Endogenous group formation and the provision of public goods: The role of promises and lies

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Abstract

Recent experimental findings suggest that the opportunity for endogenous group formation significantly affects the provision of public goods. In these studies the group formation is based on information about past contributions. However, in reality it is often difficult to obtain such information reliably. We investigate whether communication can help to find the optimal group composition. Using two treatments that vary with regard to the type of reported behavior on which group formation decisions are based (past behavior vs. intended future behavior), we observe that subjects are quite successful in finding the most cooperative group formation. However, significant differences in the content of the communication leading to the group formation decisions could be observed.

Keywords: public good, endogenous group formation, communication, economic experiment

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1 Introduction

From the experimental literature on individual behavior in public good games we know that, *on average*, subjects neither behave as strict free riders nor achieve the efficient contribution level (for an overview see Ledyard 1995). Therefore, recent experimental research on the provision of public goods has focused on mechanisms that are able to significantly increase cooperation rates. One of the mechanisms that has the potential to significantly increase contributions is the pooling of group members. In fact, Gunnthorsdottier et al. (2001) observed that reducing the cooperative subjects' interaction with free riders slowed down the decay of contributions that is characteristic of repeated public good experiments. Similar results were reported by Gächter and Thöni (2005), who compared the contributions made in groups consisting of cooperators with the contributions made in randomly composed groups. Yet, other findings cast some doubt on the effectiveness of implementing exogenous pooling mechanisms. In their public good experiment, Ockenfels and Weimann (1999) could not find any effect on the level of contribution of separating cooperators and free riders, although subjects were informed about the rule used for group formation.

Motivated by these observations, subsequent research has been devoted to investigating what happens if subjects were given the opportunity to form their group endogenously based on information about previous cooperation behavior. In the experiment conducted by Erhard and Keser (1999), subjects could freely move from one group to another at a small fixed cost. The design of the experiment ensured that contributing zero to the public good was always a dominant strategy. Due to the fact that subjects could join a group without the agreement of other group members, free riders attempted to follow cooperators, thereby undermining the pooling of subjects and, possibly, affecting cooperation. According to their results, the endogenous group formation led only to a slight increase in contributions. Although the experiment provided valuable insights into the dynamics of group formation, the interpretation of the data might have suffered from the difficulty of disentangling the effects of a repeatedly changing group size (thus, a repeatedly changing MPCR) and the opportunity for endogenous group formation. As a consequence, Page et al. (2002) analyzed the effect of endogenous regrouping in a public good game which was played with a constant group size of four. In their experiment, not only could subjects decide which group to join, but group members also had some power to exclude those with whom they did not want to be associated. The results revealed a significant increase in contributions and efficiency compared to a treatment without endogenous regrouping. Similar findings were obtained by Riedl and Ule (2002) in a social network experiment in which subjects could decide on with whom to play in a prisoner's dilemma game. When subjects were informed about the past behavior of all potential partners, cooperation was nearly complete. The effect of giving subjects the opportunity to exclude group members was investigated in Cinyabuguma et al. (2005). They report that implementing such an opportunity lead to significantly higher cooperation rates, even when the contributions of excluded subjects were included in the calculation. Further support for the coopera-

tion-enhancing effect of endogenous group formation was provided by Coricelli et al. (2004) and by Ahn et al. (2005), though their results suggest that the outcome can be significantly affected by the mechanism used for partner selection.

As already mentioned, in previous research on exogenous and endogenous group formation the association of subjects has always been based on information about previous cooperation behavior, although in reality it is often difficult to obtain such information reliably. How do people usually act in such situations? Almost any group formation in real-world (economic) environments is preceded by some sort of communication. Examples are numerous: business partners discuss before signing business contracts and lawyers and doctors talk before deciding on opening a law firm or a group practice. No academic department is formed without pre-assigned meetings, students have to decide with whom they want to work in a study group, and work teams in firms may have free choice of group formation as well. Whenever groups are formed by members who do not know each other well beforehand, communication is essential to learn about the others' intentions: "What have you done in the past?" and "What will you do in the future?" Given that there is no way to check whether the potential group members are telling the truth or not, everything that is said is cheap talk. From previous investigations on the effects of cheap talk we already know that it can remarkably improve cooperation rates (e.g., Brosig et al. 2003, Bochet et al. 2005, see Ledyard 1995 or Sally 1995 for an overview).[1] But does it also help to find the most cooperative group formation?

Our study is intended to investigate how cheap talk influences the formation of groups in a public good setting. Are subjects able to associate with the most cooperative opponents? Is there any difference regarding group formation when people talk about their past behavior or when they talk about their intended future decisions? How about subjects' honesty? As observed in experimental studies on communication, there is a significant number of subjects who lie if they have an incentive and an opportunity to do so (e.g., Brandts and Charness 2003, Croson et al. 2003, Gneezy 2005). To what extent are subjects able to identify dishonest subjects? While there is experimental evidence suggesting that subjects can assess the truthfulness of statements made about future decisions with considerable accuracy (Frank et al. 1993, Brosig 2002), there are no such observations regarding past events (Ockenfels and Selten 2000).

In order to answer these questions, we use an experimental design in which subjects consecutively play two one-shot public good games, each with different partners. Before playing the second game, subjects are given the opportunity to form their group endogenously after some minutes of face-to-face communication. We investigate two treatments which differ with regard to the behavior subjects rely on when making their group formation decision. While in

[1] Note that this is not only true for face-to-face communication, but also holds for auditory communication and even for passive forms of communication such as lectures and talk-shows, although the latter are somewhat less effective (Brosig et al. 2003).

the first treatment subjects base their decision on their opponents' reported past behavior, in the second treatment their decision depends on their opponents' reported intentions concerning their future behavior.

The remainder of the paper is organized as follows. The next section describes our experimental design in more detail. In section 3, we present the analysis of our data. Section 4 contains a discussion of our results and the conclusion.

