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The role of expectations in the provision of public goods under the influence of social identity

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**THE ROLE OF EXPECTATIONS IN THE
PROVISION OF PUBLIC
GOODS UNDER THE INFLUENCE OF
SOCIAL IDENTITY**

Matthias Lankau, Marianna Bicskei and Kilian Bizer

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

THE ROLE OF EXPECTATIONS IN THE PROVISION OF PUBLIC GOODS UNDER THE INFLUENCE OF SOCIAL IDENTITY

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Abstract

Individuals who share a common identity show persistently elevated contributions to public goods. Yet, so far the factors that actually trigger this welfare enhancement are not precisely understood. We investigate two channels: (1) subjects' expectations on group members' cooperativeness and (2) the degree to which they reciprocate these expectations by own contributions— i.e. their conditional cooperation. To this purpose we induce identity in the lab and implement an in-group, out-group and partner matching protocol in a ten-period public good game. Our results yield that comparatively higher expectations on in-group than on out-group members' cooperativeness are the main driver for welfare enhancements in identity homogeneous groups. The degree of conditional cooperation is, however, similar in all matching protocols. Merely individuals initially identified as free-riders seem to reciprocate a limited range of expectations by higher own contributions when matched with in-group than with out-group members. Nevertheless, our findings clearly underline the paramount importance of expectations in determining cooperation under social identity.

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1 Introduction

Experimental evidence has shown that individuals' willingness to be cooperative is strongly contingent on the social environment (Chen and Li, 2009). Individuals tend to be more cooperative with individuals with whom they share a common social identity (in-group) than with individuals who belong to different social groups (out-group) (Solow and Kirkwood, 2002). Often referred to as in-group bias, this behavioral pattern seems to be deeply rooted in human nature (Eaton et al., 2011) and can be found in many different cooperative settings (cf. McLeish and Oxoby, 2007; Chen and Li, 2009; Charness et al., 2007; Chen and Chen, 2011; Goette et al., 2006). In the social dilemma of privately providing public goods, field experiments have established that ethnically more homogenous groups are more successful in providing local public goods than heterogeneous communities.¹ Likewise, laboratory experiments confirm consistently higher contribution levels among subjects sharing a common identity over multiple periods of a public good game (Eckel and Grossman, 2005). So far, however, the mechanisms of this increased cooperation in the provision of public goods are not precisely understood. Nevertheless, two independent streams of social identity research offer potential explanations: (1) subjects' expectations on the cooperation of their group members and (2) their degree of reciprocating these expectations by own contributions, i.e. their degree of conditional cooperation. Starting with the former, Yamagishi et al. (1999) propose that subjects expect a higher cooperativeness of group members with which they share a common identity than of members who belong to different identities. In return, they will cooperate to a higher extent with in-group members, as well. Experimental research on the latter suggests that subjects reciprocate their expectations on contributions of in-group members to a higher degree than expectations on out-group members' contributions. This view is initiated by Chen and Li (2009), who generally find that in-groups members exhibit higher degrees of positive reciprocity among each other compared to out-group members. On this basis Lankau et al. (2012) establish that in the context of public good provision in-group members reveal the preference for significantly higher levels of conditional cooperation than out-group members or mere strangers. Please note the difference between (1) subjects' reciprocating hypothetical group members' contributions elicited via strategy method and (2) the degree of reciprocation of expectations on group members' cooperation. For the sake of clarity, within this article we will generally refer to the former as *cooperation preference or strategy* (preference for conditional cooperation) and to the latter as (actual) *conditional cooperation*. In particular, the authors employ a series of one-shot public good games in strategy method in order to elicit how strongly subjects would be willing to reciprocate

¹ See Akerlof and Kranton (2010) and Eaton et al. (2011) referring to research of Alesina et al. (1999), Xiao-Ping (1996) and Paolo Mauro (1995).

their group members' hypothetical average contributions to the public good by their own contributions. Based on their results, they conjecture that within the context of multiple-period public good games in-group subjects should reciprocate their expectations on their group members' cooperativeness to a higher degree than in out-groups, as well. Theoretically, it then follows that both subjects' expectations as well as their degree of reciprocating these expectations may determine the overall level of cooperation under social identity. At this point, however, this remains a hypothesis. Consequently, within this article we ask exactly how social identity influences individuals' cooperation in the context of multiple-period public good provision.

To this purpose, we artificially induce social identity in the lab through a simple group task, which subjects solve jointly by communicating anonymously via chat. Our experiment is mainly based on a ten-period public good game with stable group membership, in which subjects are matched with members of their own identity (in-group matching), of different identities (out-group matching) or with mere partners for whom no induction of social identity has taken place (partner matching). In addition to recording subjects' contributions to the public good in each period, we ask for their expectations on their group members' contributions throughout the game, as well. Our design is complemented by employing a variant of the strategy method (Selten, 1967) as pioneered by Fischbacher et al. (2001) in order to automatically classify subjects into certain types according to their cooperation preferences. This allows for finer grained analyses of the effects of social identity (cf. Lankau et al., 2012).

Our results indicate that despite recent progress in understanding social identity's impact on positive reciprocity, differences in cooperativeness are predominantly triggered by subjects' expectations. In particular, when matched with members of their own identity subjects hold significantly higher expectations on their cooperativeness than when interacting with out-group members. Yet, the degree of reciprocating these expectations is very similar. Nevertheless, we find that subjects initially characterized as free-riders do exhibit significantly higher levels of conditional cooperation in in-group than in out-group matching.

Our article is organized as follows: Section 2 reviews the most relevant literature on this subject and derives our research hypotheses. While section 3 details the experimental design, we report the main results of this research in section 4. Finally, section 5 concludes.

2 Literature Review and Research Hypotheses

The origins of experimental economic research on social identity can be found in the social identity theory as pioneered by Tajfel and Turner (1979). Its core element is the deduction of discriminatory behavior's psychological foundations, which is routed in three distinct social processes: (1) Categorization – individuals associate themselves rather quickly with certain social categories; (2)

identification – they derive self-esteem from these (in-) groups, and (3) comparison – they start to compare their in-groups with out-groups they do not identify with. Together, these processes trigger discriminatory behavior towards members of different identities (out-group members) and favorable treatment of members of their own identity (in-group members).² This phenomenon, generally termed as in-group bias, seems to be deeply rooted in human nature (Eaton et al., 2011) and pervasive in many different forms of social interactions. Experimental investigations focusing on cooperative behavior, for instance, show that social identity increases cooperativeness when individuals interact with in-group members as opposed to random and/or out-group matching. This has been shown in two-player response games (McLeish and Oxoby, 2007), dictator games (Chen and Li, 2009), two-player coordination games (Charness et al., 2007) and minimum-effort games (Chen and Chen, 2011) all using induced social identity, as well as in prisoners' dilemma games using pre-existing social identification with real Swiss army platoons (Goette et al., 2006).

