

Group Composition and Conditional Cooperation

Alexander Smith*

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Abstract

This paper examines how group composition affects conditional cooperation in a repeated voluntary contribution mechanism linear public good game. Identity was created using a team-building activity and subjects were assigned to groups of six consisting of a varying number of subjects from two teams. Contributions to the public good were decreasing in polarization within the group and were higher among majority members than minority members. Also, the relationships between contributions and beliefs about the contributions of others indicate that conditional cooperation was stronger among subjects from the same team than among subjects from different teams.

Keywords: Public Good Game; Group Composition; Conditional Cooperation; Identity; Reciprocity

JEL Codes: C7; C9; H4

*Department of Economics, University of Calgary, 2500 University Drive NW, Calgary Alberta Canada, T2N 1N4; smithad@ucalgary.ca; Phone +1 403 220 4602; Fax +1 403 282 5262.

1 Introduction

Public goods provide a wide variety of welfare benefits; examples include environmental quality and national defense. In many countries, services such as education and health-care are non-excludable, exhibiting characteristics of public goods as well. Research on social capital suggests that the social cohesion supporting the provision of public goods promotes economic activity and development (Glaeser, Laibson and Sacerdote, 2002; Putnam, 2000). For example, Knack and Keefer (1997) report a positive relationship between nation-wide generalized trust and annual growth rates. However, Zak and Knack (2001) find trust is negatively related to population heterogeneity including income inequality and ethnic diversity.

Evidence also suggests heterogeneity affects cooperation providing public goods. Alesina, Baqir and Easterly (1999) report that ethnic fragmentation is associated with decreased local government spending on public services including education, roads, sewers and waste removal. Miguel and Gugerty (2005) find a negative relationship between ethnic diversity and funding for schools and community wells in Kenya. Relatedly, studies of individual behavior show heterogeneity is associated with decreased propensities of volunteering for non-profit organizations (Clark and Kim, 2009; Smith, 2010) and census response rates (Vigdor, 2004), an important determinant of federal transfers to communities.

While social effects, where the cooperation of one person affects the cooperation of others, might be an important determinant of cooperation, social effects are typically omitted from empirical papers on heterogeneity and cooperation. Estimates of social effects tend to be biased by multiple endogeneity problems (Manski, 1993; 2000). However, evidence from public good game experiments suggests cooperation is conditional, with people contributing more when they believe others are contributing high amounts (Croson, 2007; Fischbacher and Gachter, 2006; Fischbacher, Gachter and Fehr, 2001).

As a result, the appropriate way of studying cooperation involves considering the role of beliefs about the actions of others.

This paper examines heterogeneity and conditional cooperation using an experiment based on the public good game of Isaac, Walker and Thomas (1984). An experiment has three primary benefits over traditional empirical methods. The first is a precise and accurate measure of cooperation, something hard to obtain from naturally occurring data. When considering a parent volunteering at their child's school, for example, it is difficult distinguishing between the private and social benefits of their actions. The second benefit is that social effects are studied using beliefs about the cooperation of others, avoiding the potential endogeneity issues associated with using the actions of others. Finally, group composition is manipulated exogenously, addressing the problem that in the real world, people choose the community in which they live and their peers, including friends and co-workers.

The experiment created identity in the lab using a team-building activity. Subjects were then assigned to groups of six consisting of a varying number of subjects from two teams. Groups had either five subjects from one team and one from the other, four subjects from one team and two from the other, or three subjects from each team. Within these groups, subjects played a repeated voluntary contribution mechanism (VCM) linear public good game. In addition to making contribution decisions, subjects reported their beliefs about the contributions of other subjects from their team and from the other team. Repetition of the game with re-matching in each round meant subjects served as majority and minority members, and allowed for the updating of beliefs.

Aggregate contributions were highest in groups consisting of five subjects from one team and one from the other. Contributions were lowest in groups consisting of three subjects from each team, suggesting a negative relationship between cooperation and polarization (Montalvo and Reynal-Querol, 2005; Reynal-Querol, 2002). Polarization

captures the idea that in groups consisting of a large majority and a small minority, the potential for conflict is small. In contrast, when half a group's members have one affiliation and the other half have another, there is the most potential for disagreement.¹

Within the groups, majority members made higher contributions than minority members. However, contributions were mainly related to beliefs about the contributions of other group members from the same team. As far as beliefs about the contributions of group members from the other team, minority members made contributions increasing in their beliefs about the contributions of the majority, but the contributions of majority members were unrelated to beliefs about the minority. Beliefs were mainly a function of experience in previous rounds.

The results contribute to the literature on conditional cooperation, previously focusing on homogeneous groups (Croson, 2007; Fischbacher and Gächter, 2006; Fischbacher, Gächter and Fehr, 2001), and suggest an explanation for why heterogeneity decreases cooperation (Goette, Huffman and Meier, 2006; Oxoby and Spraggon, 2006; Ruffle and Sosis, 2006). Cooperation is closely related to beliefs about the cooperation of others, which are adversely affected by heterogeneity.

The remainder of the paper is organized as follows. Section 2 discusses previous experiments on cooperation and heterogeneity. Section 3 describes the experimental design and motivates hypotheses. Section 4 presents results and section 5 concludes.