2 Design

All experimental sessions consisted of two consecutive parts, the game part and the exclusion part. In the game part, subjects played a one-shot three-person public good game. In this game, every subject received an endowment of € 5.00 and had to decide how much of the endowment to "keep" for himself and how much to "invest". Each individual investment x_i yielded a payment of $0.6 \cdot x_i$ for each group member. Thus, the payoff for each individual π_i was determined by

$$\pi_i (x) = 5.00 - x_i + 0.6 \cdot \sum x_j \quad .$$

According to the game-theoretical prediction, subjects should keep their entire endowment for themselves, although their group-payoff would be maximized if all of them invested the whole amount. After the game part, subjects received no feedback on decisions and payoffs.

In the exclusion part, subjects again played a three-person one-shot public good game. This time, however, they were matched with three instead of two other subjects, so that they had to decide on whom to exclude from playing the game. Subjects were informed that the three opponents were not identical to the group members they interacted with in the game part of the experiment. In order to exclude one subject from the group, each group member had to allocate a total of six points to his three opponents in the following order. The subject's first choice received three points, the subject's second choice received two points, and the subject's third choice received one point. The subject who received the highest number of points from his group members was excluded from playing the game.[2]

Before allocating their points, subjects were given the opportunity to communicate face-to-face with their potential group members for a maximum of 15 minutes via a video-conferencing system.[3] The content of communication was not restricted, but subjects were not permitted to agree on side-payments or to reveal any personal information such as their names, addresses, and telephone numbers. All group discussions were videotaped. After communication, subjects received a decision form on which they had to record their ranking of their opponents, their predictions regarding the group members' investments, and, where

[2] Note that this procedure is similar to the Borda count method.

[3] As observed in the public-good experiment conducted by Brosig et al. (2003), the effects of face-to-face communication via a video-conferencing system were not significantly different from the effects of face-to-face communication via direct contact.

required, their own investment for every possible group formation. Subjects were paid € 0.50 for each correct prediction.

We ran two different treatments of the exclusion part that differed only with regard to the investment decision made by the group members. In the past behavior treatment, subjects' investments were carried over from the game part of the experiment. Consequently, the group formation and the predictions were related to subjects' reported past behavior. In the future behavior treatment, subjects had to decide again on their investments, whereby they could make their decisions conditional on every possible group composition. Consequently, the group formation and the predictions were related to the subjects' expected future behavior.

The experiment was run with 96 students of economics and management science at the Laboratory for Experimental Economics in Magdeburg (MaXLab), Germany. Each of the two treatments was played with 48 subjects. No session lasted longer than 45 minutes. Overall, average payoffs were € 13.65, with a minimum of € 3.92 and a maximum of € 22.10.

3 Data analysis

3.1 Decisions

We first analyze the subjects' investment decisions made in the game part and in the exclusion part of the experiment before relating these decisions to the predictions made after group discussions.

Past behavior treatment

Investigating the decisions made in the past behavior treatment, we found that subjects invested on average 41.5 percent of their individual endowment.[4] This average investment was very similar to the average of contributions reported in related standard public good game experiments (for an overview see Ledyard 1995). The question is how did the possibility of endogenously forming a group affect the efficiency of the public good provision. Our data revealed that the average group investment calculated after the endogenous formation of groups was higher than the average amount invested by groups in the game part of this treatment (45.5 percent vs. 41.5 percent). In a comparison of the average investment made by the non-excluded subjects with the average investment made by the excluded subjects, the former was found to be marginally significantly higher than the latter (47.5 percent[5] > 28.4 percent, $p = 0.032$, one-tailed Mann-Whitney-*U* test). It seems that subjects were quite successful in

[4] There was no significant difference between the average investment made in the game part of the past behavior treatment and the average investment made in the game part of the future behavior treatment (41.5 percent vs. 43.1 percent, $p = 0.931$, two-tailed Mann-Whitney-*U* test).

[5] In three groups, two subjects received the highest number of points from their opponents (hence, a coin flip decided on their exclusion). Therefore, the average group investment calculated after the group formation (45.5 percent) was somewhat different from the average investment made by the non-excluded subjects, i.e. those subjects who did not receive the highest number of points from their opponents (47.5 percent).

excluding those group members whose contribution to the public good was relatively low. Our observations further revealed that the average investment made by the group members who were least preferred to be excluded was somewhat higher than the average investment made by the other subjects, although the difference was not significant (51.5 percent > 37.0 percent, p = 0.100, one-tailed Mann-Whitney-*U* test).

As a result, the average contribution made by each group's most preferred group composition (45.8 percent), i.e. the group composition which received the lowest total number of points for its group members, was higher than the average contribution made by each group's least preferred group composition (37.1 percent), i.e. the group composition which received the lowest total number of points for its group members. The average of contributions made by the two remaining group compositions was in between (41.6 percent). Our results are summarized in Figure 1.

