of the temporary agent, new agents contribute more than others in the group.*

5. Results

The analysis of the results will be structured along our three major research questions. First, we ask whether the opportunity of a membership extension motivates temporary agents and also affects permanent group members' cooperation levels in both treatments. Second, we investigate why a *P* player decides to extend her group membership. Moreover, finally, we focus on behavior in part II to gain insight into cooperation behavior after a group membership has been extended or the temporary player has been replaced by a new player. To understand the effect of the endogenous decision of the internal group member, we compare behavior in the *Endo* treatments with behavior in the *Exo* settings in which the extension decision is randomly made.

5.1. Does the Prospect of Membership Extension Affect Cooperation?

Exploring possible incentive effects of the extension promise, we first focus on type *T* players in particular because they are directly affected by the decision. Subsequently, we then also consider possible effects for type *P* players because individual contributions within groups are related.

Total mean contributions in our two treatments *Endo* and *Exo* do not significantly differ in part I.[12] In addition, we do not find any differences regarding the contributions of players *P* between the two settings in part I (Table 2, see also Figure 2a,b). Furthermore, temporary agents in *Endo* (mean:

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[11] Results of a weakest-link experiment by McCarter and Sheremeta [43] show a decrease in group performance after the arrival of two newcomers in a group of four, and the authors justify the behavior by a decrease of trust within the group, as newcomers are unaffected by performance history. However, with an endogenous decision mechanism, replacement of the temporary group member may signal information on (failed) performance to the newcomer.

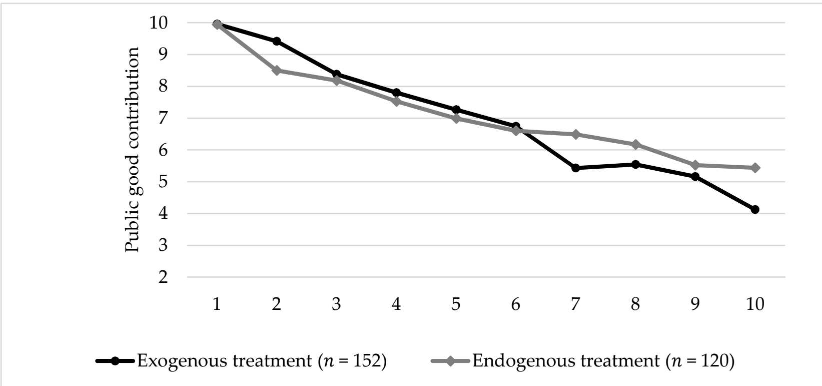
[12] In settings with four permanent group members, Grund et al.'s [16] findings reveal an average contribution of 5.95 over 10 rounds. Our results indicate a higher level of cooperation in both treatments.

7.88) cooperate marginally significantly more than the temporary players (mean: 6.20; $p = 0.064$)[13] in *Exo*. This result may indicate that T-type subjects in *Endo* choose higher contributions in order to foster an extension decision. Note that there is a considerable monetary incentive to get a membership extension, as temporary group members, when staying in the group, have an expected income of 24.34 tokens (equal to the mean payoff of temporary group members in the first part) compared to a lump sum of 12 tokens each for being unemployed. During the first part, only three Ts earn less than 12 tokens in one of the ten rounds each. Thus, from an ex-post perspective, Ts have a monetary incentive to stay in the group.

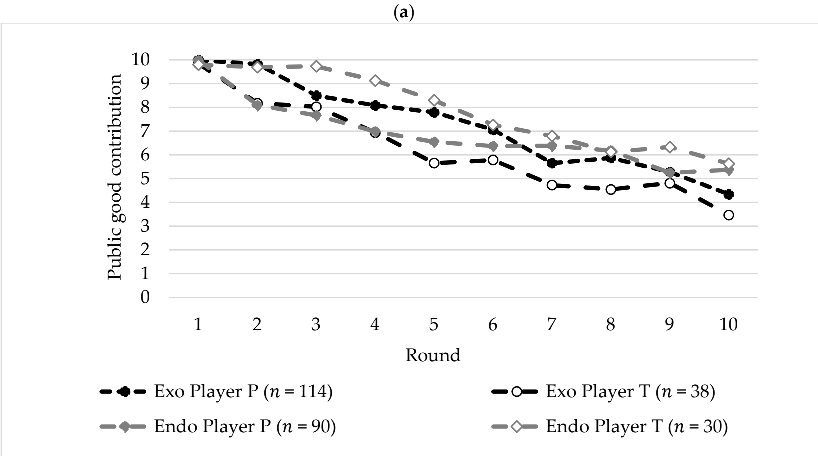
Table 2. Mean contribution in part I.

	Total	**Player *P***	**Player *T***	
Exo (n = 152)	6.98	7.24	6.20	p = 0.287
Endo (n = 120)	7.14	6.89	7.88	p = 0.308
	p = 0.491	p = 0.865	p = 0.064	

Note: nonparametric tests refer to means row-wise or column-wise.



(**a**)



(**b**)

Figure 2. (**a**) Mean contribution over rounds in part I per treatment. (**b**) Mean contribution over rounds in part I per treatment and player type.

In order to get a deeper understanding of behavior in part I, we control for the conditional contributions that subjects are asked for before the experiment starts. In line with Fischbacher et al. [37],

13 All reported nonparametric tests are conducted with the Mann–Whitney U test and are two-tailed. Only in the case of a directed hypothesis are applied nonparametric tests one-tailed.

we calculated Spearman rank correlations for each subject between the individual contribution and the mean contributions of the other group members in a one-shot public good game as a measure for the *Conditional willingness to cooperate*. Insignificant correlations (p-value < 0.001) are recorded as zero. To capture typical diminishing contributions in public good games, we use *Round* as a control variable, too. We apply Tobit estimations and cluster at the subject level[14] in the analysis presented in Table 3.

Table 3. Tobit estimations on individual contributions in part I.

	Individual Contribution in Part I
Endo treatment (1 = yes)	3.009 *
	(1.701)
Player of type P (1 = yes)	1.451
	(1.359)
Endo treatment × *Player of type P*	−3.512 *
	(1.982)
Conditional willingness to cooperate	5.549 ***
	(1.018)
Round	−0.888 ***
	(0.0783)
Constant	5.603 ***
	(1.472)
Pseudo R2	0.023
Observations	2720

Note: robust standard errors clustered at the individual level of 272 subjects (in parentheses). *** $p < 0.01$, * $p < 0.1$.

Temporary group members contribute weakly significantly more in *Endo* than they do in *Exo*, which is in line with nonparametric results and marginally supports our Hypothesis 1a.