2 Related Literature

In a standard public good game, such as the game of Isaac, Walker and Thomas (1984), subjects are provided with endowments and randomly assigned to groups. Subjects

¹When agents have one of two affiliations, Reynal-Querol's (2002) measure of polarization is equivalent to the indices of fragmentation used by Alesina and La Ferrara (2000; 2002). However, fragmentation seems more appropriate for environments with more than two affiliations.

choose contributions to a group account and the sum of the contributions is multiplied by $\alpha \in (0, 1)$, determining the amount returned to each subject. The Nash equilibrium (under the assumption of individual wealth maximization) is contributing nothing, but the total surplus is maximized when everyone contributes their whole endowment.

In Isaac, Walker and Thomas (1984), contributions average 42%. The results are robust, but there are different explanations for the cooperation.² Andreoni examines the roles of strategy (1988) and confusion (1995), concluding that altruism is an important factor. More recent research, however, argues that contributions are mainly due to reciprocity. Fischbacher, Gachter and Fehr (2001) find that many subjects are “conditional cooperators,” contributing more when other group members contribute high amounts. Other experiments report contributions increasing in beliefs about the contributions of others (Croson, 2007; Fischbacher and Gachter, 2006).

With respect to heterogeneity, authors use many ways of creating differences among subjects, including varying α (Fisher et al., 1995), show-up fees (Anderson, Mellor and Milyo, 2008) and endowments (Buckley and Croson, 2006; Chan et al., 1996; Cherry, Kroll and Shogren, 2005). Other papers consider the effects of identity. For example, Ruffle and Sosis (2006) find that members of the Israeli kibbutz, a society known for being universal cooperators, are more cooperative when grouped with each other than with city residents. A similar experiment by Castro (2006) reports lower contributions when British and Italian subjects are grouped together compared to when they are in groups consisting of subjects with the same nationality.

Germane to experiments on heterogeneity and cooperation, Eckel and Grossman (2005) find that creating and promoting a common identity among subjects increases cooperation in public good games. Their paper is part of a growing economics literature on identity with origins in social psychology. Tajfel and Turner (1979) develop

²See Ledyard (1995) for a survey of the literature on public good game experiments.

a theory of identity consisting of three components: categorization, identification and comparison. Categorization is the act of assigning people to groups, identification is recognizing the groups to which one belongs and comparison is the process of measuring one's group against other groups. Research on intergroup discrimination argues that biases are moreso related to favoritism toward people with the same affiliation than hostility toward people with different affiliations (Brewer, 1979).

In economics, Akerlof and Kranton (2000) propose that identity affects behavior because people conform to the norms of the social groups with which they are affiliated, suggesting identity can foster cooperation in organizations (Akerlof and Kranton, 2005) if members of the organization perceive themselves as a social group.

Other papers study cooperation in different environments. Bernhard, Fehr and Fischbacher (2006) conduct a third-party punishment game using members of two tribal groups in Papua New Guinea and find that dictators making unfair allocations are punished more severely when the punisher is from the same tribe as the recipient than when the punisher is from the other tribe. Relatedly, Goette, Huffman and Meier (2006) have members of the Swiss army play a prisoner's dilemma game and report more cooperation among officers from the same platoon than among officers from different platoons. Finally, Chen and Li (2009) examine the effects of social groups using two-person sequential games to estimate a model of social preference incorporating identity. They find altruism and reciprocity are stronger among subjects sharing affiliations than among subjects with different affiliations.

3 The Experiment

The experiment was based on a repeated VCM linear public good game similar to the game of Isaac, Walker and Thomas (1984). The primary differences were the solicitation

of beliefs and manipulation of group composition.

Sessions began by creating identity using a team-building activity. Subjects were randomly divided into two “teams” of six as they arrived at the experiment. Teams were sent to separate rooms and asked to answer a quiz consisting of 20 questions. The quiz involved unscrambling letters making words, determining the next number in a sequence of numbers, matching celebrity stage names to real names and matching three-letter airport codes to the cities the airports serve. Teams submitted one answer sheet, so members had to interact while answering the quiz. The aim was developing a sense of common identity among the members of each team.³ Members of teams answering at least 12 of the 20 questions correctly each received \$5, otherwise they would have received nothing.⁴

Following the quiz, subjects played 12 rounds of a public good game in groups of six using endowments of \$10. In Treatment 1, groups consisted of five subjects from one team and one from the other. In Treatment 2, group composition was four subjects from one team and two from the other, and in Treatment 3, groups had three members from each team. A subject’s type was the number of subjects in the group from their team. Thus, Treatment 1 consisted of type 1 and 5 subjects, Treatment 2 of type 2 and 4 subjects, and Treatment 3 of type 3 subjects.

Groups were re-matched at the start of each round. In the sessions of Treatment 1, subjects were type 1 twice and type 5 ten times over the 12 rounds of the experiment. In Treatment 2, subjects were type 2 four times and type 4 eight times, and in Treatment 3, subjects were type 3 in every round. The matching mechanism meant the probability a subject was re-matched with another subject from their team was highest in Treatment 1, followed by Treatment 2 and then Treatment 3, possibly leading to spurious findings

³The process was similar to the identity-building activity used by McLeish and Oxoby (2007).