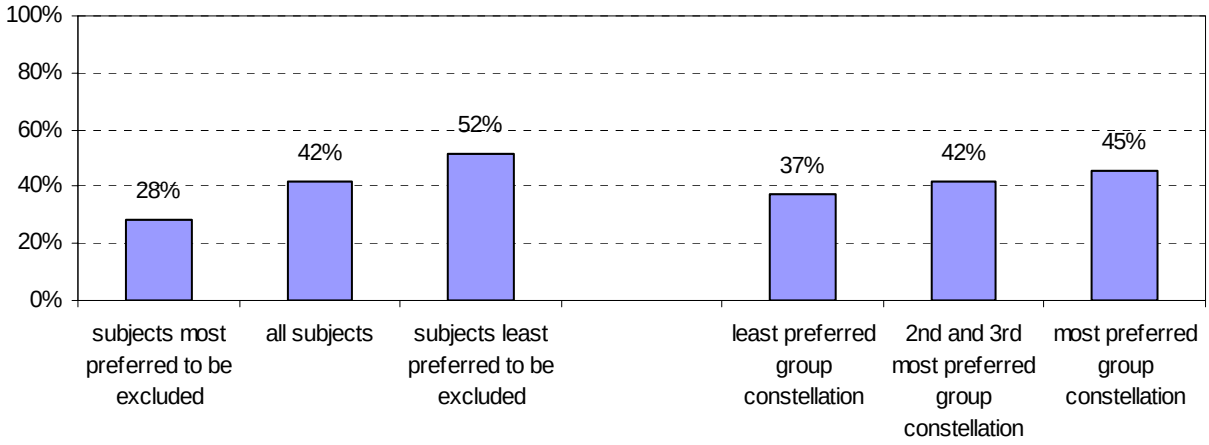

Figure 1: *Average investments made in the past behavior treatment*

The question remains whether the subjects' decisions were optimal in the sense that they managed to exclude the group member who invested the lowest amount in their group. According to our data, 52.1 percent of subjects correctly excluded the opponent with the lowest investment. This was significantly better than chance (52.1 percent > 33.3 percent, p = 0.025, one-tailed binomial test), but still less than optimal. Consequently, the average investment made by the realized group composition was somewhat lower than the maximum possible average group investment. This difference was not significant, however (45.5 percent < 52.4 percent, p = 0.159, one-tailed one-sample *t*-test).[6]

Before analyzing the transcripts of group discussions to learn more about the subjects' exclusion decisions, we will first investigate whether we obtain similar results for the future behavior treatment.

[6] But the average investment made by the realized group composition was significantly higher than the minimum possible average group investment, which was only 30.9 percent (p = 0.024, one-tailed one-sample *t*-test).

Future behavior treatment

In line with other experimental studies, we observed that pre-play communication significantly increased the subjects' average contribution to the public good in the future behavior treatment. Even the average of each subject's lowest investment decision made in the exclusion part of the future behavior treatment (aggregated over groups) was significantly higher than the average amount invested by groups in the game part of this treatment (64.3 percent > 43.1 percent, p = 0.010, one-tailed Wilcoxon test).[7] Contrary to that in the past behavior treatment, the average investment made by the realized group composition was similar to the average amount invested by all subjects (71.9 percent vs. 70.6 percent). This result also held in a comparison of the average group investment made by the non-excluded subjects with the average group investment made by the excluded subjects (71.4 percent vs. 72.7 percent, p = 0.834, two-tailed Mann-Whitney-*U* test).[8] Likewise, no differences were found between the average group investment made by the group members who were least preferred to be excluded and the average group investment made by the other subjects (79.2 percent vs. 66.3 percent, p = 0.160, two-tailed Mann-Whitney-*U* test).

As a result, in the future behavior treatment the average of contributions made by each group's most preferred group composition (70.5 percent), the average of contributions made by each group's least preferred group composition (69.1 percent), and the average of contributions made by the two remaining group compositions (71.5 percent) were roughly the same. Our findings are depicted in Figure 2.

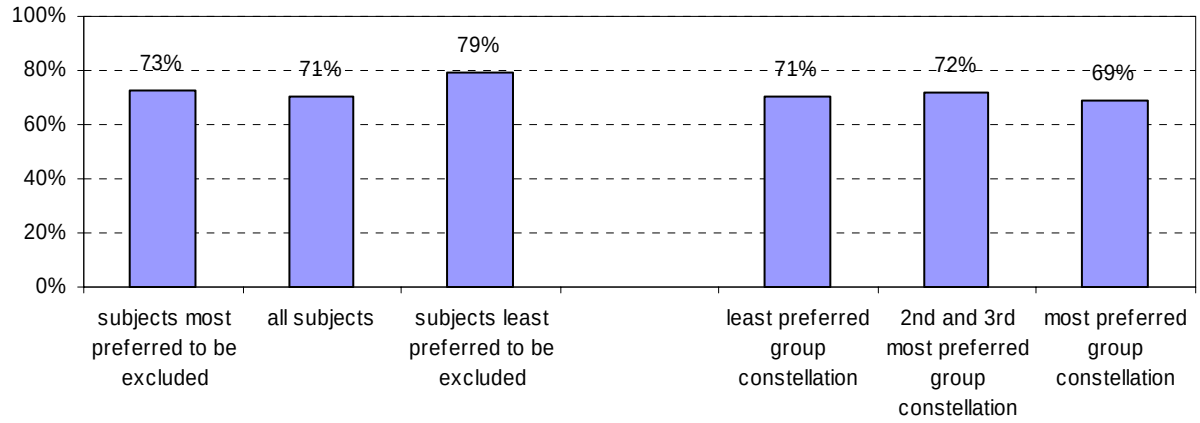

Figure 2: *Average investments made in the future behavior treatment*

Inspection of the accuracy of the subjects' exclusion decisions reveals, however, that the percentage of subjects who excluded the opponent with the lowest average investment was just as high as the percentage observed in the past behavior treatment. This means that the exclu-

[7] Note that subjects made their investment decision for each of the three possible group compositions (see section 2 of this paper).

[8] Similar results were obtained in the comparison of the past investments made by the non-excluded subjects with those of the excluded subjects in the future behavior treatment (43.2 percent vs. 42.8 percent).

sion decisions were also significantly more accurate than chance in the future behavior treatment (52.1 percent > 33.3 percent, p = 0.025, one-tailed binomial test)[9]. This result was not mirrored in the average amount invested in the realized group formation. This might be due to the fact that, after communication, most of the subjects invested their whole endowment in the public good, while the distribution of investments was much less uniform in the past behavior treatment. Consequently, the potential for efficiency gains that could be realized by endogenously forming a group was relatively low in the future behavior treatment. We found no significant differences (p > 0.198, two-tailed one-sample *t*-test) in the comparison of the average amount invested by the realized groups with the maximum possible average group investment (71.9 percent vs. 83.8 percent) and the minimum possible average group investment (71.9 percent vs. 58.0 percent). Figure 3 shows the distributions of investments made in the game part of the past behavior treatment and in the exclusion part of the future behavior treatment.