Result 1: *The prospect of group membership extension in our Endo treatment seems to serve as an incentive device for temporary players to contribute more to the public good.*

Moreover, there are no player type differences in *Exo*, indicated by the insignificant effect of the dummy variable for player type P. However, the relation of contributions by type of player is weakly different in the *Endo* treatment: P-type players in *Endo* contribute relatively less than P-type players in *Exo*, refuting our Hypothesis 1b. The *Conditional willingness to cooperate* is positively related to contributions in part I of our experiment.

Result 2: *Average group contributions to the public good do not differ between an endogenous and an exogenous mechanism.*

5.2. What Determines the Decision to Extend Membership?

In the *Endo* treatment, one of the P players is informed after part I that she is entitled to decide about whether to extend T's group membership or not. Almost two of three decisions (19 of 30) were in favor of replacing the temporary group member with a newcomer, whereas in 11 groups, temporary players were extended. To understand why a membership has been extended, we examine the behavior in part I ex post for a given decision. We assume that higher levels of cooperation in part I lead to the decision to extend T's group membership.

Our results depicted in Table 4 show that the decision to extend membership or not seems to be related to group contributions in part I. The endogenous decision-maker does not receive full information about individual contributions, and, hence, her decision depends on total group

[14] Existing public good literature usually clusters at group-level, but assumes homogenous group members; in contrast, our groups consist of heterogeneous player types and, therefore, we cluster at individual level to disentangle contribution behavior of different player types. However, results of Table 3 are robust to clustering at group-level.

contributions. In particular, the decision seems to be dependent on the average level of previous cooperation and, further, on the evolvement of cooperation over time. Indeed, groups in which T is replaced (*Endo_Rep*) contribute 6.34, while groups in which T's membership is extended (*Endo_Ext*) contribute marginally significantly more on average in part I (8.52; $p = 0.051$, one-sided Mann–Whitney U- test). Thus, the contribution level of part I seems to affect extension decisions.

Table 4. Average of mean group contribution and *MaxDrop* in part I by decision.

	Replacement Decision (*Endo_Rep*, $n = 19$)	**Extension Decision (*Endo_Ext*, $n = 11$)**	**[*]**
Mean group contribution part I	6.34	8.52	$p = 0.051$
MaxDrop	6.47	4.52	$p = 0.160$

Note: [*] since we have an explicitly directed hypothesis, we use one-sided Mann–Whitney U tests here.

Besides an analysis of the mean contribution, also the evolvement of group contributions over rounds may explain extension decisions. Thus, we introduce a second measure which may influence the decision in favor of or against replacement of the temporary group member: We calculate the difference between the maximal average group contribution in a round in the first part and the average group contribution in round 10 (*MaxDrop*, Table 4). This measure serves as an indicator for the experienced group-specific maximal drop in average contributions. Descriptively, there is indeed a considerable difference between the averages of *MaxDrop* regarding the extension decisions, but it is not statistically significant.

The question is whether the reported difference in mean group contribution is equally driven by both player types. Table 5 reveals that both player types P and T play a role here. In particular, contributions of Ps are significantly higher in the *Endo_Ext* (mean contribution: 8.36) than in the *Endo_Rep* (mean contribution: 6.04, $p = 0.022$) in part I. The T-type players also contribute somewhat more in part I of *Endo_Ext* than in *Endo_Rep* (9.02 vs. 7.23). However, mean contributions do not differ significantly at the usual level due to fewer observations ($p = 0.189$).

Table 5. Contributions by player type in part I by subsequent decision.

	Replacement Decision (*Endo_Rep*)	**Extension Decision (*Endo_Ext*)**	**[*]**
Player P	6.04 ($n = 57$)	8.36 ($n = 33$)	$p = 0.022$
Player T	7.23 ($n = 19$)	9.02 ($n = 11$)	$p = 0.189$

Note: [*] since we have an explicitly directed hypothesis, we use one-sided Mann–Whitney U tests here.

Mean contributions per group do not differ between *Endo_Ext* and *Endo_Rep* at the beginning of the experiment but drift apart after the first rounds. From round five onwards, Ts in *Endo_Ext* contributes more on average than T in *Endo_Rep* (significant difference in rounds eight to ten with $p < 0.1$). Moreover, also Ps in *Endo_Ext* cooperate more than the respective Ps in *Endo_Rep*: The mean contribution of P in *Endo_Ext* is already higher than in *Endo_Rep* from round three onwards (significant difference in rounds seven to ten with ($p < 0.05$)). This difference between Ps in *Endo_Ext* and Ps in *Endo_Rep* may be related to differing beliefs elicited before round 1: Player P's beliefs towards the contributions of type T players before round 1 differ between cases of later extensions (10.97) and replacements (8.84, $p = 0.044$; detailed results are presented in Appendix C in Table A1).

Further, we apply probit estimations in order to examine the decisions about whether to extend or not to extend membership in more detail (Table 6). We again use the *Conditional willingness to cooperate* with the decision-maker as a control variable.

Table 6. Binary probit estimations on replacement decisions (1 = yes) in *Endo* by the decision-maker.

	I	II
Mean group contribution in part I	−0.149 *	
	(0.081)	
	[−0.050]	
MaxDrop		0.153 *
		(0.083)
		[0.052]
Conditional willingness to cooperate	−0.361	−0.279
	(0.568)	(0.544)
	[−0.122]	[−0.095]
Constant	1.654	−0.314
	(0.827)	(0.614)
Observations	30	30

Note: robust standard error (in parentheses). Marginal effects [in brackets]. * $p < 0.1$.

In line with our nonparametric results, we test the effect of average group contributions in part I on the decision to replace the temporary group member with a newcomer (model 1 of Table 6). *Mean group contributions in part I* are negative and weakly significant, which implies that higher average group contributions in part I slightly decrease the probability of replacement. Further, we introduce *MaxDrop* as described above (model II). The variable is positively and marginally significantly related to the replacement decision in *Endo*. This result indicates that a higher probability of replacement is in line with a higher drop in contributions in part I. Overall, the decision of the randomly selected player *P*, who may decide to extend group membership, is related to the preceding cooperation rate within the group, and our results confirm our expectations in Hypothesis 2.

Result 3: *A higher probability of extending the membership is related to a higher cooperation rate within the group in the first part.*

5.3. How Do Membership Extensions or Replacements Affect Subsequent Cooperation Behavior?

Finally, it is important to investigate whether extending membership affects subsequent cooperation behavior. Therefore, we compare contributions in the different settings in part II of the experiment. Mean contributions by treatment variation and player type in part II of our experiment are reported in Table 7. We find that within the *Exo* treatment, average contributions subsequent to replacements exceed marginally significantly those after extensions (Mann–Whitney U test; $p = 0.071$). In part II, neither the previous decision mechanism (*Endo* versus *Exo*) nor the decision (replacement or extension) affects contributions for a given type of player, i.e., *T* or *P* players. The difference– reported above– within the *Exo* treatment between the replacement and the extension decision is only driven by the high contributions of the *Newcomers* (*N*s).