⁴All teams were successful on the quiz, so all subjects had the same accumulated earnings when playing the public good game.

if the potential for reputation building affects cooperation.⁵ However, a meta-analysis by Andreoni and Croson (2008) comparing partner and stranger matching finds no evidence that subjects engage in reputation building in single finitely repeated public good games. Also, the re-matching incorporated a with-in subject design, with subjects in Treatment 1 serving as type 1 and 5 subjects, and subjects in Treatment 2 as type 2 and 4 subjects. Within subject comparisons are later used examining the effect of subject type, while between subject comparisons study polarization. Subjects were informed of their type, indicating minority or majority status in the group, before making any decisions.

In each round, subjects chose a contribution to the “community account” and guessed the average contribution of other group members from their team (their “same-team” belief) and from the other team (their “other-team” belief).⁶ The sum of contributions was multiplied by 0.33, determining the amount returned to each subject. Payoffs were the amount subjects kept initially plus their share of the community account:

$$\pi_{ir} = 10 - c_{ir} + 0.33 \sum_{j=1}^6 c_{jr} \quad (1)$$

where c_{ir} is the contribution of subject i in round r and the summation of contributions is taken over the six group members indexed by j . At the end of each round, subjects were informed of their payoff and the average contributions of the other group members from their team and from the other team. Incentivizing the elicitation of beliefs, subjects received \$1 for guesses within \$1 of the actual amount, making earnings in each round the sum of the payoff from the public good game and up to \$2 for correct guesses. After the 12 rounds, one round was randomly selected for determining final earnings,

⁵Subjects were matched with others from their team 40, 32 and 24 times out of 60 in Treatments 1, 2 and 3.

⁶Type 1 subjects were not asked their same-team belief; none of their other group members were from their team.

which were a \$5 payment for success on the quiz plus earnings in the randomly selected round. Earnings could not be accumulated across rounds; subjects played each round using endowments of \$10.

Hypotheses

Hypotheses are motivated by theories of conflict (Montalvo and Reynal-Querol, 2005; Reynal-Querol, 2002), altruism (Becker, 1974) and reciprocity (Dufwenberg and Kirchsteiger, 2004; Rabin, 1993). To begin, suppose polarization decreases cohesion among group members, adversely affecting cooperation. This suggests:

Hypothesis 1: *Aggregate contributions are decreasing in polarization.*

Hypothesis 1 predicts aggregate contributions will be highest in Treatment 1, followed by Treatment 2 and then Treatment 3.⁷ The prediction is consistent with Montalvo and Reynal-Querol's (2005) research on polarization and ethnic conflict, and is tested using between subject comparisons.

Next, suppose altruism is an important factor determining cooperation and subjects are more altruistic toward others from the same team. Subjects will make contributions increasing in the number of group members from their team. That is:

Hypothesis 2: *Individual contributions are increasing in subject type.*

Hypothesis 2 is consistent with Andreoni's (1988, 1995) work on the role of altruism in public good games and Chen and Li's (2009) findings that subjects are more generous toward others with whom they share affiliations. The prediction is tested using within subject comparisons.

Finally, consider the effects of reciprocity. If reciprocity is strong among subjects

⁷Reynal-Querol's index of polarization is given by $RQ = 4s_i(1 - s_i)$ where s_i is the share of people with affiliation i . The index has values of 0.56, 0.89 and 1.00 for Treatments 1, 2 and 3.

from the same team, subjects will contribute more when they believe other group members from their team are contributing high amounts. If reciprocity is weaker among members from different teams, beliefs about the contributions of group members from the other team will have smaller effects. Thus:

Hypothesis 3: *Individual contributions are increasing in same-team beliefs, and to a lesser degree, in other-team beliefs.*

Hypothesis 3 is consistent with experiments reporting that subjects make contributions increasing in their beliefs about the contributions of others (Croson, 2007; Fischbacher and Gachter, 2006) and that reciprocity effects are stronger among subjects sharing affiliations than among subjects with different affiliations (Chen and Li, 2009).

4 Results

The experiment was conducted at our University's experimental economics laboratory using subjects recruited from the undergraduate student body. The decision-making rounds were programmed in z-Tree (Fischbacher, 2007) and occurred over a computer network. Nine sessions were conducted using a total of 108 subjects; there were three sessions of each of the three treatments. Sessions lasted about 75 minutes and average earnings were \$18.90 with a standard deviation of \$3.44. The minimum earnings were \$8.67 and the maximum was \$29.33.

The 108 subjects each made twelve contribution decisions, for a total of 1,296 observations. Mean contributions in each round are plotted by treatment in Figure 1.

Insert Figure 1 here.

The downward trend is a common finding in repeated public good games and is well-documented in the literature.⁸ Overall, the mean contributions in Treatments 1, 2 and 3 are 3.95, 3.26 and 1.80. Wilcoxon ranksum tests making pair-wise comparisons between treatments suggest that contributions are higher in Treatment 1 than in Treatment 2 ($p = 0.03$, two-sided test) and higher in Treatment 2 than in Treatment 3 ($p < 0.01$).⁹ This supports Hypothesis 1, that aggregate contributions are decreasing in polarization, since polarization is highest in Treatment 3, followed by Treatments 2 and then 1.