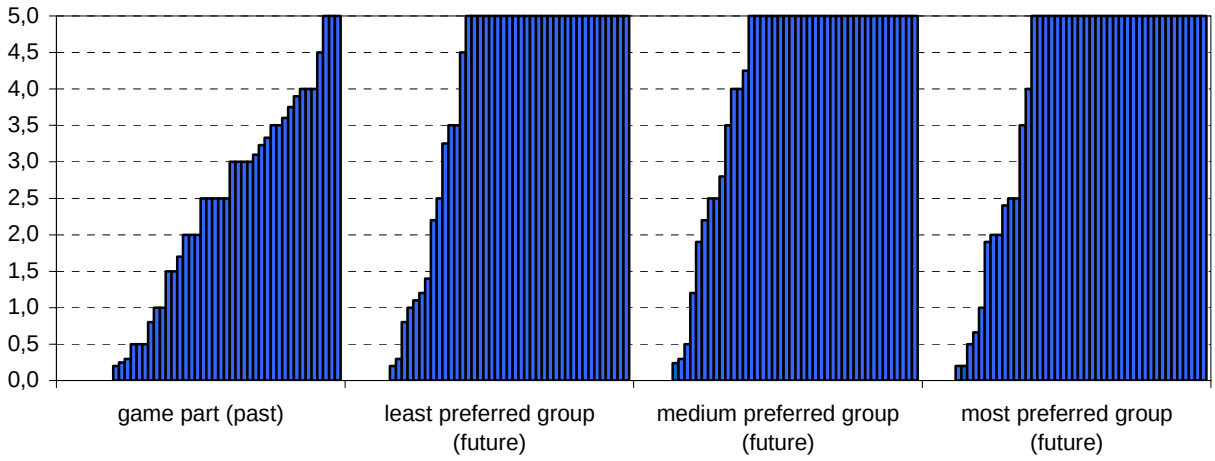

Figure 3: *Distribution of investments made in the past behavior treatment and in the future behavior treatment*

3.2 Communication

The analysis of the transcripts revealed that subjects used the opportunity for communication to discuss the incentives prevalent in the public good game. In particular, group members computed the payoff consequences resulting from various investment decisions and pointed out the conflict between individual and group rationality. In their discussions, subjects also talked about the decisions they made in the game part of the experiment and/or the investments they intended to make in the exclusion part of the experiment. The next two sections investigate the content of communication in the two treatments, past behavior and future behavior, in more detail.

[9] The comparison based on the average percentage of correct exclusion decisions made per group also revealed a significant difference (p = 0.004, one-tailed one-sample *t*-test).

Past behavior treatment

In the past behavior treatment, all subjects revealed the individual investment they made in the game part of the experiment. While 85.4 percent of subjects specified an exact number, the remaining 14.6 percent of subjects indicated a range for the amount they invested. At least one subject in every group pointed out that nobody could verify the stated amounts. In fact, 50.0 percent of the stated investments were not true. While those who told the truth invested €2.31 on average, those who lied invested only €1.86 on average. This difference was not significant at the individual level ($p = 0.316$) or at the group level ($p = 0.146$, two-tailed Mann-Whitney-*U* test).[10]

Given the significant number of liars in the past behavior treatment, to what extent were subjects able to correctly assess their three opponents' investment decisions? On average, 28.5 percent of the estimated investments precisely matched real behavior. Since announcing an individual investment of €0.00 was credible *per se*, we excluded all predictions that were related to these announcements.[11] With this adjustment, the percentage of correct predictions was still 27.8. On average, predictions deviated from real behavior by €1.24.

Analyzing whether subjects could correctly predict the truthfulness of their opponents' announcement revealed that, on average, 54.9 percent of each subject's three predictions were correct.[12] This percentage was not significantly different from chance at the individual level ($p = 0.319$) or at the group level ($p = 0.479$, one-sample two-tailed *t*-test). Due to the fact that, in most of the cases, subjects believed their opponents' statement (62.5 percent), 65.0 percent of the true announcements were correctly predicted to be true, while only 42.7 percent of the false announcements were correctly assessed as lies.

Since Brosig (2002) observed that those subjects who behaved cooperatively in a pre-game test made particularly accurate predictions regarding their opponent's behavior, we investigated whether there was a difference with regard to the average number of correct predictions made by the subjects who invested €2.50 or more and the subjects who invested less than €2.50. The difference was not significant (48.6 percent vs. 61.1 percent, individual level : $p = 0.175$, group level: $p = 0.385$, two-tailed Mann-Whitney-U test). In both cases, the average number of correct predictions was not significantly better than chance (individual level: $p > 0.161$, group level: $p > 0.296$, one-sample two-tailed *t*-test).

In the next section, we investigate whether similar results apply in the future behavior treatment.

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[10] Similarly, there was no difference regarding the frequency of liars between the subjects who invested €2.50 or more and the subjects who invested less than €2.50 (45.8 percent vs. 54.2 percent, individual level: $p = 0.773$, two-tailed Fisher test, group level: $p = 0.138$, two-tailed Mann-Whitney-*U* test).

[11] In total, we observed only three such announcements.

[12] Again, all predictions relating to an announcement of €0.00 investment have been excluded.

Future behavior treatment

In the future behavior treatment, only 58.3 percent of the subjects revealed the individual investment they made in the game part of the experiment. While 82.2 percent of the 'revealers' specified an exact number, 17.8 percent gave a range for the amount they invested. Talking about their past investments, at least one subject in all but one of the groups pointed out that nobody was obliged to tell the truth. Similar to the past behavior treatment, only 50.0 percent of the stated past investments were true.