In the context of private public good provision there are two studies focusing on the impact of social identity on contributions to public goods. Both show that a common identity increases individuals' contribution despite the dominant strategy of free-riding (Solow and Kirkwood, 2002; Eckel and Grossman, 2005). Eckel and Grossman (2005), for instance, employ a ten-period public good game framed as a time allocation problem with different treatments designed to induce increasing strengths of social identity. The authors find that enhanced team identification yields consistently higher cooperation levels indicating less free-riding in general. Unfortunately, their research does not allow concluding on the driving forces of these increases in cooperation under social identity.

Nevertheless, there are two independent lines of thought from which hypotheses on the mechanisms of social identity in public good provision can be drawn. Originating in experimental psychology the first stream refines the understanding of social identity theory by stressing the pivotal role of expectations on group members' behavior. In particular, within the context of sequential minimal group reward allocation games Yamagishi et al. (1999) establish that when individuals interact with other members of their in-group, they expect their group members to reciprocate favors given to them. This occurs even if they merely know the social but not the personal identity of the individuals they were interacting with.³ Due to this elevated expectation in-group members cooperate more with each other than with out-group members from whom they expect less reciprocation. The authors termed this phenomenon the expectation of bounded – since confined to in-groups – generalized reciprocity. In the context of a simultaneous prisoners' dilemma situation they also show that subjects cooperate to a higher degree with their in-group than with out-group matches because they hold higher expectations on the contributions of in-group matches (see also

² See for instance Chen and Li (2009) for a more detailed summary.

³ Thus, their design rules out direct reciprocation between two subjects.

Yamagishi and Kiyonari, 2000). Likewise, cooperation in the public good context under social identity ought to be mainly driven by subjects' expectations, as well. This view is shared by Fischbacher et al. (2010), who generally argue that subjects' expectations determine cooperative patterns in public good contexts.⁴

The second stream of literature is driven by research on the impact of social identity on individuals' social preference for positive reciprocity. Generally, positive reciprocity captures individuals' inclination to reward acts that are perceived to be kind (cf. Fehr and Fischbacher 2002; Falk and Fischbacher 2006). In particular, in a series of two-person response games Chen and Li (2009) find that in-group members exhibit a 19 percent higher degree of positive reciprocity among each other than out-group members.⁵ Using a comparable game setting, Currarini and Mengel (2012) report a 34 percent higher positive reciprocity in in-group matching. Accordingly, when subjects interact with members of their own identity they exhibit the preference to reciprocate favors given to them to a significantly higher degree than when interacting with individual of different identities. Moreover, Lankau et al. (2012) show that social identity's impact on reciprocity preferences has direct bearing in the provision of public goods, as well. Within the context of one-shot public good games in strategy method, the authors elicit subjects' cooperation preferences. They establish that in-group members contribute significantly more to the public good independent of their group members' hypothetical average contributions than out-group members.⁶ Consequently, we argue that social identity tends to systematically affect subjects' cooperation preferences in the provision of public goods. The authors go on to conjecture that these distinct preferences will shape subjects' conditional cooperation in longer term public good provision, as well.⁷ Specifically, conditional cooperation within the context of multiple-period public good games is often captured by the degree to which subjects reciprocate their expectations on their group members' contribution as measured by own contributions (cf. for instance Chaudhuri and Ananish, 2011; Fischbacher and Gächter, 2010).⁸ However, so far little is known to what extent (if any) social identity leads to differences in

⁴ The causality of both variables is by no means a clear-cut. Daws (1980; 1989) for instance argues that subjects project their own contributions onto others, which is then reflected in their expectations. Yet, based on the results of Yamagishi et al. (1999), Yamagishi and Kiyonari (2000) as well as Fischbacher et al. (2010) we view expectations to drive contributions.

⁵ Additionally, subjects are significantly more forgiving for "bad behavior", i.e. they exhibit less negative reciprocity Chen and Li (2009). See also Bicskei et al. (2013).

⁶ In order to elicit subjects' cooperation preferences the authors employed a series of one-shot games in strategy method (cf. Fischbacher et al., 2001; Fischbacher and Gächter, 2010; Volk et al., 2012) by asking subjects for their contributions conditional on hypothetical average contributions (0-20) of their group members.

⁷ In general, results of the strategy method have been found to significantly predict subjects' cooperative behavior in response to their expectations on the average contributions of their group members (Fischbacher and Gächter, 2010).

⁸ Alternatively, conditional cooperation can be captured by analyzing how subjects react to changes in cooperativeness of their group members in the previous game periods (Keser and van Winden, 2000). Yet, expectation should generally comprise previous group members' behavior (Fischbacher and Gächter, 2010), so that we use them as the base for establishing the degree of conditional cooperation.

conditional cooperation in multiple-period public good games, measured by subjects' degree of reciprocating their expectations on group members' behavior. This is by no means obvious, since in such an environment expectations tend to impact on cooperation in addition to subjects' cooperation preferences (Fischbacher and Gächter, 2010).⁹

From a theoretical perspective, both literature streams complement each other. Subjects may expect greater cooperation of their own identity's members than of out-group members and thus contribute more to the public good. Additionally, they could exhibit higher degrees of conditional cooperation and reciprocate these expectations by increased own contributions. Investigating to what extent this theoretical construct holds, is at the heart of this article.¹⁰ Accordingly, we formulate the following research hypotheses.

Based on Eckel and Grossman (2005), we first of all expect larger contributions in in-group matching than in out-group or partner matching¹¹ throughout all periods of the public good game.

Hypothesis 1: Contributions to the public good are significantly higher when subjects are matched with members of their own identity than in partner or out-group matching.

Secondly, based on Yamagishi et al. (1999) and Yamagishi and Kiyonari (2000), we hypothesize that subjects expect significantly greater average contributions of their in-group members as compared to out-group members or in partner matching.

Hypothesis 2: Expectations on group members' average contributions to the public good are larger when subjects are matched with in- than with out-group members or with partners.

Lastly, following Chen and Li (2009) and Lankau et al. (2012) we expect that when subjects interact with members of their own identity they will display a higher degree of conditional cooperation – expressed by the reciprocation of their expectations on group members' average contributions by their own contributions – than in out-group or partner matching.

Hypothesis 3: Subjects reciprocate their expectations on their group members' contributions to a significantly higher degree when interacting with in-group members than when interacting with partners or out-group members.

⁹ The authors elicited cooperation preferences through a one-shot public good game in strategy method that was played in addition to a ten-period public good game in stranger matching. Conditional contributions from the strategy method were used to predict actual contributions in the ten-period game based on subjects expectations on group members' contributions.

¹⁰ Of course, there may well be other factors that influence how social identity shapes cooperation. Yet, within this study we specifically seek to disentangle expectations and conditional cooperation.