Differences across treatments are partly because of high contributions from majority members (type 4 and 5 subjects). However, the contributions of minority members (type 1 and 2 subjects) are also higher than those of the type 3 subjects in Treatment 3 (Wilcoxon $p = 0.01$ and $p < 0.01$). Mean contributions in each round are plotted by subject type in Figure 2.

Insert Figure 2 here.

The mean contributions of subject types 1, 2, 3, 4 and 5 are 2.65, 2.64, 1.80, 3.57 and 4.21. Comparisons between subject types in the same treatment examine the effect of subject type, controlling for the amount of polarization within the group. In Treatment 1, the contributions of type 5 subjects are higher than those of type 1 subjects (Wilcoxon $p < 0.01$) and in Treatment 2, the contributions of type 4 subjects are higher than those of type 2 subjects ($p < 0.01$). Both results support Hypothesis 2, that individual contributions are increasing in subject type.

Considering the role of beliefs is important for understanding differences across treatments and subject types. Figures 3 and 4 plot contributions on same-team and other-team beliefs, where the size of each bubble is proportional to the number of observations with that set of coordinates.

⁸See Ledyard (1995) for a survey.

⁹All Wilcoxon p-values are for two-sided tests. The difference between Treatments 1 and 3 is also significant at 1%.

Insert Figures 3 and 4 here.

Contributions and same-team beliefs have a correlation of 0.72, with many observations lying on or near the 45° line. The correlation between contributions and other-team beliefs is lower (0.29), but is still indicative of a positive relationship. The correlations are consistent with Hypothesis 3, that individual contributions are increasing in same-team beliefs, and to a lesser degree, in other-team beliefs.

Regression analysis estimates the effects of beliefs. The contribution of each subject in each round is regressed on subject type dummy variables, the round and beliefs about the average contributions of other group members from the same team and from the other team.¹⁰ The cross-sectional time series model is estimated using feasible generalized least squares, accounting for heteroskedasticity between subjects and the autoregressive nature of the multiple observations obtained from each subject. The regression constant is suppressed and an intercept is estimated for each subject type. The results are reported in Table 1.

Insert Table 1 here.

Specification (1) regresses contributions on subject type dummies and the round, omitting beliefs. The coefficients for the subject type dummies are decreasing and then increasing in subject type, suggesting a nonlinear relationship between subject type and contributions. An F-test of the null hypothesis that the five subject type coefficients are equal is significant at 1%, indicating that subject type has an important effect on contributions. Repetition decreases contributions by 0.20 in each round; the negative effect is consistent with previous results in the literature.¹¹

¹⁰The subject type dummies capture the effects of polarization and subject type. Independently identifying each effect requires imposing additional structure on the model, such as assuming contributions are linear in polarization and subject type.

¹¹See Ledyard (1995).

Specification (2) adds beliefs about the contributions of other group members from the same team and from the other team. The observations from type 1 subjects are omitted because they have no same-team beliefs. Controlling for beliefs, the effect of subject type remains significant (F-test $p < 0.01$). However, the subject type coefficients now range by 0.74, compared to 2.35 in specification (1). In addition, the effect of the round is diminished, suggesting that the large effects of subject type and repetition estimated in specification (1) are largely from an omitted variable bias. The coefficient on same-team beliefs indicates that each unit increase in same-team beliefs is associated with contributions increasing by 0.88. Other-team beliefs have a much smaller effect. The results support Hypothesis 3, that contributions are increasing in same-team beliefs, and to a lesser degree, in other team beliefs.

Specification (3) adds the square of same-team beliefs, finding a positive effect. The effect of same-team beliefs remains positive and highly significant, emphasizing the strong relationship between contributions and same-team beliefs.

A similar regression including interaction terms created by multiplying each of the subject type dummies by the round, and same-team and other-team beliefs determines if the effects of repetition and beliefs are the same across subject types. The results are given in Table 2.

Insert Table 2 here.

In this regression, there is no evidence that subject type significantly affects contributions. An F-test of the null hypothesis that the constants estimated for each subject type are equal is not statistically significant ($p = 0.72$). Likewise, the round coefficients suggest that the effect of repetition is similar across subject types ($p = 0.78$). The effect of same-team beliefs is positive and highly significant for all subject types. However, the estimated coefficients are increasing in subject type and an F-test ($p < 0.01$)

provides evidence that the effect is not equal across types. In contrast, the effect of other-team beliefs is decreasing in subject type. For minority members (type 1 and 2 subjects), contributions are positively related to other-team beliefs, whereas for majority members (type 4 and 5 subjects), the relationship is not significant. An F-test for differences in the effect of other-team beliefs across subject types is significant at 1%. The results of this regression are also consistent with Hypothesis 3, that contributions are increasing in same-team beliefs, and to a lesser degree, in other-team beliefs.

Adding interaction terms between each of the subject type dummies and the square of same-team beliefs finds that the nonlinear effect of same-team beliefs is significant only for type 5 subjects, for whom the effect is positive.

We now focus on beliefs. Same-team beliefs are regressed on subject type dummy variables, the round and the contributions of other group members in previous rounds.¹²

The results are reported in Table 3.

Insert Table 3 here.