For the most part, group members discussed their future investments. Two-thirds of all subjects used the communication phase to state their intended future cooperation. In every statement subjects promised to invest their whole endowment in the exclusion part of the experiment and only 25.0 percent of the subjects failed to keep their promise. That is, the percentage of subjects who lied about their future investment was significantly lower than the percentage of subjects who lied about their past investment (25.0 percent < 50.0 percent, individual level: $p = 0.017$, one-tailed Fisher-test; group level: $p = 0.040$, one-tailed Mann-Whitney-*U* test). This result suggests that it was easier for subjects to lie about their past behavior than about their future behavior. We also tested whether those who lied made lower investments in the game part of the experiment than those who told the truth.[13] Based on individual data, the difference was significant at the 6-percent level (€1.50 < €2.44, group level: $p = 0.107$, one-tailed Mann-Whitney-*U* test).[14]

Interestingly, subjects were aware of the increased honesty about future decisions. While in the past behavior treatment on average 62.5 percent of each subject's predictions were in line with the opponent's statement, in the future behavior treatment on average 89.5 percent of each subject's predictions were consistent with the announcement made by the opponent (individual level: $p = 0.000$, group level: $p = 0.005$, two-tailed Mann-Whitney-*U* test). Hence we questioned whether this resulted in a higher percentage of predictions that precisely matched the opponents' future behavior. Our data revealed that, in fact, 54.6 percent of all predicted decisions were correct. This percentage was significantly higher than the 27.8 percent of correct predictions observed in the past behavior treatment (individual level: $p = 0.000$, group level: $p = 0.048$, one-tailed Mann-Whitney-*U* test). While 71.9 percent of the predictions of subjects whose opponents promised to fully cooperate were correct, only 2.9 percent could correctly guess the intended investment when their opponents did not talk about it (individual level: $p = 0.000$, group level: $p = 0.005$, one-tailed Mann-Whitney-*U* test).

[13] Since all subjects who made a statement regarding their future decision promised to invest their whole endowment, all those who lied invested less in the exclusion part of the experiment than those who told the truth.

[14] While the frequency of liars among subjects who invested €2.50 or more in the game part of the experiment was 15.0 percent, the frequency of liars among those who invested less than €2.50 was 37.5 percent. The difference was not significant, however (individual level: $p = 0.146$, two-tailed Fisher test; group level: $p = 0.283$, two-tailed Mann-Whitney-*U* test).

On average, predictions deviated from real decisions by €1.30, whereby deviations made by subjects whose opponents revealed their intended future investment were lower than the deviations made by subjects whose opponents did not do so (€1.11 < €1.86, individual level: p = 0.015, group level: p = 0.145, one-tailed Mann-Whitney-*U* test). The difference between the deviations made by subjects whose opponents made a statement about their future investment decision and the deviations made by subjects in the past behavior treatment (whose opponents also made a statement about their investment decision) was highly significant (€1.11 vs. €1.24, individual level: p = 0.000, group level: p = 0.005, two-tailed Mann-Whitney-*U* test).

Could subjects correctly predict whether their opponents would keep their promises? Our investigation revealed that on average 74.4 percent of each subject's predictions were correct. This percentage was significantly better than the percentage observed in the past behavior treatment (74.4 percent > 54.9 percent, individual level: p = 0.004, group level: p = 0.022, two-tailed Mann-Whitney-*U* test) and also significantly better than chance (individual level: p = 0.000, group level: p = 0.008, one-tailed one-sample *t*-test). Due to the fact that most of the subjects believed their opponents' statement, 90.7 percent of the true announcements were correctly predicted to be true, while only 17.5 percent of the false announcements were correctly assessed as lies. Similar to the past behavior treatment, there was no significant difference between the average number of correct predictions made by the 75 percent of subjects who always invested €5.00 and the average number of correct predictions made by the subjects who invested less than €5.00 (77.4 percent vs. 65.4 percent, individual level: p = 0.274, group level: p = 0.917, two-tailed Mann-Whitney-*U* test).[15] Although the average number of correct predictions was significantly better than chance only for the former (individual level: p = 0.000, group level: p = 0.038, one-sample one-tailed *t*-test).

Finally, the future behavior treatment allowed us to investigate whether subjects made their investments conditional on the expected investment made by their opponents. Subjects invested the highest amount in the group composition in which they expected their group members to invest the most. The difference between the average individual investments made in the expected high contribution group and the average individual investments made in the expected medium contribution group and in the expected low contribution group, respectively, were significant at the 5-percent level (group level: p > 0.124). The difference between the average individual investments made in the expected medium and in the low contribution group were not significant, however (individual level: p = 0.941, group level: p = 0.875, two-tailed Wilcoxon test). Figure 4 illustrates our findings.

[15] Similar results apply if we compare the average number of correct predictions made by the 56 percent of subjects who invested €2.50 or more in the game part of the experiment with the average number of correct predictions made by the subjects who invested less than €2.50 in this part (73.9 percent vs. 75.0 percent, individual level: p = 0.881, group level: p = 0.475, two-tailed Mann-Whitney-*U* test).

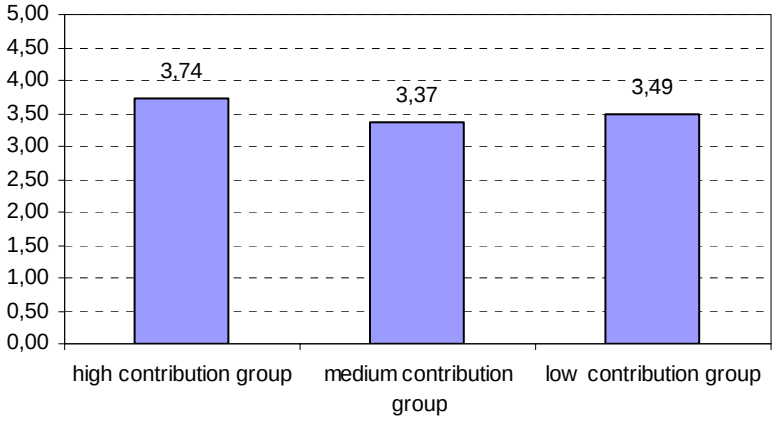

Figure 4: *Own investment conditional on expected investments by other group members*

4 Summary and discussion

In this paper, we investigated the effects of endogenous group formation in a three-player public good game. The groups were formed endogenously by the exclusion of subjects after a face-to-face communication phase. Before communication, subjects anonymously played a one-shot public good game with different partners. There were two treatments in our experiment. While in the future behavior treatment subjects played a second public good game after the communication phase, in the past behavior treatment their contributions made in the first public good game were carried over to the second game.