¹¹ The term partner matching characterizes stable group membership over the periods of the public good game.

3 Experimental Design

The participants of the experiment were assigned to groups comprising three subjects. Each group member was endowed with 20 points that could be invested either in their private account ($20 - g_i$) or into a public good, framed as a *project* (g_i). The payoffs associated with this decision are given by the following formula:

$$\pi_i = (20 - g_i) + 0.4 \sum_{j=1}^3 g_j$$

Accordingly, it is individually more beneficial to invest in the private account, because every point invested returns exactly 1 point, while the project only yields 0.4 points. Generally, we employ two techniques of collecting subjects' contributions to the public good: the standard method and the strategy method (cf. Fischbacher et al., 2001). Within the rounds carried out in strategy method, subjects had to make two decisions, an *unconditional* and a *conditional contribution* to the public good. At first, they had to decide how many of their 20 points they would like to invest in the public good irrespective of what their group members contribute (*unconditional contribution*). Then, subjects were asked to fill out a contribution table consisting of 21 entries in which they were asked to decide how much they *would* invest if their group members invested on average (round to the next higher integer value) 0-20 points in the public good (*conditional contribution*). In order to render both decisions potentially payoff-relevant, we randomly determined¹² one group member who was to contribute according to the conditional contribution decision, while for the remaining two their unconditional contributions were applicable. Within the rounds that were played in standard method, subjects merely had to indicate how much they would like to invest in the project regardless of the contributions of their group members, with each decision being directly payoff-relevant (cf. similar to the unconditional contribution in the strategy method game).

In total, the experiment consisted of three stages (see Table 1). In Stage A subjects were randomly allocated into different groups (random matching) and played a one-shot public good game in strategy method. This followed the purpose of eliciting subjects' cooperation preferences without any influences of social identity (Lankau et al., 2012). Specifically, it helped to classify them as conditional cooperators or free-riders, allowing for a differentiated analysis of subjects behavior in later stages of the experiment (cf. Fischbacher et al., 2010; Burlando and Guala, 2005).¹³

¹² After both decisions were made, one participant in each session rolled a die to determine the respective group member.

¹³ We defined conditional cooperators as subjects who exhibit a positive significant Spearman rank correlation coefficient ($p < 0.01$) between own conditional contributions and others' average contributions. Subjects were classified as free-riders if they contributed nothing to the public good in any case.

Stage	ID-Treatments		Control Treatment
A	Public Good Game in Strategy Method Random Matching		
B	Group Identity Task		-
C	In-Group Matching	Out-Group Matching	Partner Matching
	Ten-Period Public Good Game Period 1: Strategy Method Period 2-10: Standard Method		

Table 1 – Experimental Design

Stage B served the purpose of inducing social identity in the laboratory using a design pioneered by Ibañez and Schaffland (2012), which is based on insights of Eckel and Grossman (2005) and Chen and Li (2009). Specifically, we randomly re-assigned subjects to different groups with each group having been given a different color indicated by a colored flag. These groups then had to solve a simple group task in order to create a positive group experience (Eckel and Grossman, 2005). Given 10 minutes time, subjects had to jointly find hidden objects in a picture and report coordinates of their location (row and column).¹⁴ To this purpose, subjects could discuss solutions with their group members via an anonymous online chat tool. In order to elevate subjects' propensity to coordinate and to render this task a true group exercise, our instructions explicitly stated that answers would only count as correct should each group member enter them correctly. What is more, the task was played as a tournament in which the group with the highest number of objects found won. Yet, in order to prevent negative associations from not winning this task, only the winning team received a congratulating message at the end of the experimental session. The remaining teams were not provided with information about their results and position relative to the other groups. Lastly, avoiding income effects there were no monetary incentives for winning this game.

In Stage C three different matching protocols were in effect. On the one hand, subjects were either matched with individuals of their own identity with whom they solved the group task in Stage B (in-group matching); or with subjects of different identities (out-group matching). Throughout Stage C each group member' identity was made salient by showing special flags colored according to group membership from Stage B. Subjects matched with out-group members for instance saw a red and a green flag in addition their own flag of blue color, visually stressing differing group identities. On the other hand, we implemented a control treatment, in which subjects did not take part in the identity induction. Since all protocols are characterized by stable group membership throughout Stage C, the control treatment is effectively a mere partner matching condition (see for instance Andreoni, 1988;

¹⁴ The instructions and the picture used in the experiment are available upon request.

Andreoni and Croson, 2008). Subsequently, subjects played a ten-period public good game,¹⁵ with the first period played in strategy method analogous to Stage A, and the remaining periods in standard method. Additionally, throughout all decision periods of Stage C, subjects had to state what they expected their remaining two group members to (unconditionally) contribute on average, next to their own contribution decision.¹⁶ At the end of each game period subjects were informed about their payoff from this round, including how much their two group members contributed on average to the project.

The instructions to this experiment were provided successively in order to prevent subjects to adjust their behavior according to their expectation of events in later stages. Additionally, payoffs from Stage A were not revealed until the end of the experiment prior to the post-experimental questionnaire. At this point subjects were told about their total payoff, comprised of income from Stages A and C as well as the 2.50 € show-up fee.

4 Results

The experiment was carried out in the Göttingen Laboratory of Behavioral Economics (GLOBE) at the Göttingen University from December 2011 to January 2012 using the software z-Tree (Fischbacher, 2007). Altogether, we observed decisions of 300 subjects, of which 108 took part in in-group matching, 105 in out-group matching and 87 in control matching. The subjects were students recruited from the ORSEE Database and the canteen of the Göttingen University. Sessions took approximately 1.5 hours and the subjects earned 13.20 € on average including the show-up fee.

4.1 Cooperation under Social Identity

Figure 1 depicts the impact of our matching conditions on cooperation in the ten-period public good game of Stage C. Clearly, independent of the treatment we observe the usual pattern of diminishing contributions over the course of the game. In period 1, subjects start off by investing on average approximately 8 of their 20 points into the public good.¹⁷ In the following periods, average cooperation gradually decreases within each treatment condition. Importantly though, when subjects interact with members of their own identity they consistently show higher average cooperation levels than when matched with individuals who belong to different identity groups or

¹⁵ The actual number of periods in Stage C was randomly set to be between 11 and 15. Subjects did not know about the actual length of the game in advance, which served the purpose of avoiding end-game effects in period 10 (cf. Andreoni and James, 1988).

¹⁶ Accurate expectations were incentivized according to the following scheme: 3 points for correct expectations, 2 (1) point(s) for expectations that were 1 (2) point(s) off from actual average contributions.