Table 7. Mean contribution in part II.

	Rep		*Ext*				
	Player *P*	**Player *N***	**Player *P***	**Player *T***	**Total *Rep***	**Total *Ext***	
Exo (n = 152)	6.46	7.16	4.97	4.77	6.63	4.91	$p = 0.071$
Endo (n = 120)	5.22	6.67	6.25	6.52	5.58	6.31	$p = 0.562$

Note: number of individuals per variation: *Exo_Rep* (*P*: n = 54; *N*: n = 18), *Exo_Ext* (*P*: n = 60; *T*: n = 20), *Endo_Rep* (*P*: n = 57; *N*: n = 19), *Endo_Ext* (*P*: n = 33; *T*: n = 11).

In the *Exo*-Treatment, new players of type *N* contribute significantly more in round 11 than their group members of type *P* (mean contribution: 14.06 vs. 9.15, $p = 0.029$). Their contributions are also much higher than those of type *T* players in *Exo_Ext* (mean contribution: 5.80, $p = 0.007$). However, from round 12 onwards, the *N* players reduce their contributions, and differences between *T* in *Exo_Ext* and *N* in *Exo_Rep* are no longer significant. Supporting our Hypothesis 3b, we find similar patterns in *Endo,* although the overall difference in mean contributions is not significant: The new player of type *N* contributes more to the public good only at the beginning. In round 11 of *Endo_Rep*, *N* (mean: 12.47) contributes on average more than *P* (mean: 8.75, $p = 0.066$). Subsequently, *N*s adjust to the mean contribution level after round 13.

Thus, we find that the new players who are added to the group in the replacement settings provide higher contributions at the beginning than all other players. Comparing the contributions of the new *N* players in round 11 to the contributions of other players in their first-round in part I, we find that in the *Exo* treatment, contributions of *N* are significantly higher compared to both other player types in round 1 (*N* in round 11 (mean: 14.06) vs. *P* in round 1 (mean: 10.00): $p = 0.031$; *N* in round 11 vs. *T* in round 1 (mean: 9.84): $p = 0.046$).

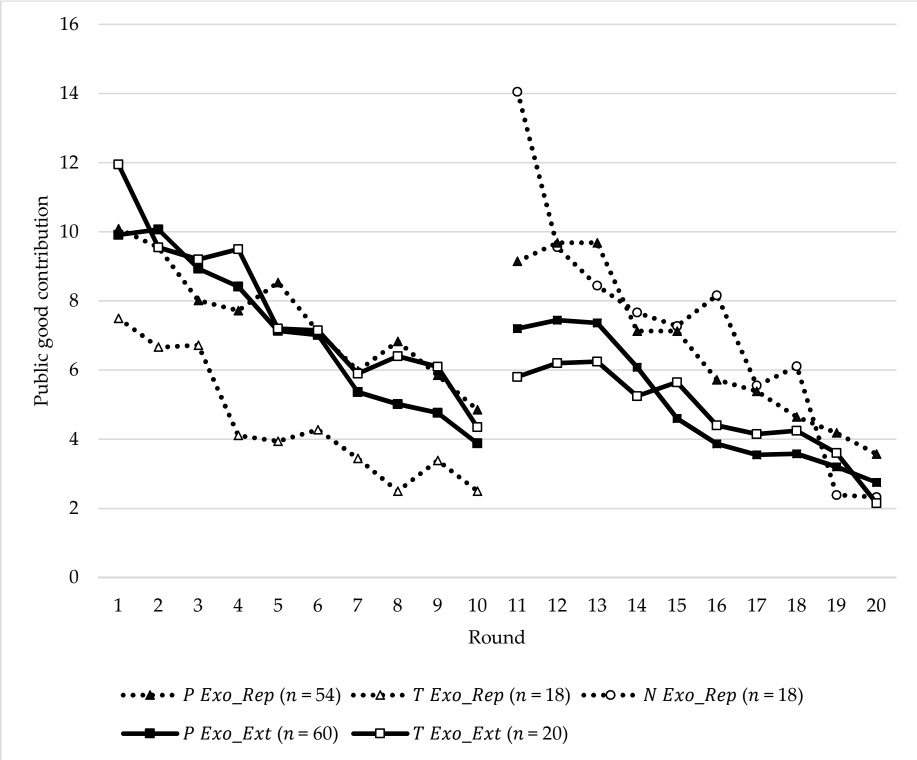
Result 4: *Newcomers start with considerably high contributions after replacement decisions. However, they adapt to the contributions of other group members rather fast.*

Moreover, we also take a closer look at the evolvement of contributions over rounds to get a better understanding of behavior in settings in which group membership was extended. The average contribution per player type in each round in *Exo* and *Endo* is shown in Figure 3a,b. In the *Exo* treatment, contributions show the typical behavioral pattern of social dilemma games, i.e., contributions decrease over each part of the experiment. Furthermore, we examine the restarting effect by comparing the contributions of round 10 (end of part I) and round 11 (first round in the second part). A restart effect can be shown for all player types ($p < 0.01$) in *Exo* except for players of type *T* in *Exo_Ext (n.s.)*. Comparing part I and part II in *Exo_Ext*, we find higher contributions in the first part for both player types compared to the second part (*P*-type: mean in part I: 7.05; mean in part II: 4.97; $p = 0.007$; *T*-type: mean in part I: 7.73; mean in part II: 4.77; $p = 0.030$).