Looking at the discussions that preceded the group formation decisions, we found a strong asymmetry in the way subjects communicated their past behavior and their intended future decisions. While subjects seemed to have no problem lying about what they did in the past, in most cases they truthfully revealed their intentions regarding their future behavior. That is, subjects showed a strong tendency to keep the promises that they had made. Apparently it was more costly to them (in a mental sense) to break a promise than to be dishonest about something they did in the past. Furthermore, not only were promises hardly ever broken, but they were also hardly ever disbelieved. This suggests that the increased honesty regarding future decisions was common knowledge among subjects. However, the lack of skepticism about statements of intentions made it quite easy for liars in this treatment, and only a few of them were detected.

Despite the asymmetry of the content of discussions, in both treatments subjects were equally successful in finding out the most cooperative group composition. In total, 52.1 percent of all subjects excluded the player with the lowest contribution, thus making an optimal group formation decision. This percentage was significantly better than the percentage produced by chance. Given the significant number of subjects who lied about their non-cooperative behavior, this success rate was fairly high.

From past experimental research it is well known that cheap-talk communication significantly increases contributions to the public good that are made thereafter. Not only can our results

confirm this effect, but they demonstrate that, in addition, communication can be very helpful in deciding on the optimal group composition. Particularly in the past behavior treatment, which involved no interaction after the communication phase, subjects still managed to use their communication to improve the provision of the public good. This once more underlines the importance of cheap-talk communication for cooperation behavior.

Relating our findings to real life (economic) evidence, we argue that cheap talk can be a reliable and powerful instrument to distinguish cooperators from free riders when there is no reliable information about previous cooperation behavior. For future research on endogenous group formation, our findings suggest a more insightful look at the mechanisms that drive subjects to lie as well as to tell the truth - depending on which decision processes (past or future) are at stake.

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Appendix I: Instructions

The instructions were originally written in German.

Welcome to the experiment!

This is an experiment in economic decision making. You can earn money during this experiment, depending on your decisions. The money will be paid to you privately in cash at the end of the experiment. No other participant will be informed about your decisions and cash return.

The experiment consists of two parts. Before each part, you will receive detailed information on the experimental procedure. Instructions are the same for all participants. About five minutes after you have received the instructions, we will come to you to answer, privately, any questions you may have.

Instructions Part 1

Decision

You are a member of a group of **three persons.** Groups are formed randomly. Like you, the other group members are sitting in a booth, similar to yours, and have received the same instructions. In the first part of the experiment, you receive an initial **endowment of 5.00 EURO**. You have to decide how much of the endowment you would like to **keep** and how much you would like to **invest**. Every **investment (I)** has a return of 0.6*I for every group member (including the investor).

Summarized, your **income in the first part of the experiment** is as follows:

5.00 EURO – Your Investment (I) + 0.6 x **sum of investments** of all three group members

Example: Suppose all group members invest 3.34 EURO. Then, your income is 5.00 EURO – 3.34 EURO + 0.6 x 3 x 3.34 EURO = 7.67 EURO. Note, your investment can be any amount between zero and 5.00 EURO and all group members face the same decision situation.

Decision form

In the following, you will receive a decision form on which you record your investment in EURO. After all the forms are collected from all the participants, you will receive information about the second part of the experiment. Remember, no other participant will be informed about your decision.

In the second part of the experiment there will be no further interaction between you and the other two group members of part 1.

Instructions Part 2 (Future Behavior)

Decision:

You are a member of a group of **four persons.** Groups are formed randomly and group formation is not identical to part 1 of the experiment. Like you, the other group members are sitting in a booth, similar to yours, and have received the same instructions. In the second part of the experiment, you will be **facing the same decision situation as in part one**.

In contrast to the first part of the experiment with a group size of three, you now have to vote on which group member is to be **excluded** from the decision **by assigning points** to the other group members. Therefore, as in part 1, your decision applies to a group of three. The following section describes the exclusion procedure in more detail.

Exclusion procedure

You are endowed with **6 points**. These points are to be assigned as follows: one group member receives **3 points**, one **2 points,** and one group member **1 point**. It is not possible to assign the points otherwise.

Points are added up for every group member and the group member with the **highest total is excluded** from the second part of the experiment. If two or more group members receive the same number of points, the exclusion decision is made by chance.

Communication

Prior to the exclusion procedure you are given the opportunity to communicate with each other. Communication takes place via a **video-conferencing system**. Communication must not last longer than **15 minutes**, but you are free to finish earlier. The content of communication is not restricted. However, *nobody is allowed to talk about personal details such as name, address, telephone number etc. Furthermore, side-payments are prohibited.* If one of the group members disregards these instructions, he or she will be excluded from the experiment, and hence **will not receive any payment**.

Decision form

After the communication phase, you will receive a **decision form** to record your allocation of points as well as your investment decision for all possible group compositions resulting from your group of four in the exclusion case.

Furthermore, we ask you to **forecast** the investment decisions of your three group members for all possible group compositions of groups of three. For every correct forecast you receive an additional amount of 0.50 EURO. You will receive a copy of such a decision form before the communication phase so that you can become familiar with it.

Payment

After collecting the decision forms from all participants and totaling up your earnings in both parts of the experiment, we will **pay** you privately in cash. Your earnings in the second part of the experiment depend on the **realized group composition** according to the distribution of points from the exclusion procedure. Since the excluded group member will not have made a relevant decision, he or she will not receive any payment from this part of the experiment (except for the additional amount for the right forecasts).

Again, remember, no other participant will be informed about your decision, distribution of points, or forecasts.