Specification (1) regresses same-team beliefs on subject type dummies and the round without including contributions from previous rounds. The subject type coefficients indicate that subject type has a significant effect on same-team beliefs (F-test $p < 0.01$), while repetition decreases same-team beliefs by 0.24 in each round.

Specification (2) incorporates contributions from the previous round. The variable act_{-1} is the average contribution of other group members in the previous round of the subject's current type. The variable $acot_{-1}$ is the average contribution of other group members in the previous round of the type other than the subject's current type.¹³ For example, suppose a subject is type 4 in round 8 and had been type 2 in round 7. In

¹²Observations from type 1 subjects are once again omitted because they had no same-team beliefs.

¹³Recall that subjects knew act_{-1} and $acot_{-1}$ because they were informed of the average contributions of their other group members from the same team and from the other team at the end of each round.

round 8, act_{-1} is the average contribution of the subject's type 4 group members in round 7 and $acot_{-1}$ is the contribution of the other type 2 member in round 7.

Including act_{-1} and $acot_{-1}$, the differences in the subject type coefficients remain significant ($p < 0.01$). However, the round has a smaller effect, indicating that the repetition effect in specification (1) may be biased by the omission of previous contributions. The coefficients on act_{-1} and $acot_{-1}$ suggest that subjects believe others make contributions increasing in the contributions of previous subjects of the same type, and that the contributions of previous subjects of the other type have a much smaller effect.

A second lag of the variable $acot$ is not statistically significant. However, additional lags of the variable act improve the model's fit. With the additional lags of act included in specification (3), the significance of the differences between the subject type coefficients decreases ($p = 0.05$) and the coefficients now range by 0.26, compared to 1.18 in specification (2) and 1.84 in specification (1). Finally, the round is no longer significant, suggesting that after sufficient experience, same-team beliefs are related mainly to the contributions of previous subjects of the same type.

The analysis of other-team beliefs is similar. Without including previous contributions, differences between the subject type coefficients are highly significant and the round has a negative effect. Including previous contributions, other-team beliefs are primarily a function of the contributions of previous subjects of the same type; the significance of the differences between subject type coefficients is diminished, as is the effect of the round.

5 Conclusions

In this paper, we examine how identity affects conditional cooperation in a repeated VCM linear public good game. Identity was created using a team-building activity

and subjects were assigned to groups consisting of a varying number of subjects from each team. In addition to making contribution decisions, subjects reported their beliefs about the contributions of other subjects from their team and from the other team.

Primary findings are that cooperation was decreasing in polarization and majority members cooperated more than minority members. However, behavior was mainly related to beliefs about the actions of others. In particular, contributions were increasing in beliefs about the contributions of other group members from the same team. The contributions of minority members were also increasing in their beliefs about the contributions of majority members, but there was no significant relationship between the contributions of majority members and their beliefs about the minority. This suggests that while conditional cooperation was strong among subjects sharing affiliations, conditional cooperation among subjects with different affiliations depended on status within the group. Beliefs about the contributions of others were mainly a function of the contributions of previous subjects of the same type.

The results have important implications for policy. First, people are more likely to cooperate in their community if they identify with a majority of the residents. Disenfranchised individuals do not have the same incentives for cooperation and this can reduce their participation in the provision of public goods. Second, insofar as beliefs about the actions of others might affect behavior, it is the choices of similar individuals influencing the decisions people make. Thus, public campaigns aimed at increasing cooperation such as volunteering and charitable giving have potential for being successful. The key is emphasizing the positive choices of people with whom the target audience relates. For example, promoting the volunteering of young people is a good way of encouraging other young people to volunteer. Alternatively, middle-aged adults will be more likely to recycle if they believe their peers are doing the same.

Finally, the strong relationship between cooperation and beliefs about the coopera-

tion of others with the same affiliation highlights the importance of building a common identity within organizations (Akerlof and Kranton, 2005). When people perceive themselves as members of the same social group, the effect of a small amount of additional cooperation can propagate, inducing a norm of increased cooperation throughout the organization.

References

- Akerlof, G. and R. Kranton (2000).** “Economics and Identity.” *Quarterly Journal of Economics*, 115(3), 715-753.
- Akerlof, G. and R. Kranton (2005).** “Identity and the Economics of Organizations.” *Journal of Economic Perspectives*, 19(1), 9-32.
- Alesina, A., Baqir, R. and W. Easterly (1999).** “Public Goods and Ethnic Divisions.” *Quarterly Journal of Economics*, 114(4), 1243-1284.
- Alesina, A. and E. La Ferrara (2000).** “Participation in Heterogeneous Communities.” *Quarterly Journal of Economics*, 115(3), 847-904.
- Alesina, A. and E. La Ferrara (2002).** “Who Trusts Others?” *Journal of Public Economics*, 85(2), 207-234.
- Anderson, L., Mellor, J. and J. Milyo (2008).** “Inequality and Public Good Provision: An Experimental Analysis.” *Journal of Socio-Economics*, 37(3), 1010-1028.
- Andreoni, J. (1988).** “Why Free Ride? Strategies and Learning in Public Goods Experiments.” *Journal of Public Economics*, 37(3), 291-304.
- Andreoni, J. (1995).** “Cooperation in Public Goods Experiments: Kindness or Confusion?” *American Economic Review*, 85(4), 891-904.
- Andreoni, J. and R. Croson (2008).** “Partners versus Strangers: Random Rematching in Public Goods Experiments.” In C. Plott and V. Smith, *Handbook of Experimental Economics Results*. North-Holland, Amsterdam, Netherlands.
- Becker, G. (1974).** “A Theory of Social Interaction.” *Journal of Political Economy*, 82(6), 1063-1093.
- Bernhard, H., Fehr, E. and U. Fischbacher (2006).** “Group Affiliation and Altruistic Norm Enforcement.” *American Economic Review*, 96(2), 217-221.
- Brewer, M. (1979).** “In-group Bias in the Minimal Intergroup Situation: A Cognitive-motivational Analysis.” *Psychological Bulletin*, 86(2), 307-324.