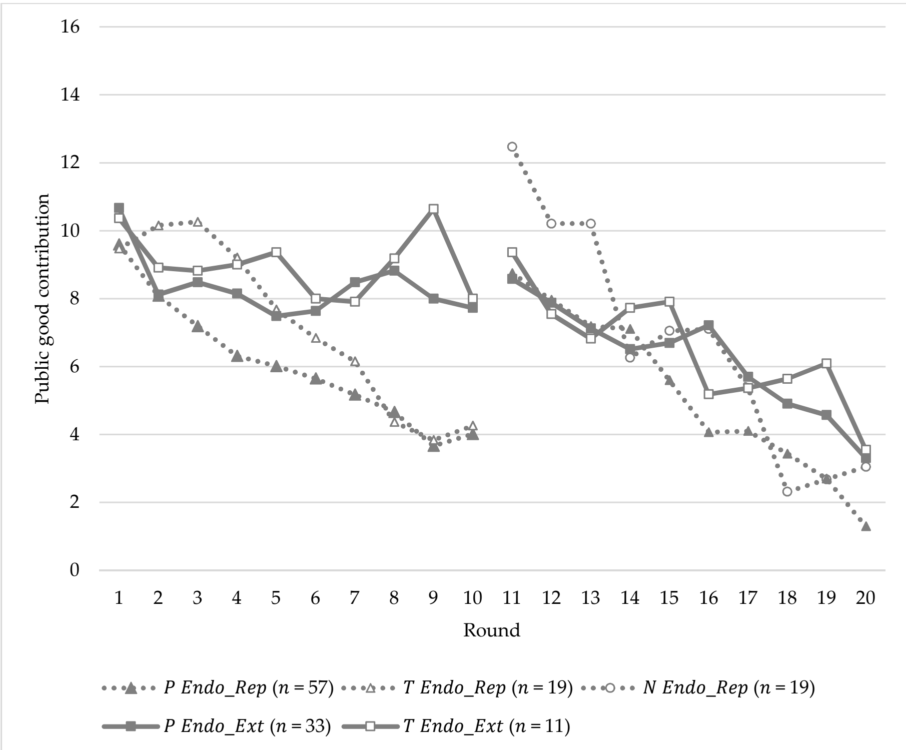
The evolvement of mean contributions over all rounds in the *Endo* treatment is illustrated in Figure 3b. In *Endo_Ext*, neither contributions of player type *P* (mean in part I: 8.36; mean in part II: 6.25) nor contributions of player type *T* (mean in part I: 9.02; mean in part II: 6.52) are significantly different comparing part I and part II. This result refutes our Hypothesis 3a that mentions a lower level of cooperation after the membership extension of the temporary group member. Furthermore, a restart effect can only be shown for *P* and *T* (compared to their successors *N*) in *Endo_Rep* ($p < 0.01$).

Result 5: *Within the endogenous setting, the cooperation level of the temporary group member remains stable after group membership extension compared to the situation before group membership extension with group membership uncertainty and an incentive for higher cooperation.*

Further, we analyze possible determinants of contributions in part II by using multivariate analysis. We separately explore the determinants of contributions for *Exo* and *Endo* (Tables 8 and 9, respectively). In detail, we apply Tobit estimations and cluster at the subject level.



(**a**)



(**b**)

Figure 3. (**a**) Mean contribution over rounds in *Exo* by player type. (**b**) Mean contribution over rounds in *Endo* by player type.

Table 8. Tobit estimations on individual contributions in part II (*Exo*).

	I	II	III	IV	V	VI
Replacement (1 = yes)	2.558 *	2.579 *	3.503	2.026	−3.456	−2.570
	(1.444)	(1.433)	(3.456)	(1.439)	(3.103)	(4.323)
Player type P (1 = yes)		−0.322	0.250	−0.320	−0.306	0.241
		(1.840)	(2.167)	(1.794)	(1.766)	(1.941)
Player type P×Replacement			−1.224			−1.159
			(3.748)			(3.592)
MaxDrop				−0.395 *	−0.709 **	−0.708 **
				(0.210)	(0.287)	(0.287)
MaxDrop×Replacement					0.848 *	0.847 *
					(0.471)	(0.471)
Conditional willingness to		3.274 *	3.318 *	3.175 *	2.727	2.769
Cooperate		(1.725)	(1.707)	(1.738)	(1.725)	(1.702)
Round	−1.297 ***	−1.299 ***	1.298 ***	−1.307 ***	−1.311 ***	−1.310 ***
	(0.144)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)
Constant	21.85 ***	19.899	19.434 ***	23.007 ***	25.687 ***	25.235 ***
	(2.160)	(3.190)	(3.248)	(3.360)	(3.618)	(3.632)
Observations	1520	1520	1520	1520	1520	1520

Note: robust standard errors clustered at the individual level of 152 subjects (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *MaxDrop* shows the difference between the maximal average group contribution in a round in the first part and the average group contribution in round 10.

Table 9. Tobit estimations on individual contributions in part II (*Endo*).

	I	II	III	IV	V	VI
Replacement (1 = yes)	−1.089	−0.431	0.785	0.376	−4.888 *	−3.672
	(1.353)	(1.316)	(2.119)	(1.400)	(2.677)	(3.069)
Player type P (1 = yes)		−2.334 *	−1.335	−2.346 *	−2.333 *	−1.364
		(1.369)	(2.016)	(1.371)	(1.339)	(1.906)
Player type P×Replacement			−1.616			−1.563
			(2.710)			(2.623)
MaxDrop				−0.363 *	−1.156 ***	−1.152 ***
				(0.208)	(0.417)	(0.415)
MaxDrop×Replacement					1.058 **	1.050 **
					(0.476)	(0.473)
Conditional willingness to		2.871 *	2.994 *	3.138 **	2.844 *	2.965 *
Cooperate		(1.535)	(1.554)	(1.536)	(1.506)	(1.529)
Round	−1.270 ***	−1.269 ***	−1.269 ***	−1.270 ***	−1.264 ***	−1.264 ***
	(0.132)	(0.132)	(0.132)	(0.132)	(0.132)	(0.132)
Constant	24.00 ***	23.407 ***	22.572 ***	24.838 ***	28.486 ***	27.965 ***
	(2.209)	(2.764)	(2.777)	(2.745)	(3.234)	(1.529)
Observations	1200	1200	1200	1200	1200	1200

Note: robust standard errors clustered at the individual level of 120 subjects (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *MaxDrop* shows the difference between the maximal average group contribution in a round in the first part and the average group contribution in round 10.

First, we examine the effect of *Replacement* or *Extension* in part II for *Exo* in Table 8. Subjects in the *replacement* treatment (*Exo_Rep*) contribute weakly significantly more compared to the *extension* treatment. Additionally, we check for player type (*P* or *T* and *N*) and do not find a significant relationship between the *Player type P* and individual contributions in the second part (model II). Moreover, the interaction between *P* and *Replacement* is not significant (model III), so that there are no hints of particular effects of newcomers.

To investigate spillover effects in the sense that experiences from part I affect the individual contributions in part II, we use the variable *MaxDrop* as described above and add it to model IV. Indeed, *MaxDrop* is negatively significantly related to the individual contribution in the second part. Additionally, we examine the interaction between *MaxDrop* and *Replacement* in models V and VI. The role of *MaxDrop* for contributions in part II of the experiment is only relevant subsequent to extension decisions, indicated by the significantly positive interaction term, which abolishes the negative *MaxDrop* effect.