Instructions Part 2 (Past Behavior)

Decision

You are a member of a group of **four persons.** Groups are formed randomly and group formation is not identical to part 1 of the experiment. Like you, the other group members are sitting in a booth, similar to yours, and have received the same instructions. In the second part of the experiment, you will be **facing the same decision situation as in part one**. Since your decision will be carried over from the previous part of the experiment, **you do not have to decide again**.

In contrast to the first part of the experiment with a group size of three, you now have to vote on which group member is to be **excluded** from the decision **by assigning points** to the other group members. Therefore, as in the first part of the experiment, your decision carried over from part one applies to a group of three. The following section describes the exclusion procedure in more detail.

Exclusion procedure

You are endowed with **6 points**. These points are to be assigned as follows: one group member receives **3 points**, one **2 points,** and one group member **1 point**. It is not possible to assign the points otherwise.

Points are added up for every group member and the group member with the **highest total is excluded** from the second part of the experiment. If two or more group members receive the same number of points, the exclusion decision is made by chance.

Communication

Prior to the exclusion procedure you are given the opportunity to communicate with each other. Communication takes place via a **video-conferencing system**. Communication must not last longer than **15 minutes**, but you are free to finish earlier. The content of communication is not restricted. However, *nobody is allowed to talk about personal details such as name, address, telephone number etc. Furthermore, side-payments are prohibited.* If one of the group members disregards these instructions, he or she will be excluded from the experiment, and hence **will not receive any payment**.

Decision form

After the communication phase, you will receive a **decision form** to record your allocation of points.

Furthermore, we ask you to **forecast** the investment decisions of your three group members in part 1 of the experiment. For every correct forecast you receive an additional amount of 0.50 EURO. You will receive a copy of such a decision form before the communication phase so that you can become familiar with it.

Payment

After collecting the decision forms from all participants and totaling up your earnings in both parts of the experiment, we will **pay** you privately in cash. Your earnings in the second part of the experiment depend on the **realized group composition** according to the distribution of points from the exclusion procedure. Since the investment decision of the excluded group member will not have been carried over to part 2, he or she will not to receive any payment from this part of the experiment (except for the additional amount for the right forecasts).

Again, remember, no other participant will be informed about your distribution of points or forecasts.

Appendix II: Data

Treat Past	Sess	Group	Group ID	ID	Part1	Part2 ABC	Part2 ABD	Part2 ACD	Part2 BCD	ex	vote	Pred A	Pred B	Pred C	Pred D
0	0	1	1	1	0.00	x	x	x	x	1	8	x	4	3	3
0	0	1	2	2	2.50	x	x	x	x	0	5	0	x	0	1.5
0	0	1	3	3	0.50	x	x	x	x	0	6	1	3.5	x	2
0	0	1	4	4	2.00	x	x	x	x	0	5	1	4	1.5	x
0	0	2	1	5	0.00	x	x	x	x	0	5	x	0.5	0.5	2.5
0	0	2	2	6	1.50	x	x	x	x	1	8	1	x	0.5	2.5
0	0	2	3	7	0.00	x	x	x	x	0	4	0	1.5	x	2.5
0	0	2	4	8	0.00	x	x	x	x	0	7	0	0	0.5	x
0	1	1	1	9	1.50	x	x	x	x	0	7	x	3	3.5	3
0	1	1	2	10	4.00	x	x	x	x	0	6	2	x	3	4
0	1	1	3	11	3.50	x	x	x	x	1	7	1.5	3	x	3
0	1	1	4	12	5.00	x	x	x	x	0	4	1.5	3	3.5	x
0	1	2	1	13	3.90	x	x	x	x	0	6	x	4.2	3.5	2.5
0	1	2	2	14	5.00	x	x	x	x	0	4	3.9	x	3.5	4
0	1	2	3	15	1.70	x	x	x	x	1	8	3.9	1.6	x	2.4
0	1	2	4	16	3.50	x	x	x	x	0	6	3.9	4.5	3.5	x
0	2	1	1	17	3.33	x	x	x	x	1	9	x	4.25	3.5	3.25
0	2	1	2	18	1.00	x	x	x	x	0	5	2.35	x	1.5	3
0	2	1	3	19	5.00	x	x	x	x	0	4	4.49	4.25	x	3.5
0	2	1	4	20	0.50	x	x	x	x	0	6	4.95	0	0	x
0	2	2	1	21	3.00	x	x	x	x	0	6	x	2	3.5	4
0	2	2	2	22	0.25	x	x	x	x	1	8	3	x	3	4
0	2	2	3	23	2.50	x	x	x	x	0	7	2.5	0	x	4
0	2	2	4	24	3.23	x	x	x	x	0	3	3	2	2.8	x
0	3	1	1	25	1.00	x	x	x	x	1	7	x	4	3.5	1
0	3	1	2	26	4.00	x	x	x	x	0	6	3	x	3.5	2
0	3	1	3	27	0.50	x	x	x	x	0	4	0	4	x	2
0	3	1	4	28	2.00	x	x	x	x	0	7	4	3	3.5	x
0	3	2	1	29	2.50	x	x	x	x	0	5	x	4	2.5	3
0	3	2	2	30	0.00	x	x	x	x	0	4	2	x	1	2.5
0	3	2	3	31	3.00	x	x	x	x	1	9	1.5	3	x	2
0	3	2	4	32	0.00	x	x	x	x	0	6	2	2	0	x
0	4	1	1	33	0.00	x	x	x	x	0	7	x	4.5	0	4
0	4	1	2	34	4.50	x	x	x	x	0	6	0	x	0.2	4
0	4	1	3	35	0.20	x	x	x	x	1	7	0	4.5	x	4
0	4	1	4	36	4.00	x	x	x	x	0	4	0	2.5	0.2	x
0	4	2	1	37	0.30	x	x	x	x	0	5	x	3	0	2
0	4	2	2	38	3.00	x	x	x	x	0	5	0.3	x	0	2
0	4	2	3	39	0.00	x	x	x	x	1	9	0	0	x	0
0	4	2	4	40	2.00	x	x	x	x	0	5	0.3	3	0	x
0	5	1	1	41	0.80	x	x	x	x	1	9	x	4	1.5	3.75
0	5	1	2	42	2.50	x	x	x	x	0	4	2.5	x	3.5	3.75
0	5	1	3	43	3.00	x	x	x	x	0	6	2.5	3.75	x	4
0	5	1	4	44	3.75	x	x	x	x	0	5	2.5	4	3.5	x
0	5	2	1	45	0.00	x	x	x	x	0	7	x	3	0	0
0	5	2	2	46	2.50	x	x	x	x	1	8	2	x	0	0
0	5	2	3	47	3.10	x	x	x	x	0	6	3	4	x	3.6
0	5	2	4	48	3.60	x	x	x	x	0	3	4	3	3.1	x