¹⁷ In period 1, which was carried out in strategy method subjects' unconditional contributions were chosen as their contribution to the public good. This ensures the highest degree of comparability to the remaining periods of the game, in which subjects were not asked for their conditional contributions.

with partners. The Tobit-regression analysis in Table 2 (Model 1) confirms firstly that these differences are statistically significant and secondly that contributions decrease over time.¹⁸ Consequently, we find supporting evidence for Hypothesis 1 of a prevailing in-group bias in subjects' contributions.

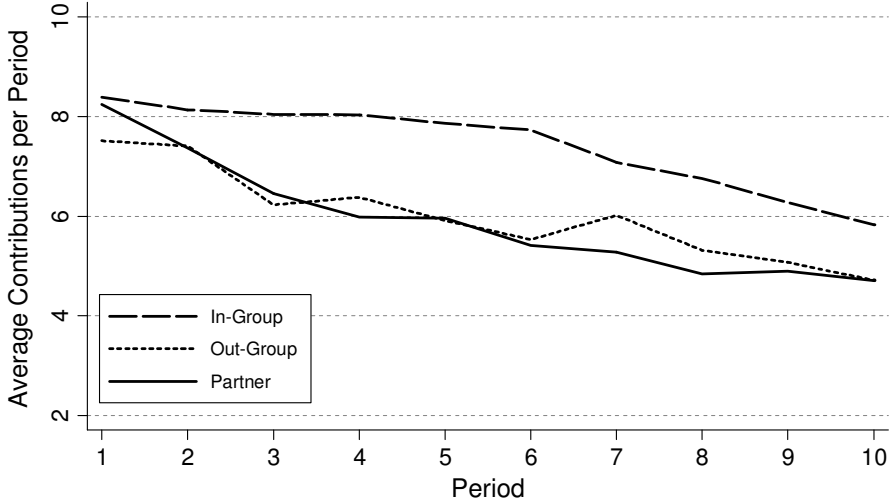


Figure 1: Average Cooperation Levels per Treatment

Tobit Regression	Model	
	(1) Contributions	(2) Expectations
Ingroup	2.4037** (1.027)	2.1580*** (0.738)
Outgroup	0.3303 (1.066)	0.4265 (0.734)
Period	-0.4738*** (0.058)	-0.3984*** (0.046)
Constant	7.0276*** (0.764)	8.2799*** (0.484)
Ingroup - Outgroup = 0	p=0.0372	p=0.0183
sigma Constant	8.5439*** (0.385)	6.3005*** (0.236)
Observations	3,000	3,000
Pseudo-R2	0.0068	0.0088

Note: Robust standard errors in parentheses, clustered around individuals, sign. levels: *** p<0.01, ** p<0.05, * p<0.1

Table 2: Tobit-Regression on Treatment Effects on Contributions and Expectations

¹⁸ A Tobit-estimation is particularly suitable in this case, because it allows controlling for truncated data. In our case we observe comparably many contributions and expectations of 0 and 20 points. Standard errors are cluster over individuals to control for auto-correlation of the error-term. Please see Appendix 6.1 for a robustness check using an OLS-estimation.

RESULT 1: *Subjects showed significantly higher levels of cooperation when interacting with members of their own identity than in mere partner or out-group matching.*

This result is in line with Eckel and Grossman (2005), who find strong social identity to raise cooperation compared to groups bound together by weaker identities.

Contrarily, we do not find any statistical differences in contributions between partner and out-groups. Following Yamagishi et al. (1999) this could be due to subjects holding similar expectations on partners' and out-group members' cooperation. In case their conditional cooperation – i.e. the degree to which they reciprocate their expectations with own contributions – is similar in both matching protocols as well, comparable average contribution levels result automatically.

After having established that relative to the other treatment conditions in-groups cooperate to the highest extent, we subsequently investigate the two explanatory factors that we derived from previous research: subjects' expectations on their group members' cooperativeness (Hypothesis 2) and subjects' conditional cooperation capturing the degree to which subjects reciprocate these expectations by their own contributions (Hypothesis 3).

4.2 Explaining In-Group Biased Cooperation

4.2.1 Expectations on Group Members' Contributions

Figure 2 compares the average levels of expectations in the different identity treatments. In line with the findings on cooperation levels, when subjects are matched with individuals of their own identity they expect much more cooperation of their group members than in partner or out-groups, with both differences being highly significant (see Table 2, Model 2). Although in eight of ten game periods out-group expectations are on average higher than partner expectations (periods 1 and 4-10), we do not find any statistically significant difference between these conditions (see Table 2, Model 2). This serves as a first explanation of why subjects' cooperativeness in out-group and partner matching does not differ either. Overall, we thus cannot reject Hypothesis 2. Subjects in in-group matching do hold higher expectations on their group members' contributions than in out-group or partner matching.

RESULT 2: *Subjects hold significantly higher expectations on their group members' cooperativeness when interacting with members of their own identity than when matched with partners or out-group members.*

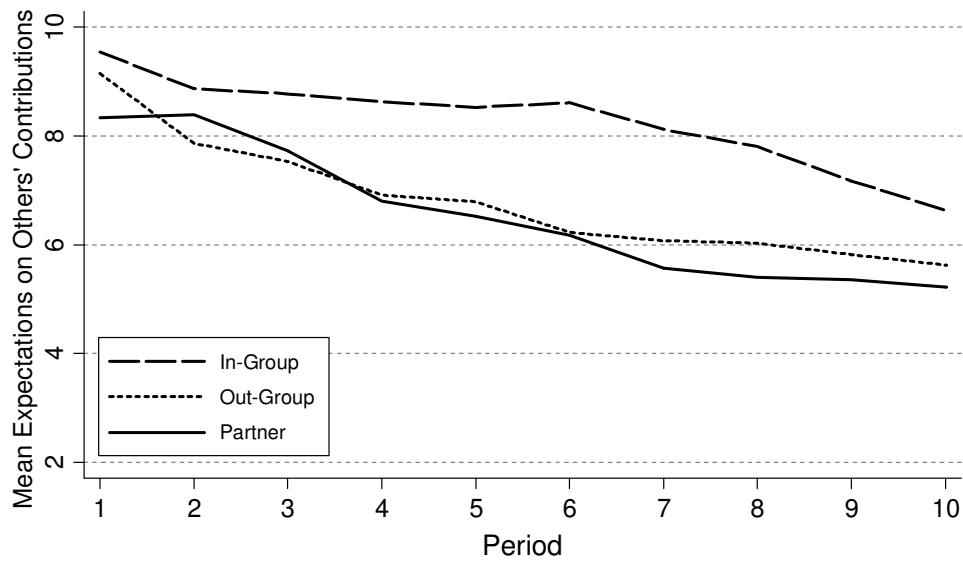


Figure 2: Average Expectations on Group Members' Average Cooperation

This result is in line with previous findings by Yamagishi et al. (1999). Within the context of prisoner's dilemma games, the authors show that subjects hold significantly higher expectations on the cooperativeness of in-group than of out-group members and thus cooperate to a higher extent, in return. Evidently, as to be seen in Figure 3, our results demonstrate that the level of subjects' expectations is highly correlated to their contributions. In each matching protocol, subjects' average contributions closely follow the pattern of their expectations. In the next section, we will elaborate subjects' conditional cooperation in each matching in detail.