Second, we use the same multivariate analyses for the *Endo* treatment as depicted in Table 9. *Replacement* does not have a significant effect on the individual contribution in part II (model I). Further, players of type *P* contribute significantly less in part II than players of type *T* or *N* (model II). The interaction between *Player type P* and *Replacement*, though, is not significant (model III). Furthermore, the variable *MaxDrop* shows a weakly significantly negative effect on the individual contribution in general (model IV). In model V, the interaction between *MaxDrop* and *Replacement* is included. The variables *Replacement* and *MaxDrop* are negative and significant, whereas the interaction term is positive and significant. Again, experiences from part I seem to influence behavior in part II, especially for *Extension* (*Endo_Ext*). These findings coincide with prior findings from *Exo*. The effects of *Replacement*, *MaxDrop*, and the interaction term of both are confirmed in model VI.

Result 6: *The maximal drop of cooperation rates over part I (measured by MaxDrop) is positively related to the replacement decisions.*

Finally, we further explore possible differences between type *P* players in the *Endo* treatment. We denote players as "decision-makers" if they are randomly assigned the right to decide whether to extend group membership or not after part I; others in the group are denoted as "non-decision-makers" in the following. Here, we again (see also Table 3 above) take the degree of conditional cooperativeness next to *MaxDrop* into account. The results are reported in Table 10 and reveal considerable differences between decision-makers and non-decision-makers. Decision-makers, in particular, seem to react to *MaxDrop*. In addition, the positive interaction effect between *MaxDrop* and *Replacement*, already known from Tables 8 and 9, traces back to decision-makers in particular. In contrast, the (ex-ante reported) degree of conditional willingness of decision-makers to cooperate does not matter. In contrast, the degree of *Conditional willingness to cooperate* plays a crucial role in non-decision-makers. This relevance is decreasing in *MaxDrop*, indicated by the significantly negative interaction term. However, previous experiences do not seem to be as relevant for non-decision-makers as for those who are assigned the role of decision-maker after part I. Even the interaction term of *Replacement* and *MaxDrop* is not significant.

Table 10. Tobit estimations on individual contributions in part II in *Endo (player of type P: decision* vs. *non-decision-maker)*.

	Decision-Maker (Player of Type P)			**Non-Decision-Maker (Player of Type P)**		
	I	**II**	**III**	**IV**	**V**	**VI**
Replacement (1 = yes)	3.915	−7.172	−6.597	−1.354	−3.425	−3.831
	(2.909)	(5.796)	(5.643)	(1.854)	(3.647)	(3.814)
Conditional willingness to Cooperate	0.816	−0.0152	−5.147	6.019 ***	5.856 ***	13.73 ***
	(2.836)	(2.542)	(5.929)	(2.195)	(2.154)	(4.189)
MaxDrop	−1.554 ***	−3.282 ***	−3.966 ***	0.0522	−0.255	0.638
	(0.530)	(1.068)	(1.131)	(0.266)	(0.627)	(0.726)
Replacement×MaxDrop		2.378 **	2.247 *		0.407	0.575
		(1.194)	(1.168)		(0.680)	(0.716)
Conditional willingness to Cooperate×MaxDrop			0.957			−1.344 **
			(1.086)			(0.669)
Round	−1.203 ***	−1.168 ***	−1.160 ***	−1.321 ***	−1.320 ***	−1.323 ***
	(0.266)	(0.259)	(0.257)	(0.210)	(0.210)	(0.210)
Constant	27.23 ***	34.45 ***	38.20 ***	19.88 ***	21.38 ***	15.86 ***
	(4.280)	(6.350)	(6.531)	(3.747)	(4.387)	(4.978)
Observations	300	300	300	600	600	600

Notes: robust standard errors clustered at the individual level of subjects (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *MaxDrop* shows the difference between the maximal average group contribution in a round in the first part and the average group contribution in round 10.

Result 7: *Cooperation behavior in the second part differs between decision-maker and non-decision-maker: decision-makers are influenced by the maximal drop of cooperation rates over part I, whereas contributions of non-decision-makers are affected by their initial conditional willingness to cooperate.*

6. Discussion and Conclusions

Our contribution adds to prior work on the determinants of cooperation in heterogeneous workgroups with heterogeneity being modeled by different time limits of a group membership. In our setting, three permanent workers (players of type *P*) and one temporary worker (player of type *T*) repeatedly contribute to a public good. Temporary workers know that their group membership will either be extended after the first part of the experiment or that they will be replaced by a new player. We vary the decision mechanism after the first part by comparing an endogenous decision where one of the permanent players is entitled to decide about the temporary worker's membership extension with an exogenous decision which is randomly made.

First, we investigate whether the prospect of being allowed to stay in the group serves as an incentive mechanism to provide higher contributions. In line with research on the literature of endogenous group formation [31,44], our results provide an indication that endogenous decision mechanisms can serve as an incentive for temporary group members in heterogeneous groups, too. Thus, having a temporary membership may lead to higher contributions when agents know that the decision about group membership extension will be endogenously made by one of the group members.

Second, we analyze why group membership is extended or not. We conjecture that higher contributions within a group may tend to induce a decision-maker to extend the membership. Our results show that there is a tendency to replace temporary workers with new players. When comparing groups ex-post in which membership of temporary members has been extended by one permanent member with groups in which they were replaced, we find that in the former groups not only the temporary group member contributed more in the first part, but also the permanent group members. Interestingly, permanent group members start to contribute more than temporary group members earlier, implying that the former even initiate higher levels of contributions. One possible explanation is revealed by the analysis of beliefs measured before the experiment starts. We find that in groups in which a *T*'s membership is extended, *P*s expect temporary workers to contribute more than in groups in which a *T*'s group membership is not extended. This expectation may result in a self-fulfilling prophecy. Although this attribution is not justified by actual contribution patterns from the start of the experiment, it does become true after round three or five.

Additionally, our variable *MaxDrop* reflects the difference between the maximal contribution per group over rounds and the low contribution in the last round. One may cautiously interpret this variable as a proxy for the degree of disappointment, as it captures the maximal perceived decrease of cooperation per group. Our results indicate that temporary workers are slightly more often replaced when the disappointment measured by *MaxDrop* is higher. Taken together, an ex-post analysis for a given decision shows that groups in which the temporary group member is extended reveal different contribution patterns early on compared to groups in which the temporary group member is replaced. When the group membership is extended, the contribution level is higher in the beginning, but we observe the characteristic decrease in contributions over rounds.

Finally, we investigate whether subsequent cooperation behavior is affected by the decision to extend group membership or not. Interestingly, we find that cooperation is higher if a temporary worker is replaced by a group member via an exogenous decision mechanism. Newcomer's contribution is even higher than the contributions of others at the very beginning of the experiment. Furthermore, when the decision is made endogenously, new players provide higher contributions in the first rounds of part II, but the effect is not similarly pronounced. How can we explain the extraordinarily high contributions of new players when they are "invited" by a random device?

