Group identity and gender in public goods experiments

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Abstract

This paper explores the effects of group identity and gender in a public goods experiment. We compare the behavior of participants who can be expected to have a pre-existing sense of group identity to that of randomly selected participants, and to that of participants who have undertaken community-building pre-experiment activities. While statistically significant differences were observed, our results suggest that the effects of group identity and gender on behavior are complicated, involving the nature of the groups involved. In particular, the claim that women are less likely to free-ride on others with whom they have a relationship is not supported. © 2002 Elsevier Science B.V. All rights reserved.

1. Introduction

Neoclassical economic theory makes a clear prediction about voluntary contribution to the provision of a pure public good. *Homo economicus*, recognizing that he will profit from the total group contribution whether he contributes or not, and recognizing that any contribution he might make has little impact on the total, will "free-ride" on the contributions of others. The public goods setting lends itself readily to experimental research, and a rich experimental literature exists, addressing such issues as the number of players and their experience, the return on contributions to the public good, the number of repetitions of the experiment, and whether the players repeat the experiment with the same partners

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or randomly assigned partners.[1] As a general result, free-riding is neither pervasive nor non-existent in experimental settings. It tends to occur more frequently in later rounds when the experiment is repeated, and when players are randomly mixed after each round, but rarely approaches the complete non-contribution that theory predicts.

Recent feminist re-examinations of economic theory by Ferber (1995), Nelson (1995), and Strober (1994) which criticize the rational self-interest model of human behavior as influenced by male bias have led experimental economists to investigate the possibility that the gender of participants affects their willingness to contribute voluntarily to a public good. The results of these tests have been mixed. Brown-Kruse and Hummels (1993) find that women free-ride more, not less, than men. On the other hand, Nowell and Tinkler (1994) find that all-female groups free-ride less than all-male groups. In between, finding little or no gender difference in contribution or free-riding, are Isaac et al. (1985), Stockard et al. (1988), and Cadsby and Maynes (1998).[2]

Interpreting the feminist critique as implying that men and women will behave differently as a general matter is overly simplistic. In point of fact, the feminist critics of neoclassical economics do not argue that *homo economicus* is a model of men's behavior, and that women's behavior is best modeled by *femina economica* (to use Nelson's term). On the contrary, most argue that on average both men and women share aspects of selfishness and altruism and of competitiveness and cooperation. They criticize instead the restriction of economic theory to the autonomous utility-maximizing agent of neoclassical theory, who is dependent on no one but himself, responsible for no one but himself, and relates with others only through arm's length contractual transactions with no regard for the consequences for anyone but himself. In its place, they urge the adoption of a sociological view in which gender is socially constructed.[3] In this view, all people are socialized into families and other groups, are connected to others through webs of social relations, and have concerns about fairness, care and responsibility. Hence, people's actions can be expected to reflect their concerns for others to the extent they feel related to them through social networks or by group identity, and sex-based differences in socialization can potentially lead men and women to respond differently to the same situation.

This view of the feminist critique implies that some form of group identity or community might decrease free-riding in public goods environments, and that this effect might differ by gender. Several experiments have attempted to test these hypotheses. Orbell et al. (1988) performed an experiment in which some groups were told that their contributions to the social endeavor would provide a reward to themselves, while others were told that the reward would go to a similar experimental group in another location. Contributions were found to be nearly twice as likely when the reward was received by the group participants than when it was given to others. Brown-Kruse and Hummels tried to create a sense of community in some groups through pre-experiment activity, by having the participants work together as a group to complete a questionnaire that required them to learn something about each other (e.g. academic interests, favorite flavor of ice cream, best movie seen recently), a

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[1] Much of this literature is reviewed by Ledyard (1995).

[2] See also the references in Ledyard, and Ball and Cech (1996).

[3] This point is made most explicitly by Nelson. For a review of the relevent sociological leterature, see Wiley (1995).

procedure that was also followed by Cadsby and Maynes. In the former experiments, men who took part in the community-building activity contributed more than those who did not participate, while there was no such effect for women. In the latter experiments, the only effect of the community-building activity was to decrease the contributions by women in the initial round of the experiment. Cadsby and Maynes attribute this to the fact that women participants did not appear to enjoy the activity (unlike the men), and they express doubt that the instrument succeeded in creating a sense of community. Cadsby and Maynes did note that their women subjects converged on the equilibrium more rapidly and more tightly than do men. They view this as supportive of the notion that women react to the persons they are interacting with more than men, who pursue their strategies with less regard for the actions of others.