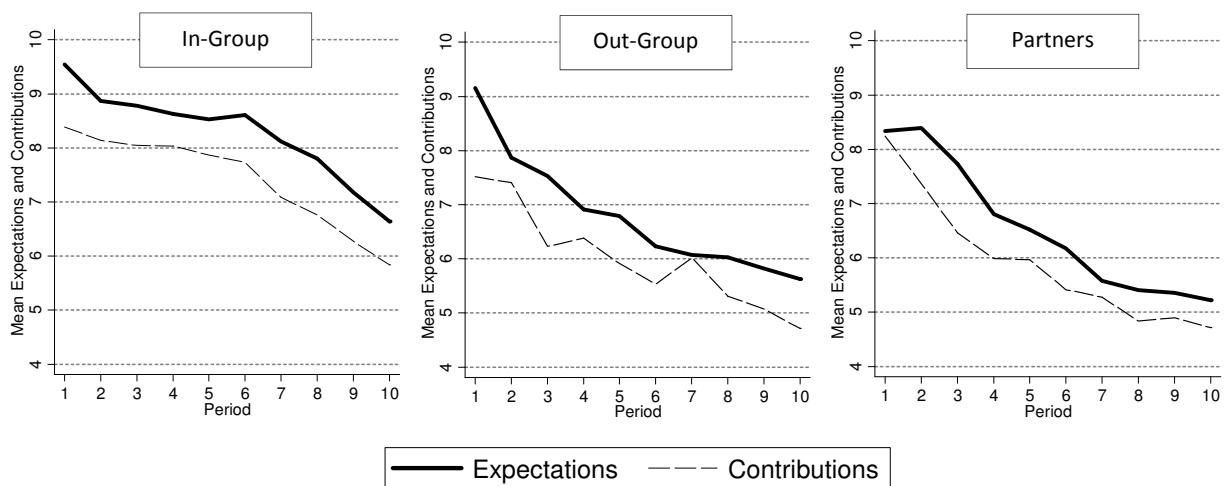


Figure 3: Average Expectations and Contributions per Period and Matching Protocol

4.2.2 Conditional Cooperation

The following analyses of subjects' degree of reciprocity will be split into two parts. At first, we will investigate subjects' initial *cooperation strategies* of the first period in Stage C. Please recall that the first period was carried out in strategy method by which we elicited how subjects reciprocate hypothetical contribution behavior of their group members (their conditional contributions). Next, we analyze their *actual conditional cooperation*, i.e. how they actually reciprocate expectations on their group members' cooperation throughout all of Stage C's periods. Please note that subjects were fully aware that they would be interacting with the same group members throughout Stage C. Such longer-term interactions with stable group membership typically give rise to strategic and future-oriented incentives. These can alter subjects' degree of reciprocity – captured by their cooperation strategy and their actual conditional cooperation - compared to their preferences for reciprocity in one-shot environments (cf. Fehr and Fischbacher, 2002). Nevertheless, these incentives are equally present in in-, out- and partner groups. Thus, we assume that any difference in subjects' observed reciprocity indicates differences in their reciprocity preferences, free of any strategy bias.¹⁹

To start with the former, Table 3 reports the results of three linear regressions on the influence of matching conditions on subjects' conditional contributions, which were elicited in Stage C's first period.²⁰ Our findings first of all reveal that independent of the matching protocol subjects are willing to be conditionally cooperative. This is indicated by the highly significant coefficient on the "Group Average" variable in combination with the statistically insignificant interaction terms of in-group and control matching with "Group Average" (Model 1). Nevertheless, their strategies point towards a certain self-serving bias. Upon increase of their group members' average contributions by 1 point subjects merely increase their own conditional contributions by approximately half a point. Secondly, we find that subjects' cooperation strategies significantly differ between in-groups and out-groups (Model 1). Here, the coefficient on the in-group dummy variable reveals that across the whole range of others' average contributions to the public good (0-20) in-group members are willing to contribute approximately 1 point more than out-group members. Testing the linear combination of intercept and slope confirms the result, which is significant at the 10%-level. What is more, controlling for subjects' experiences from the Stage A of the experiment, in which they already played a public good game in strategy method, reinforces the significance. Nevertheless, we do not find any difference – neither in intercept nor in slope – between cooperation strategies of in-groups and control groups as well as of out-group and control groups.

¹⁹ For the impact of social identity on cooperation preferences in a one-shot environment, please see Lankau et al. (2012).

²⁰ In this case we chose an OLS-regression, since we do not face the problem of truncated data. Subjects' conditional contributions are – due the experimental design – equally distributed over the whole range of group members' average contributions. For a graphical representation of subjects' average conditional contributions per treatment see Appendix 6.2.

Linear Regression (OLS) Conditional Contributions	Model	
	(1)	(2)
In-group	0.9858* (0.539)	0.8418** (0.368)
Control	0.6330 (0.503)	0.2624 (0.271)
In-group x Group Average	-0.0141 (0.064)	-0.0293 (0.038)
Control x Group Average	0.0012 (0.063)	-0.0307 (0.039)
Group Average	0.5382*** (0.045)	0.1828*** (0.035)
Conditional Contributions (Stage A)		0.7223*** (0.038)
Constant	0.5045 (0.306)	-0.0627 (0.161)
Tests of Linear Combinations		
Ingroup + In-group x Groupaverage = 0 (In-group vs. Outgroup)	0.9717* (0.5000)	0.8125** (0.349)
Control + Control x Groupaverage = 0 (Control vs. Outgroup)	0.6341 (0.473)	0.2318 (0.251)
In-group vs. Control	0.3376 (0.564)	0.5808 (0.372)
Observations	6,300	6,300
R-squared	0.293	0.672

Note: Robust standard errors in parentheses, clustered around individuals, sign. levels: *** p<0.01, ** p<0.05, * p<0.1

Table 3: Linear Regressions on the effects of Matching Conditions on Conditional Contributions (Stage C, Period 1)

RESULT 3: *In-group matches reveal a greater willingness to be conditionally cooperative than out-group matches.*

After having shown that subjects' initial cooperation strategies under social identity are characterized by a differing willingness to be conditionally cooperative, we proceed by analyzing their *actual degree of conditional cooperation* by measuring the correlation between subjects' expectations and contributions. Specifically, we run a Tobit-regression analysis (see Table 4) to compare slopes of the function that maps subjects' contributions on their expectations (contribution schedule).²¹ This allows us to exactly quantify marginal effects of expectations on contributions at each level of

²¹ We opted for a non-linear estimation, since marginal effects may differ depending on the actual level of expectations. This regression includes expectations and contributions from each period of the public good game. We equally ran a Tobit-regression using individual averages of expectation and contributions over the ten periods in order to better account for statistical dependencies that may occur over the course of the game. The results are not essentially different, which is why we did not include them in this paper.

expectations from 0 to 20. What is more, the models' intercepts will shed light on treatment differences in the position of the according contribution schedules. This analysis is carried out for all subjects combined (Model 1 and 2) as well for free-riders and conditional cooperators (Model 3 and 4, respectively), which were identified in Stage A, separately.²² Figures 6 to 8 depict the conditional marginal effects based on Models 1, 3 and 4, respectively.