The decision by a permanent group member to replace a temporary team member could be interpreted as a sanction for preceding behavior. The decision-maker may use the chance to signal her dissatisfaction to the group by deciding to replace the worker. Apparently, the new incumbent may interpret the replacement as a signal of failed cooperation within the group and try not to fall into disfavor with the permanent group members in contrast to the former temporary group members. This may explain why the new player's contributions are somewhat higher if the decision is made endogenously. In the case of an exogenous random mechanism, participants know that they are not entering the group to replace a temporary worker who might not have provided the contribution as expected. Thus, there is a chance to enter a group that may not have experienced a low cooperation rate, and newly entering participants might be willing to match the potential contributions of others.

Moreover, new group members integrate well into the group in both settings with endogenous and exogenous replacement decisions. The new incumbent influences the whole group's contribution positively, albeit she promptly adapts her contribution behavior to the contribution behavior of the other, experienced group members. This result is in line with the finding of Gunnthorsdottir et al. [45], who show that individuals adjust their contributions to a public good depending on the former group mates' contributions. In the same vein, contributions of the permanent group members may be affected by former cooperation within the group in the previous part.

Our results from the multivariate analysis revealed that a higher experienced disappointment, approximated by *MaxDrop* in part I, implies lower contributions in the second part. However, in the case where a temporary worker has been replaced, the new incumbent can neutralize this effect on average through high contributions in the second part.

In our paper, the extension of the temporary agent's membership may serve as an incentive for higher cooperation rates, albeit the threat of replacement may be perceived as punishment. Results of Masclet [29], for instance, reveal two reasons to exclude peers from a public good game: subjects use exclusion as a sanction for uncooperative behavior and expect behavioral changes in contributions to the public good after exclusions. In the endogenous setting, both perceptions of group members' incentive for membership extension or the threat of punishment may increase the cooperation of the temporary agent. In the exogenous setting, replacement of the temporary group member may be perceived as "blind punishment" [46] due to the incoherence of replacement decision and cooperation history.

In real settings, starting as a temporary group member and receiving a permanent contract after an initial probation period is a realistic prospect and often serves as an incentive for temporary workers. Firms may hold out the prospect of a contract extension before the temporary contract starts and can determine a decision mechanism to decide whether a temporary contract will be extended or not. Furthermore, our results are relevant for other types of heterogeneous groups with differences in group membership duration, such as project teams or as groups using agile management practices.

However, in real settings, decisions about group membership extension or replacement are associated with additional costs, e.g., recruitment costs or setup costs, which may directly affect decisions about group composition. In our setting, we abstract from additional monetary consequences of decision mechanisms. Therefore, future research should focus on more complex settings with costly actions. Further, group sizes in firms are much larger than in our experiment, and, additionally, group composition is not fixed as we used in our setting. Previous research [16,17] indicate differences in cooperation levels with mixed group composition of partner and strangers, but also consider groups of four. Hence, future research should focus on larger groups to gain more insights on cooperation behavior with heterogeneous group members.

To conclude, our results imply that the prospect of having a group membership extended may be used as a motivating incentive in heterogeneous workgroups. Subsequent to the group membership decision, however, extending a group membership seems to be similar to settings where temporary workers have been replaced.

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Appendix A

Experimental Instruction (Originally in German)

Welcome to the experiment! In this experiment, you are able to earn money. How much money you earn depends on your decisions and the decisions of the other participants.

Please turn off your phone, and as of now, do not communicate with other participants.

During the experiment, we will not speak of "Euros", but rather of "tokens". During the experiment, your entire earnings will be calculated in tokens. At the end of the experiments, the total amount of tokens you have earned will be **converted to Euros at the following rate**:

1 token = 0.18 €

All decisions in this experiment, as well as the final earnings, are anonymous.

The displayed results are rounded to the first decimal place.

The Decision Situation

One group has four members. You are playing with three randomly selected participants in a group. Each member has to decide on how to divide up 20 tokens. You can put these 20 tokens into a **private account,** or you can invest them fully or partially into a **shared project**. You can only invest integral tokens between 0 and 20.

Your Income from Your Private Account

Each token that you do not invest in the project will automatically be transferred to your private account. **Nobody but yourself** can receive tokens from your **private** account.

Income from the private account = 20 − contribution to the shared project

Your Income from the Shared Project

Each token that is being invested in the shared project will be multiplied by 1.6 and **equally distributed among all four members of the group**.

Income from the shared project = 0.4 × sum of all contributions to the project

Your Total Income

Your **total income** is the sum of your **income from the private account** and your **income from the shared project**. It holds that:

Income from the private account (= 20 − contribution to the shared project) + Income from the shared project (= 0.4 × sum of all contributions to the project) = Total income

If you have a question about the experiment, please raise your hand. We will then come to you and answer your question.

Please answer the control questions now.

The Experiment—Part 1

In this experiment, each participant has to make two types of decisions. In the following, these decisions will be called **"Unconditional contribution"** and **"Contribution table"**.

Unconditional Contribution

With the unconditional contributions to the project, you have to decide how many of the 20 tokens you want to invest in the project.

Contribution Table

Your second task is to fill out a "contribution table". In the contribution table, you have to indicate for each possible average contribution of the other group members (rounded to the next integer) how many tokens you want to contribute to the project.

For example, you have to indicate how much you want to invest in the project if your group members invest on average 0 token, 1 token, 2 tokens, and so forth.

Payoff

For the payoff from this part, you will be randomly assigned to a group with three other participants. In each group, one member will be chosen **randomly**. For this member, his decision in the **contribution table** will be relevant for the payoff. For the other three members, their decision on the **unconditional contribution** will be relevant for the payoff.

The Experiment—Part 2 (Exogenous Decision)

In the following experiment, you will be asked again to make a decision as described above. You again have 20 tokens at your disposal in each round and have to decide how much you want to contribute to the shared project. The tokens that you do not invest will be transferred to your private account.