- Buckley, E. and R. Croson (2006).** “Income and Wealth Heterogeneity in the Voluntary Provision of Linear Public Goods.” *Journal of Public Economics*, 90(4), 935-955.
- Castro, M. (2006).** “Where are you from? Cultural Differences in Public Good Experiments.” University of London Discussion Paper 2006-03.
- Chan, K., Mestelman, S., Moir, R. and A. Muller (1996).** “The Voluntary Provision of Public Goods under Varying Income Distributions.” *Canadian Journal of Economics*, 29(1), 54-69.
- Chen, Y. and S. Li (2009).** “Group Identity and Social Preferences.” *American Economic Review*, 99(1), 431-457.
- Cherry, T., Kroll, S. and J. Shogren (2005).** “The Impact of Endowment Heterogeneity and Origin on Public Good Contributions: Evidence from the Lab.” *Journal of Economic Behavior and Organization*, 57(3), 357-365.
- Clark, J. and B. Kim (2009).** “The Effect of Social Diversity on Volunteering: Evidence from New Zealand.” University of Canterbury Working Paper.
- Croson, R. (2007).** “Theories of Commitment, Altruism and Reciprocity: Evidence from Linear Public Good Games.” *Economic Inquiry*, 45(2), 199-216.
- Dufwenberg, M. and G. Kirchsteiger (2004).** “A Theory of Sequential Reciprocity.” *Games and Economic Behavior*, 47(2), 268-298.
- Eckel, C. and P. Grossman (2005).** “Managing Diversity by Creating Team Identity.” *Journal of Economic Behavior and Organization*, 58(3), 371-392.
- Fischbacher, U. (2007).** “z-Tree: Zurich Toolbox for Ready-made Economic Experiments.” *Experimental Economics*, 10(2), 171-178.
- Fischbacher, U. and S. Gächter (2006).** “Heterogeneous Social Preferences and the Dynamics of Free Riding in Public Goods.” CeDex Discussion Paper 2006-01.
- Fischbacher, U., Gächter, S. and E. Fehr (2001).** “Are People Conditionally

Cooperative? Evidence from a Public Goods Experiment.” *Economics Letters*, 71(3), 397-404.

Fisher, J., Isaac, R., Schatzberg, J. and M. Walker (1995). “Heterogeneous Demand for Public Goods: Behavior in the Voluntary Contributions Mechanism.” *Public Choice*, 85(3), 249-266.

Glaeser, E., Laibson, D. and B. Sacerdote (2002). “An Economic Approach to Social Capital.” *Economic Journal*, 112(483), 437-458.

Goette, L., Huffman, D. and S. Meier (2006). “The Impact of Group Membership on Cooperation and Norm Enforcement: Evidence Using Random Assignment to Real Social Groups.” *American Economic Review*, 96(2), 212-216.

Isaac, R., Walker, J. and S. Thomas (1984). “Divergent Evidence on Free Riding: An Experimental Examination of Some Possible Explanations.” *Public Choice*, 43(2), 113-149.

Knack S. and P. Keefer (1997). “Does Social Capital Have an Economic Payoff? A Cross-Country Investigation.” *Quarterly Journal of Economics*, 112(4), 1251-1288.

Ledyard, J. (1995). “Public Goods Experiments.” In J. Kagel and A. Roth, *Handbook of Experimental Economics*. Princeton University Press, Princeton, NJ.

Manski, C. (1993). “Identification of Endogenous Social Effects: The Reflection Problem.” *Review of Economic Studies*, 60, 531-542.

Manski, C. (2000). “Economic Analysis of Social Interactions.” *Journal of Economic Perspectives*, 14(3), 115-136.

McLeish, K. and R. Oxbury (2007). “Identity, Cooperation, and Punishment.” University of Calgary Working Paper.

Miguel, E. and M. Gugerty (2005). “Ethnic Diversity, Social Sanctions, and Public Goods in Kenya.” *Journal of Public Economics*, 89(11), 2325-2368.

Montalvo, J. and M. Reynal-Querol (2005). “Ethnic Polarization, Potential

Conflict, and Civil Wars.” *American Economic Review*, 95(3), 796-816.

Oxoby, R. and J. Spraggon (2006). “A Clear and Present Minority: Heterogeneity in the Source of Endowments and the Provision of Public Goods.” University of Calgary Working Paper.

Putnam, R. (2000). *Bowling Alone: The Collapse and Revival of American Community*. Simon & Schuster, New York, NY.

Rabin, M. (1993). “Incorporating Fairness into Game Theory and Economics.” *American Economic Review*, 83(5), 1281-1302.