Tobit-Regression Contributions in Stage C	Model			
	(1) All Subjects	(2) All Subjects	(3) FR	(4) CC
In-Group ¹	0.1593 (0.9530)	0.2083 (0.8525)	-0.5001 (6.4216)	-0.4366 (1.1168)
Out-Group ¹	1.1895 (1.0171)	1.0237 (0.8763)	1.4609 (2.1722)	0.5903 (1.2496)
Expectations ¹	1.0187*** (0.0439)	0.6840*** (0.0657)	1.2727*** (0.2102)	1.0298*** (0.0416)
Predicted Cooperation ¹		0.4322*** (0.0653)		
In × c.Exp	0.0278 (0.094)	-0.0200 (0.086)	0.7985 (0.492)	-0.0673 (0.091)
Out × c.Exp	0.0048 (0.097)	-0.0123 (0.084)	-0.5994 (0.467)	0.0544 (0.091)
Control Variables ²				
Constant	-1.7244* (0.947)	-1.7935** (0.852)	-7.4228* (3.858)	-1.1939 (1.076)
sigma Constant	4.9449*** (0.259)	4.6689*** (0.250)	8.1526*** (1.470)	4.3509*** (0.238)
Observations	3,000	3,000	360	2,090

Note: , Robust standard errors in parentheses, clustered around individuals, lower limit 0, upper limit 20, *** p<0.01, ** p<0.05, * p<0.1

1 - Coefficients and standars errors are calculated at the mean value of these variables using the post-regression Margins-command with the noestimcheck-option, 2 - Control variables include sessions and contribution patterns of groups

Table 4: Tobit-Regression on Conditional Marginal Effects of Expectations on Contributions

First of all, marginal increases in expectations are reciprocated by an increase in contributions of approximately 1 point (Model 1).²³ Consequently, subjects generally exhibit a nearly perfect degree of conditional cooperation. What is more, their cooperation strategies from period 1 have very high explanatory power for actual contributions in the course of the public good game, which is indicated

²² Based on subjects' conditional contribution behavior in Stage A, we identified 209 conditional cooperators (69.7%), 36 free-riders (12%) and 55 subjects (18,3%) who belonged to the "other" category.

²³ In this model, the coefficient is calculated using the mean value of expectation on group members' average contributions.

by the highly significant coefficient on predicted cooperation in Model 2 (0.4322).²⁴ Nevertheless, expectations still strongly inform subjects' contributions. This indicates that subjects show conditional cooperation in addition to what is predicted based on their indicated cooperation strategy.

RESULT 4: *Subjects generally exhibit a very high degree of conditional cooperation throughout Stage C. It is strongly influenced by the level of their expectations in addition to their initially indicated cooperation strategy.*

This argumentation is in line with findings by Fischbacher and Gächter (2010). The authors argue that both subjects' beliefs and cooperation preferences explain actual contribution behavior in a multiple-period public good game.

We now turn our attention to treatment differences in conditional cooperation. Figure 4 depicts conditional marginal effects of expectations on subjects' contributions differentiated by matching protocol (based on Model 1). Clearly, independent of the level of subjects' expectations, there is always a significantly positive effect of marginal increases in expectations on own contributions. The function approximates an inverted u-shape peaking at a level of expectations of around 11 points. However, we do not find any statistically significant differences in marginal effects between the matching protocols. Thus, no matter with whom subjects interact, they reciprocate marginal increases in expectations on group members' behavior to approximately similar degrees. What is more, the intercepts for the in-group, out-group and partner conditions in Model 1 are not statistically different from each other indicating similar contribution profiles' positions.²⁵ On the whole, we consequently have to reject Hypothesis 3. Despite the fact that subjects initially indicated matching-dependent *cooperation strategies* in period 1, we do not find any differences in their *actual degree of conditional cooperation*.

²⁴ To be precise, we used subjects' entries from the conditional contribution table of period 1 to predict actual contributions given their expectations on their group members' contributions. These predicted contributions thus reflect subjects' contribution behavior in the ten-period game if they had exactly followed their contribution strategy of period 1. Due to the random end point of Stage C this should reflect their strategy in later game periods as well.

²⁵ $H_0: \text{in-group-out-group} = 0$, $\chi^2(1) = 1.35$, $\text{Prob} > \chi^2 = 0.2460$.

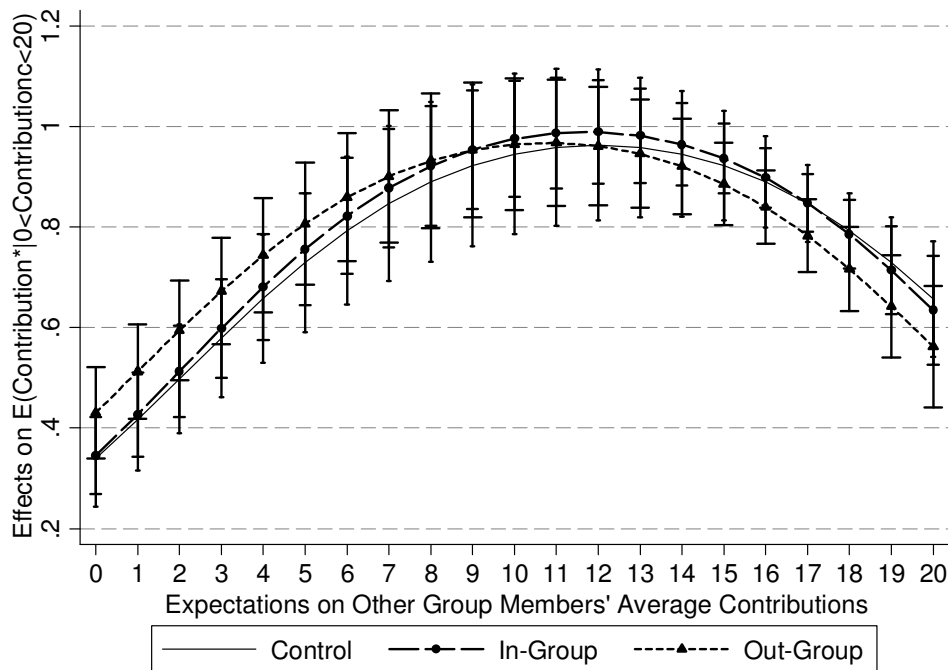


Figure 4: Conditional Marginal Effects of Expectations on Contributions (with 95% Confidence Intervals)

Result 5: Throughout the ten-period public good game individuals exhibit similar degrees of conditional cooperation when interacting within in-, out and partner groups.