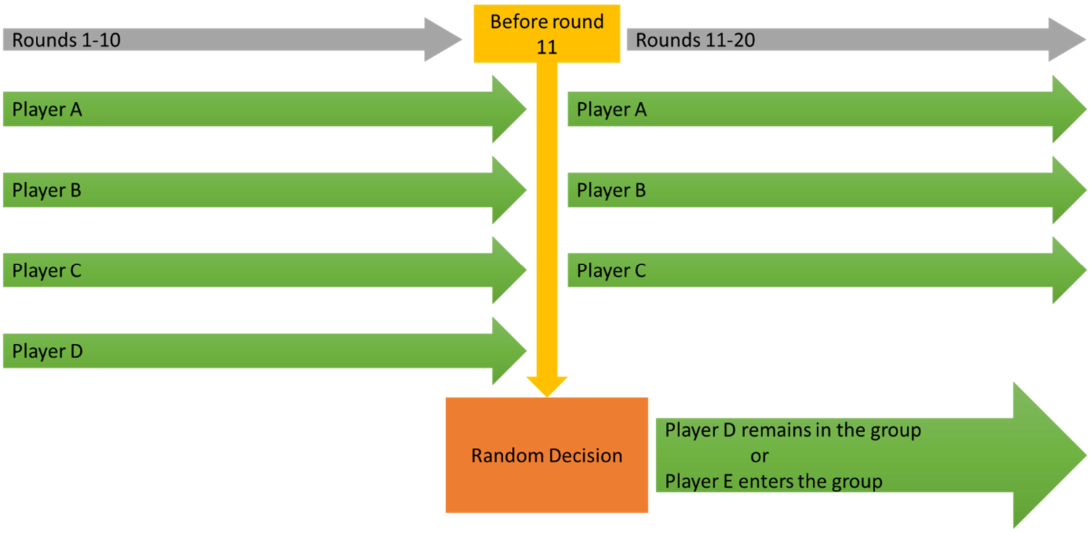
The following experiment will be played in groups of four members for **20 rounds**. You will be assigned a player type. These are player A, player B, player C, player D, and player E. You will be informed of your randomly assigned **player type** before the first round.

Player A, player B, and player C will be playing 20 rounds in the same group. In the first 10 rounds, player A, player B, player C and player D are a group of four players. Before the 11th round, a random draw will decide whether player D will remain in the group or whether she will be replaced by player E. All players will be informed about whether player D will remain in the group or whether she will be replaced by player E. After this, the next 10 rounds will be played.

In each round, **player A, player B, and player C** decide how many tokens they want to invest in the project. After each round, they receive information about their own contribution, all contributions to the project, the amount of income from the private account and from the project, as well as their total income in each round.

Player D decides in the first 10 rounds how many tokens she wants to invest in the project and receives the same information after each round as player A, player B, and player C. If player D remains in the group, she will make the same decisions and will receive the same information as in the first 10 rounds. If player D is randomly replaced before round 11, she will not make any decisions about the dividing up of 20 tokens and will not be able to observe the decisions of the other players. This player will not be part of the decision-making and can read comics.

Player E will not make any decision about dividing up of 20 tokens in the first 10 rounds and cannot observe the decisions of the other players. The player will not be part of the decisions and can read comics. If player E is brought into the group to substitute player D, she will decide how many tokens she wants to invest in the project in rounds 11 to 20. After each round, she will receive information about her own contribution, all contributions to the project, the amount of income from the private account and from the project, as well as her total income in each round. If player E is not brought in as a substitute, she will not make any decisions and will receive no information, as in the first 10 rounds.



Estimation

Before the players are told the results of the 1st and the 11th rounds, players A, B, C, and D (or player E if player D is replaced before the 11th round) will be asked to estimate the individual contribution of the players in the group in the previous round.

If the estimation of the players is close on average, they will receive an individual payoff. The payoff will be calculated as followed:

$$\textbf{Payoff from the estimation} = \textbf{10 tokens} - |\textbf{deviation}|.$$

If the players are out by 10 tokens or more, they will not receive a payoff, but no amount will be subtracted. Thus, losses are not possible.

Payoff

After the 10th round, one of the rounds 1 to 10 will be randomly selected to be relevant for the payoff of player A, player B, player C, and player D. Player E will receive a fixed compensation of 12 tokens.

Again after the 20th round, one of the rounds, 11 to 20, will be randomly selected to be relevant for the payoff of player A, player B, player C, and D (or player E if player D is replaced before the 11th round). Player E (or player D if she is replaced before the 11th round) receives a fixed compensation of 12 tokens.

Alternative: The Experiment—Part 2 (Endogenous Decision)

In the following experiment, you will be asked again to make a decision as described above. You again have 20 tokens at your disposal in each round and must decide how much you want to contribute to the shared project. The tokens that you do not invest in will be transferred to your private account.

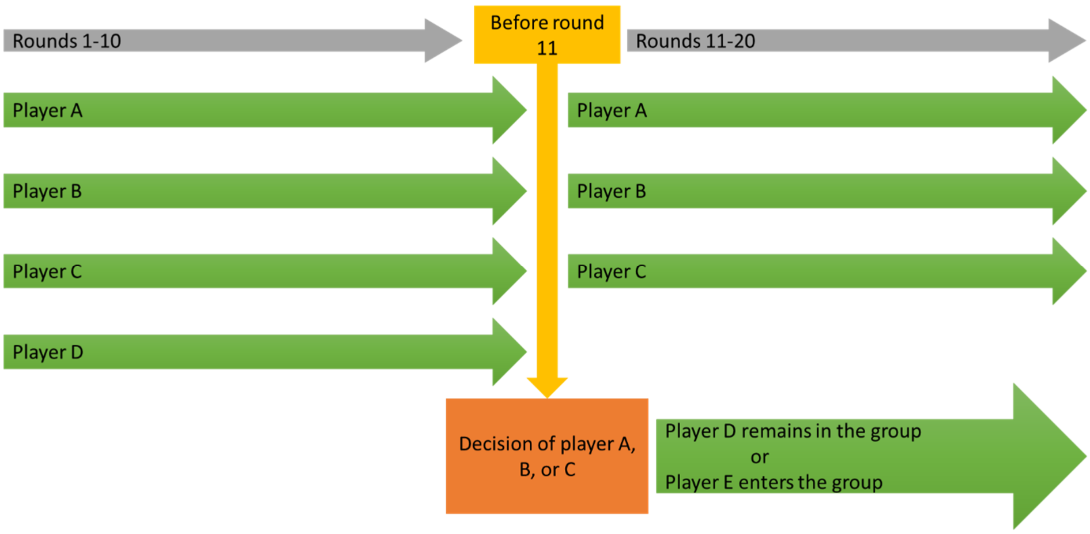
The following experiment will be played in groups of four members for **20 rounds**. You will be assigned a player type. These are player A, player B, player C, player D, and player E. You will be informed of your randomly assigned **player type** before the first round.

Player A, player B, and player C will be playing 20 rounds in the same group. In the first 10 rounds, player A, player B, player C, and player D are a group of four players. Before the 11th round, one randomly assigned player A, player B, or player C will decide whether player D remains in the group or if she will be replaced by player E. All players will be informed about whether player D will remain in the group or whether she will be replaced by player E. After this, the next 10 rounds will be played.