Treat Future	Sess	Group	Group ID	ID	Part1	Part2 ABC	Part2 ABD	Part2 ACD	Part2 BCD	ex	vote	Pred Asum	Pred Bsum	Pred Csum	Pred Dsum
1	0	1	1	49	1.70	5.00	5.00	5.00	x	0	7	x	13	12	12
1	0	1	2	50	3.00	5.00	5.00	x	5.00	0	4	15	x	15	15
1	0	1	3	51	2.30	4.25	x	4.50	3.50	1	8	15	12	x	13.5
1	0	1	4	52	2.50	x	4.00	2.20	2.50	0	5	15	12	0	x
1	0	2	1	53	3.00	5.00	5.00	5.00	x	0	5	x	15	15	15
1	0	2	2	54	3.50	5.00	5.00	x	5.00	1	9	15	x	15	15
1	0	2	3	55	1.25	5.00	x	5.00	5.00	0	4	15	15	x	15
1	0	2	4	56	5.00	x	5.00	5.00	5.00	0	6	15	15	15	x
1	1	1	1	57	2.90	2.50	3.25	1.00	x	0	5	x	9.5	4.5	4.5
1	1	1	2	58	1.99	2.50	3.50	x	2.50	0	6	10	x	8	12
1	1	1	3	59	2.00	2.00	x	2.50	2.20	0	5	14.7	14.4	x	13.5
1	1	1	4	60	1.50	x	2.00	1.20	0.80	1	8	5.8	5.6	2.8	x
1	1	2	1	61	1.79	1.20	1.90	2.40	x	0	5	x	3.1	8.4	5.5
1	1	2	2	62	0.66	0.24	0.66	x	1.10	0	7	3.39	x	7.57	14.19
1	1	2	3	63	1.13	1.40	x	2.80	1.90	1	8	4.92	4.86	x	11.8
1	1	2	4	64	5.00	x	5.00	0.00	0.00	0	4	5	5	5	x
1	2	1	1	65	3.00	5.00	5.00	5.00	x	0	4	x	15	15	15
1	2	1	2	66	2.30	5.00	5.00	x	5.00	0	6	15	x	15	15
1	2	1	3	67	0.00	5.00	x	0.00	5.00	0	5	15	15	x	15
1	2	1	4	68	4.00	x	5.00	5.00	5.00	1	9	15	15	15	x
1	2	2	1	69	4.00	5.00	5.00	5.00	x	0	5	x	15	15	15
1	2	2	2	70	2.00	0.00	0.00	x	0.00	1	7	15	x	15	15
1	2	2	3	71	0.00	5.00	x	5.00	5.00	0	7	15	15	x	15
1	2	2	4	72	4.00	x	5.00	5.00	5.00	0	5	15	15	15	x
1	3	1	1	73	0.00	0.00	0.00	0.00	x	0	6	x	9	0	15
1	3	1	2	74	3.00	5.00	5.00	x	5.00	0	4	15	x	15	15
1	3	1	3	75	4.00	0.00	x	0.00	0.00	0	6	10	15	x	10
1	3	1	4	76	0.00	x	5.00	5.00	5.00	1	8	15	15	15	x
1	3	2	1	77	3.00	5.00	5.00	5.00	x	0	4	x	15	15	15
1	3	2	2	78	5.00	5.00	5.00	x	5.00	1	8	15	x	15	15
1	3	2	3	79	0.00	5.00	x	5.00	5.00	0	5	15	15	x	15
1	3	2	4	80	2.5	x	5	5.00	5.00	0	7	15	15	15	x
1	4	1	1	81	0.20	0.30	0.30	0.20	x	0	4	x	15	15	15
1	4	1	2	82	0.00	5.00	5.00	x	5.00	1	8	15	x	15	15
1	4	1	3	83	3.75	5.00	x	5.00	5.00	0	7	15	15	x	15
1	4	1	4	84	0.00	x	0.00	0.00	0.00	0	5	15	15	15	x
1	4	2	1	85	0.40	0.50	0.20	0.20	x	0	6	x	2.5	2.5	8.5
1	4	2	2	86	2.55	5.00	0.00	x	5.00	0	4	13	x	5	14
1	4	2	3	87	3.00	3.50	x	3.50	4.00	1	9	7.2	12	x	11
1	4	2	4	88	1.00	x	0.50	4.00	1.00	0	5	7.5	6.5	5	x
1	5	1	1	89	2.50	5.00	5.00	5.00	x	0	6	x	15	15	15
1	5	1	2	90	3.5	5	5	x	5.00	0	6	15	x	15	15
1	5	1	3	91	2.5	0	x	0	0.00	1	7	0	0	x	0
1	5	1	4	92	0.5	x	5	5	5.00	0	5	15	15	15	x
1	5	2	1	93	5.00	5.00	5.00	5.00	x	1	7	x	15	15	15
1	5	2	2	94	0.00	5.00	5.00	x	5.00	0	5	15	x	15	15
1	5	2	3	95	0.00	5.00	x	5.00	5.00	0	7	15	15	x	15
1	5	2	4	96	2.50	x	5.00	5.00	5.00	0	5	15	15	15	x