These findings diverge from subjects' initial matching-dependent cooperation strategies. Clearly, strategies offer merely limited insights into the impact of social identity on conditional cooperation in longer-term public good provision. This result rather points towards the paramount importance of subjects' expectations on the behavior of their group members. Obviously, expectations dominate any differences in cooperation preferences or strategies.

Offering a more differentiated analysis of social identity's effects conditional cooperation, we proceed by investigating conditional cooperators' and free-riders' reciprocation behavior, separately. On the one hand, we find some evidence that free-riders reveal behavioral adjustments (Figure 5 based on Model 3) depending on the matching protocol. When interacting within in-groups they exhibit significantly higher changes in cooperation upon marginal increases of expectations than in out-group matching in the range of expectations from 10-18.²⁶ Here, the slope of their conditional contribution is consequently steeper. At a level of expectations of 14 points, for instance, the marginal effect of expectations on contributions for in-group free-riders is approximately 1.5 points.

²⁶ Please see Appendix 6.3 for the according test statistics.

Yet, with regard to out-group free-riders it is merely approximately 0.4 points. The differences in intercepts of the contribution schedules are not statistically different from each other.²⁷

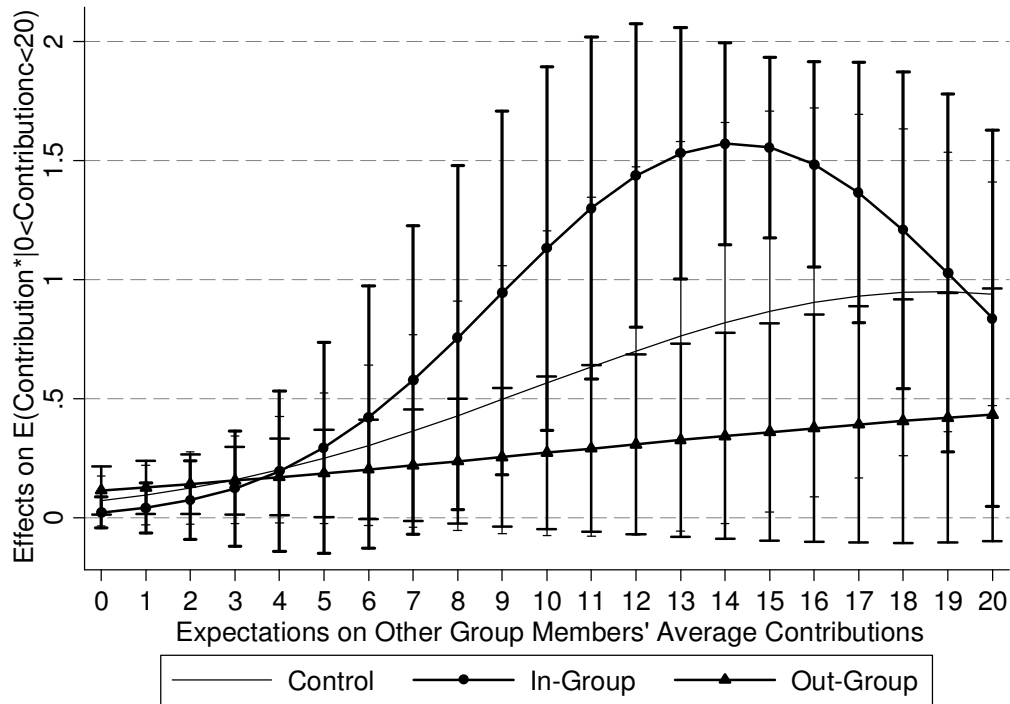


Figure 5: Conditional Marginal Effects of Expectations on Contributions in case of Free-Riders (with 95% Confidence Intervals)

Result 6: For a limited range of expectations on group members' cooperativeness, free-riders seem to be more conditionally cooperative when matched with in-group than when matched with out-group members.

When interpreting Result 6, we would like to caution, however, that merely 12% of our subjects (36 in total) were classified as free-riders. Accordingly, further research is necessary to evaluate this result's robustness with a larger number of observations.

Conditional cooperators, on the other hand, reveal similar patterns of conditional cooperation in in-group, out-group and partner matching. Although the marginal effects of expectations on contribution in out-groups are higher than in in-groups for most of the range of expectation (0-17), (Figure 6) we do not find any statistical significances. The same holds true for the intercepts of the contribution profiles.²⁸

²⁷ $H_0: \text{in-group-out-group} = 0$; $\chi^2(1) = 0.11$, $\text{Prob} > \chi^2 = 0.7452$.

²⁸ $H_0: \text{in-group-out-group} = 0$; $\chi^2(1) = 0.82$, $\text{Prob} > \chi^2 = 0.3666$.

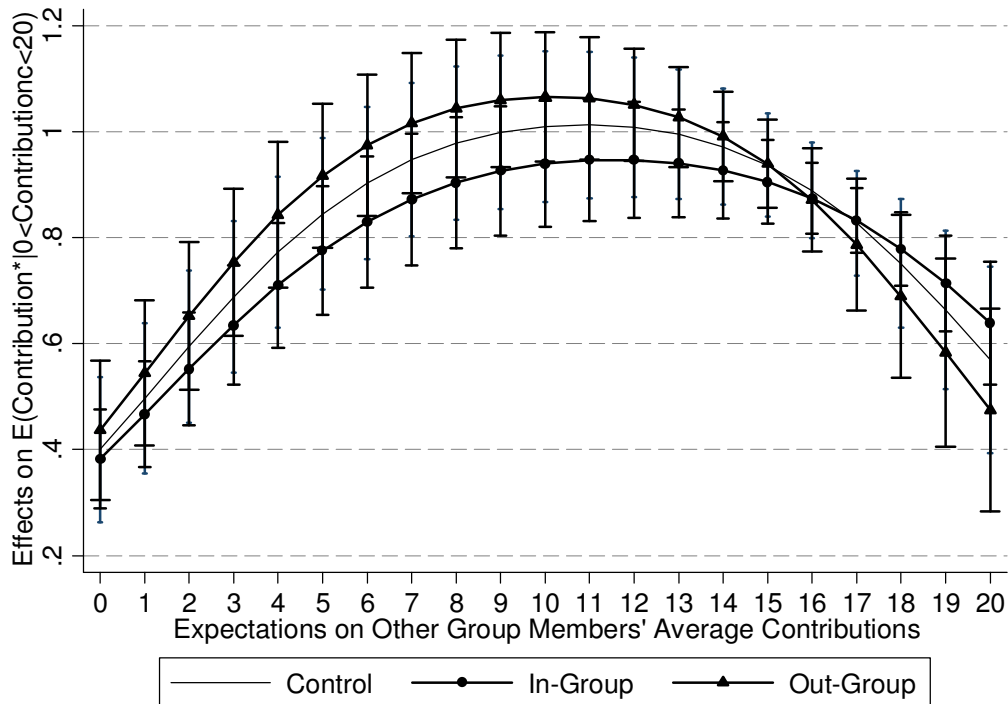


Figure 6: Conditional Marginal Effects of Expectations on Contributions in case of Conditional Cooperators (with 95% Confidence Intervals)

Result 7: Conditional cooperators exhibit stable patterns of conditional cooperation under the influence of social identity.