Reynal-Querol, M. (2002). “Ethnicity, Political Systems, and Civil Wars.” *Journal of Conflict Resolution*, 46(1), 29-54.

Ruffle, B. and R. Sosis (2006). “Cooperation and the In-group-Out-group Bias: A Field Test on Israeli Kibbutz Members and City Residents.” *Journal of Economic Behavior and Organization*, 60(2), 147-163.

Smith, A. (2010). “Who Cooperates with Whom? Evidence from Volunteering in Heterogeneous Communities.” University of Calgary Working Paper.

Tajfel, H. and J. Turner (1979). “An Integrative Theory of Intergroup Conflict.” In S. Worchel and W. Austin, *The Social Psychology of Intergroup Relations*. Brooks/Cole, Monterey, CA.

Vigdor, J. (2004). “Community Composition and Collective Action: Analyzing Initial Mail Response to the 2000 Census.” *Review of Economics and Statistics*, 86(1), 303-312.

Zak, P. and S. Knack (2001). “Trust and Growth.” *Economic Journal*, 111(470), 295-321.

Table 1: Regression of Contributions

Variable	(1)	(2)	(3)
<i>type1</i>	3.89*** (0.25)	-	-
<i>type2</i>	4.03*** (0.17)	0.14 (0.18)	0.73*** (0.20)
<i>type3</i>	2.69*** (0.15)	-0.38** (0.16)	0.12 (0.18)
<i>type4</i>	4.43*** (0.16)	0.05 (0.17)	0.69*** (0.21)
<i>type5</i>	5.04*** (0.19)	0.36* (0.21)	0.91*** (0.22)
<i>round</i>	-0.20*** (0.02)	-0.03* (0.01)	-0.04*** (0.01)
<i>belief_{st}</i>	-	0.88*** (0.02)	0.55*** (0.06)
<i>belief_{st}²</i>	-	-	0.03*** (0.01)
<i>belief_{ot}</i>	-	0.05* (0.03)	0.06*** (0.02)
<i>N</i>	1296	1224	1224
χ^2	1686	6200	6789

***, **, *: Significance at 1%, 5% and 10%.

Table 2: Regression of Contributions

Variable	Subject Type				
	1	2	3	4	5
<i>round</i>	-0.09 (0.06)	-0.01 (0.03)	-0.03 (0.03)	-0.03 (0.02)	-0.04 (0.03)
<i>belief_{st}</i>	-	0.78*** (0.07)	0.54*** (0.06)	0.97*** (0.05)	0.96*** (0.04)
<i>belief_{ot}</i>	0.72*** (0.11)	0.14** (0.07)	0.16** (0.06)	0.06 (0.07)	-0.02 (0.05)
<i>constant</i>	0.57 (0.73)	-0.05 (0.37)	0.14 (0.28)	-0.31 (0.30)	0.16 (0.38)
<i>N</i>	1296				
χ^2	4772				

***, **: Significance at 1% and 5%.

Table 3: Regression of Same-Team Beliefs

Variable	(1)	(2)	(3)
<i>type2</i>	4.52*** (0.16)	2.77*** (0.18)	0.24 (0.20)
<i>type3</i>	3.79*** (0.12)	2.31*** (0.14)	0.10 (0.16)
<i>type4</i>	5.02*** (0.15)	3.11*** (0.17)	0.17 (0.20)
<i>type5</i>	5.63*** (0.17)	3.49*** (0.18)	0.36* (0.21)
<i>round</i>	-0.24*** (0.01)	-0.14*** (0.01)	0.02 (0.01)
<i>act₋₁</i>	- -	0.35*** (0.02)	0.29*** (0.02)
<i>acot₋₁</i>	- -	0.06*** (0.02)	0.05*** (0.01)
<i>act₋₂</i>	- -	- -	0.24*** (0.02)
<i>act₋₃</i>	- -	- -	0.18*** (0.02)
<i>act₋₄</i>	- -	- -	0.12*** (0.02)
<i>N</i>	1224	1122	816
χ^2	2905	5318	5881

***, *: Significance at 1% and 10%.

Figure 1: Mean Contributions (By Treatment)