In each round, **player A, player B, and player C** decide how many tokens they want to invest in the project. After the 10th round, one randomly assigned player A, player B, or player C decides about the extension or replacement of player D within the group. After each round, they receive information about their own contribution, all contributions to the project, the amount of income from the private account and from the project, as well as their total income in each round.

Player D decides in the first 10 rounds how many tokens she wants to invest in the project and receives the same information after each round as player A, player B, and player C. If player D remains in the group, she will make the same decisions and will receive the same information as in the first 10 rounds. If player D is randomly replaced before round 11, she will not make any decisions about the dividing up of 20 tokens and will not be able to observe the decisions of the other players. This player will not be part of the decisions and can read comics.

Player E will not make any decision about the dividing up of 20 tokens in the first 10 rounds and cannot observe the decisions of the other players. The player will not be part of the decisions and can read comics. If player E is brought into the game to substitute player D, she will decide how many tokens she wants to invest in the project in rounds 11 to 20. After each round, she will receive information about her own contribution, all contributions to the project, the amount of income from the private account and from the project, as well as her total income in each round. If player E is not brought in as a substitute, she will not make any decisions and will receive no information, as in the first 10 rounds.



Estimation

Before the players are told the results of the 1st and the 11th rounds, players A, B, C, and D (or player E if player D is replaced before the 11th round) will be asked to estimate the individual contribution of the players in the group in the previous round.

If the estimation of the players is close on average, they will receive an individual payoff. The payoff will be calculated as followed:

$$\textbf{Payoff from the estimation} = \textbf{10 tokens} - |\textbf{deviation}|.$$

If the players are out by 10 tokens or more, they will not receive a payoff, but no amount will be subtracted. Thus, losses are not possible. **Payoff**

After the 10th round, one of the rounds 1 to 10 will be randomly selected to be relevant for the payoff of player A, player B, player C, and player D. Player E will receive a fixed compensation of 12 tokens.

Again, after the 20th round, one of the rounds, 11 to 20, will be randomly selected to be relevant for the payoff of player A, player B, player C, and player D (or player E if player D is replaced before the 11th round). Player E (or player D if she is replaced before the 11th round) receives a fixed compensation of 12 tokens.

Appendix B. Questionnaire

The following questions concern rounds 1–10 of the second part of the experiment.
To what extent do you agree with the following statements?

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

1. The fact that other players belonged to a different player type than mine had an influence on my game strategy.
2. The members of my group got on well together.
3. I thought that the interaction with the other group members was good.
4. I did not like most of the other group members.
5. The group members did not have to rely on each other in my group.
6. All group members had to contribute in order to achieve the group’s objectives.
7. In my group, goals could be reached that one group member could not have reached by her- or himself.
8. In my group, the group members did not have to cooperate in order to achieve the group’s objectives
9. The overall group behavior reflects who I am.
10. I consider myself to be very different from the other group members.
11. I consider myself to be similar to the other group members.
12. I would rather have been in another group.
13. I trusted the players in my group.
14. I think that the other players trusted me.
15. I could identify with my group.

The following questions concern rounds 11–20 of the second part of the experiment.
To what extent do you agree with the following statements?

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

1. The fact that other players belonged to a different player type than mine had an influence on my game strategy.
2. The members of my group got on well together.
3. I thought that the interaction with the other group members was good.
4. I did not like most of the other group members.
5. The group members did not have to rely on each other in my group.
6. All group members had to contribute in order to achieve the group’s objectives.
7. In my group, goals could be reached that one group member could not have reached by her- or himself.

8. In my group, the group members did not have to cooperate in order to achieve the group's objectives
9. The overall group behavior reflects who I am.
10. I consider myself to be very different from the other group members.
11. I consider myself to be similar to the other group members.
12. I would rather have been in another group.
13. I trusted the players in my group.
14. I think that the other players trusted me.
15. I could identify with my group.

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

1. I wanted to earn as much money as possible in this experiment.
2. I wanted to earn more money than the others in this experiment.
3. I wanted to earn exactly as much money as the others in this experiment.
4. In this experiment, I wanted to achieve that everyone earned the same amount if possible.
5. Having a player type assigned to me had an influence on my game strategy.
6. If everyone contributes to the group's results, I am willing to contribute as well.

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

I see myself as someone who . . .

1. . . . is reserved
2. . . . is generally trusting
3. . . . tends to be lazy
4. . . . is relaxed, handles stress well
5. . . . has few artistic interests
6. . . . is outgoing, sociable
7. . . . tends to find fault with others
8. . . . does a thorough job
9. . . . gets nervous easily
10. . . . has an active imagination

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

1. If someone does me a favor, I am prepared to return it.
2. If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.
3. If somebody puts me in a difficult position, I will do the same to him/her.
4. I go out of my way to help somebody who has been kind to me before.
5. If somebody offends me, I will offend him/her back.
6. I am ready to undergo personal costs to help somebody who helped me before.

Strongly disagree					*Strongly agree*	
1	*2*	*3*	*4*	*5*	*6*	*7*

1. I often compare the well-being of my loved ones (boyfriend or girlfriend, family members, etc.) with that of others.

2. I always pay close attention to how I do things compared to how others do them.
3. If I want to find out how well I have done something, I compare the result with that of other people.
4. I often compare my social skills and my popularity with other people's. I am not the type of person who compares themselves with others (reversed).
5. I often compare myself with others with regard to what I have accomplished (so far) in life.
6. I often like talking with other people about our opinions and experiences.
7. I often try to find out what others think who are facing similar problems to mine.
8. I always like to know what others would do in a similar situation.
9. If I want to find out more about something, I try to find out what others think or know about it.
10. I never rate my situation in life by comparing it with that of other people (reversed).

General characteristics

1. Please state your gender
   - ○ Male
   - ○ Female
2. Please state your year of birth
   - ○ ___________
3. Which university school or department are you currently studying with or employed by?
   - ○ Engineering
   - ○ MINT
   - ○ Business Administration/Business Administration and Engineering
   - ○ Medicine
   - ○ Other
   - ○ Employed
4. What is your next aspired academic degree?
   - ○ Bachelor
   - ○ Master
   - ○ German "Diplom"
   - ○ German State Examination
   - ○ Doctoral
   - ○ Other
   - ○ Not applicable

Appendix C

Table A1. Beliefs of Player P on Contributions of Other Group Members in Round 1.

Belief of	Belief in	Treatment Variation	Average Contribution	
P (*n* = 57)	Other *P*	*Endo_Rep*	8.781	$p = 0.193$
P (*n* = 33)	Other *P*	*Endo_Ext*	10.106	
P (*n* = 57)	*T*	*Endo_Rep*	8.780	$p = 0.044$
P (*n* = 33)	*T*	*Endo_Ext*	10.970	

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