These results contradict Lankau et al. (2012) who argue that both free-riders and conditional cooperators ought to show increased levels of conditional cooperation when interacting with members of their own identity as opposed to being matched with out-group members.

5 Conclusion

People tend to be more cooperative with individuals sharing a common identity than with individuals who belong to different identities. In the social dilemma of privately providing public goods this typically results in higher contribution levels among in-group members (Eckel and Grossman, 2005). Within this article we contribute to the understanding of why exactly we observe these increases in social welfare under the institution of social identity. In particular, we investigate its impact on subjects' expectations on the cooperativeness of their group members as well their degree of conditional cooperation, i.e. to what extent they reciprocate these expectations by their own contributions. To this purpose we designed a multiple-period public good game with stable group membership and induced social identity, implementing an in-group, out-group and partner matching treatment. Based on prior research, we hypothesize that social identity influences individuals' cooperation levels both via expectations and conditional cooperation.

In line with previous findings our results show that subjects exhibit the highest levels of contributions when matched with members of their own identity (in-group matching). This seems to be mainly triggered by the expectation that group members with a common identity will themselves cooperate significantly more than members of different identities. However, the effects of social identity on conditional cooperation seem to play a much less important role. Although we find that subjects initially reveal the strategy to be most conditionally cooperative when matched with in-group members, their expectations tend to influence final contributions on top of that. Overall, subjects show very consistent degrees of actual conditional cooperation throughout the multiple-period public good game no matter with whom they are matched. Only for those subjects that have been classified as free-riders we find some evidence for effects of social identity on conditional cooperation. In in-group matching, free-riders seem to reciprocate expectations on their group members' contribution that range from 10 to 18 by higher own contributions than when interacting with out-group members. Yet, all in all, our study clearly reinforces that expectations are a very strong motivational factor for cooperation, which most often dominates differences in cooperation strategies.

In terms of policy implications our results point to the paramount importance of managing individuals beliefs on the contribution levels of the whole group. Even if subjects interact with members of different identities, it is their expectations and not predominantly the degree of how they reciprocate these expectations, which ultimately guides their cooperation behavior. Thus, in an environment consisting of heterogeneous identities, governmental policy that places special importance on convincing groups of high mutual cooperation may prove successful in raising contribution levels.

6 Appendix

6.1 OLS-Regression on Treatment Effects on Contributions and Expectations

Linear Regression (OLS)	Model	
	(1) Contributions	(2) Expectations
Ingroup	1.5006** (0.730)	1.7198*** (0.638)
Outgroup	0.0944 (0.729)	0.2532 (0.622)
Period	-0.3053*** (0.037)	-0.3311*** (0.038)
Constant	7.5952*** (0.532)	8.3716*** (0.408)
Ingroup - Outgroup = 0	p=0.0556	p=0.0271
Observations	3,000	3,000
R-squared	0.031	0.046

Note: Robust standard errors in parentheses, clustered around individuals, sign. levels: *** p<0.01, ** p<0.05, * p<0.1

6.2 Display of Average Conditional Contributions in Period 1 of Stage C

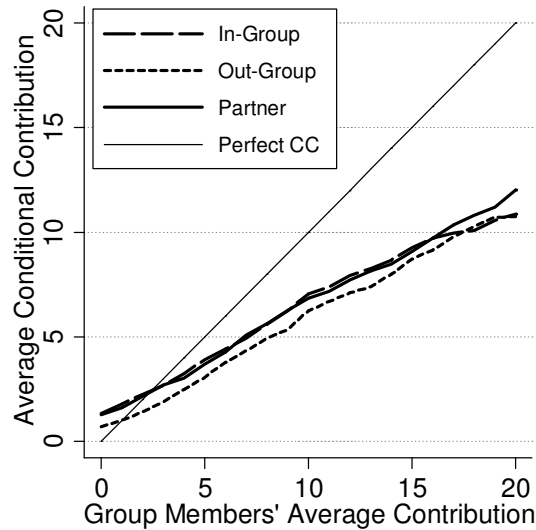


Figure 7: Average Conditional Contributions in Period 1 of Stage C

6.3 Test for Significant Differences in Marginal Effects of Model 4 in Table 2

**H0: Marginal Effect of Expectation on Contribution in
Expectation In-Group Matching = Marginal Effect in Out-Group
Matching**

0	chi2(1) = 1.50	Prob > chi2 = 0.2204
1	chi2(1) = 0.73	Prob > chi2 = 0.3922
2	chi2(1) = 0.25	Prob > chi2 = 0.6170
3	chi2(1) = 0.03	Prob > chi2 = 0.8558
4	chi2(1) = 0.01	Prob > chi2 = 0.9189
5	chi2(1) = 0.13	Prob > chi2 = 0.7175
6	chi2(1) = 0.37	Prob > chi2 = 0.5409
7	chi2(1) = 0.74	Prob > chi2 = 0.3882
8	chi2(1) = 1.27	Prob > chi2 = 0.2593
9	chi2(1) = 2.01	Prob > chi2 = 0.1558
10	chi2(1) = 3.07	Prob > chi2 = 0.0799
11	chi2(1) = 4.59	Prob > chi2 = 0.0322
12	chi2(1) = 6.85	Prob > chi2 = 0.0089
13	chi2(1) = 10.25	Prob > chi2 = 0.0014
14	chi2(1) = 15.02	Prob > chi2 = 0.0001
15	chi2(1) = 19.39	Prob > chi2 = 0.0000
16	chi2(1) = 17.97	Prob > chi2 = 0.0000
17	chi2(1) = 11.24	Prob > chi2 = 0.0008
18	chi2(1) = 5.64	Prob > chi2 = 0.0175
19	chi2(1) = 2.55	Prob > chi2 = 0.1103
20	chi2(1) = 1.00	Prob > chi2 = 0.3176

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