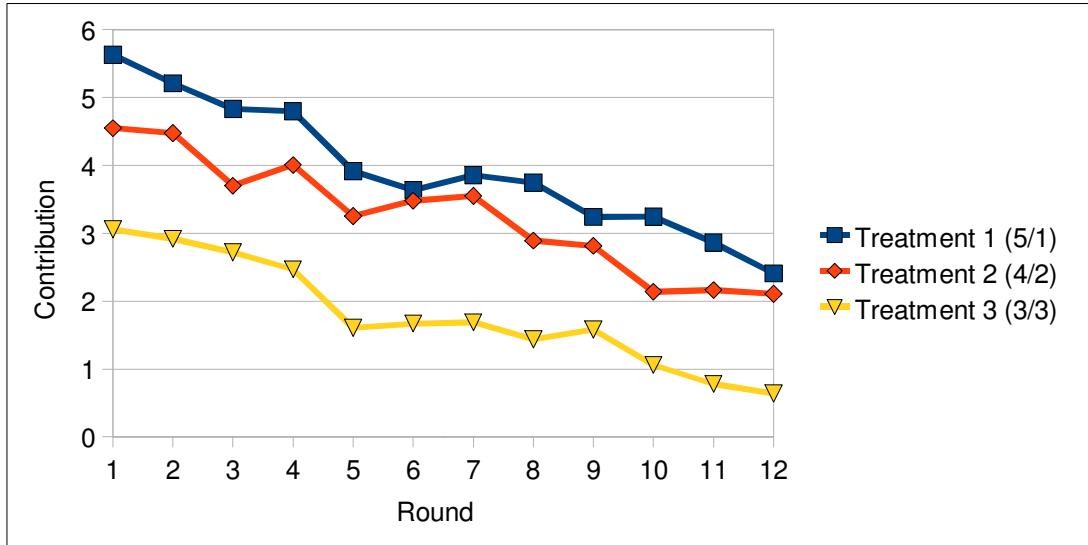


Figure 2: Mean Contributions (By Subject Type)

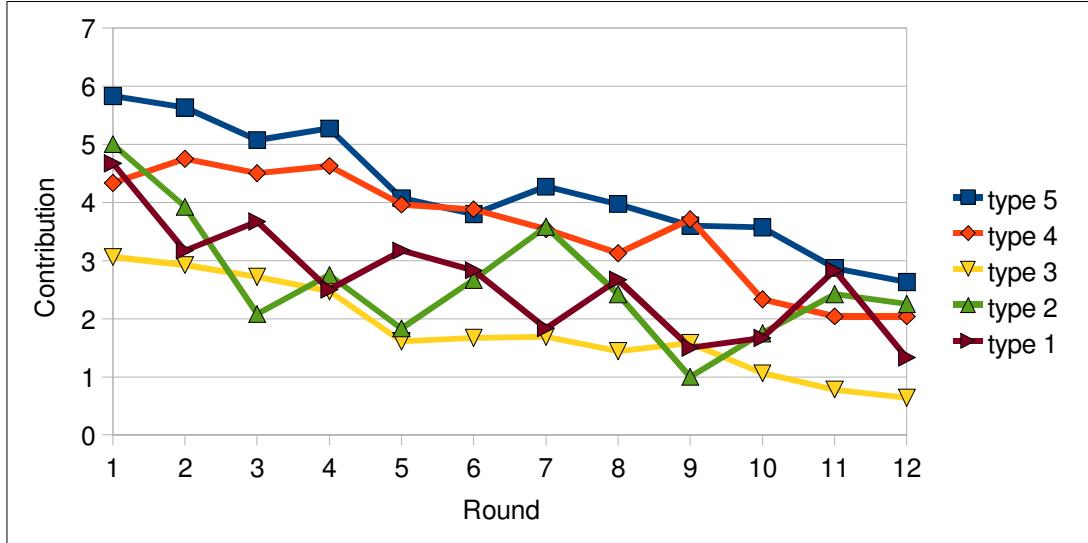


Figure 3: Scatterplot of Contributions on Same-Team Beliefs

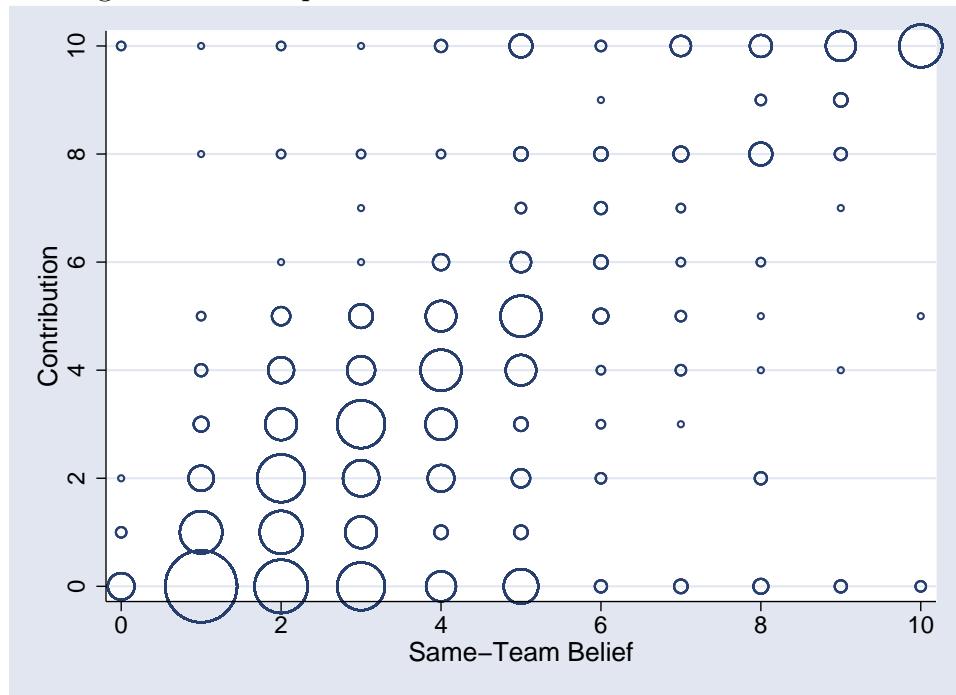


Figure 4: Scatterplot of Contributions on Other-Team Beliefs