An obvious difficulty with these approaches is that, realistically, neither pre-experiment activities nor other variations in experimental design can be expected to produce the sort of relationships that feminist economists believe affects behavior. For example, Baron and Byrne (1987, p. 378, numbering added) offer a typical social psychology definition of a social group as "two or more persons engaged in social interaction who (1) have some stable, structured relationship to one another, (2) are interdependent, (3) share common goals, and (4) perceive that they are, in fact, part of a group". A set of experiment participants, typically selected from the undergraduate population of the author's university, cannot generally be expected to have a stable, structured relationship, be interdependent (outside the experiment) or share commons goals (other than very diffuse ones, e.g. get good grades or a good job). At best, pre-experiment activities might be expected to produce some perception among participants that they are part of a group, although even that is likely to be fleeting.

If there is one thing that is common on college and university campuses, it is social groups. Students typically have the opportunity to join any number of organizations that share common interests and goals, from the Pre-Medical Society to the Japanese Cultural Association. It is a bit surprising that no one has taken advantage of the existence of these groups to explore the effects of group identity and gender in public goods experiments. In this paper, we do that by comparing the behavior of participants who are members of a true group in the sense described above to that of randomly selected participants and participants who have undertaken pre-experiment activities.

2. Experimental design

2.1. The experimental setting

The experimental setting was a standard public goods experiment, similar to that of Andreoni (1995). Since one focus is the effect of the subjects' gender on their behavior, we wanted to avoid utilizing single-gender groups of subjects, which might signal to the subjects that gender was a subject of study and lead them to alter their behavior. [4] Thus, each session involved 10 or 15 subjects, roughly half male and half female, which constituted

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[4] For more on this and other forms of "expectancy bias", see Cech and Ball.

either two or three experimental groups of five subjects each.[5] The subjects were told that they would be interacting with four other students and that the composition of their group would remain the same for the entire session, but were assured that at no point in the experiment would the identities of the other members of the group be made known to them, nor would their identity be made known to the others.[6] In addition, the subjects interacted through networked computer terminals[7] and were separated by dividers, further ensuring that no subject was aware of the identities or genders of the rest of their group.

The instructions informed the subjects that the experiment would consist of ten rounds. In each round, each subject received an endowment of 60 tokens to be divided between two investment opportunities, labeled the 'individual account' and the 'group account', representing the private and public goods, respectively. Each token placed in the individual account earned a one cent reward to the subject investing it, while each token invested in the group account earned a reward of one half of a cent reward to each member of their group (including themselves), regardless of who invested it. Thus, the Nash equilibrium is for each participant to invest his or her entire endowment in the individual account. At the end of each round, the computer software reported to each group member the total contribution to the group account and their own earnings from both accounts, but not the investment decisions or earnings of the other group members. Subjects were paid confidentially and in cash at the conclusion of the session, which typically lasted less than an hour.

2.2. Subject selection

Subjects were selected from two populations. The first were randomly selected from a larger subject pool of undergraduates at the University of Iowa who had volunteered to take part in experiments generally. Half of these were used to create the "strangers" groups, who as a general matter did not know each other.[8]

The remaining subjects selected from this pool were used to test the effect of pre-experiment community-building activities. We asked each session of these subjects to complete a questionnaire similar to that of Brown-Kruse and Hummels. This asked them to work together as a group to list their five favorite athletic activities, best books read lately, favorite flavors of ice cream, best movie seen lately, and hobbies or other special interests. These subjects comprise the "questionnaire" groups.

The second group of subjects was recruited from the University of Iowa Hawkeye Marching Band. We chose this organization for several reasons. First, it fits the definition of a true social group. With a history that stretches back over 100 years, the band is a stable

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[5] In each case, 17 or 18 subjects were recruited to increase the probability that 15 subjects were available. On two occasions, fewer than 15 subjects were available, and only two groups of five could be run. Extra subjects were paid five dollars for their time and trouble, and were invited to take part in a subsequent session.

[6] The set of experimental instructions is available from the authors on request.

[7] The experiments were run using the Voluntary Contribution Mechanism software available from the Economics Science Laboratory at the University of Arizona.

[8] We cannot rule out altogether the possibility that some of the subjects in the 'strangers' sessions already knew each other, but we made efforts to avoid thus. Thus, for example, when one subject asked whether his girlfriend could also take part, he was told that his session was already full, but that she was welcome to volunteer for another session.

organization. It is organized (by instrument type) into sections and within each section into smaller "squads", with a student leadership hierarchy that matches this structure. Its members share the common goals of providing musical support to the university's athletic teams and entertainment to their fans, and their success at accomplishing these goals depends on the coordinated interaction of the group. Additionally, band members identify themselves as such, and exhibit the cohesiveness expected of a social group, often socializing together, sharing living quarters, and not infrequently dating and even marrying other band members. Second, its members represent a fairly broad cross-section of the student population. Aside from their interest in the band itself, they do not differ greatly from the general student body in terms of their ethnicity, state of residence, choices of academic major, and so forth. Finally, this group is large enough to provide sufficient numbers of both male and female volunteers. These subjects comprise the "community" groups.

3. Results

Table 1 presents the average contributions of all the participants in each round and in total, broken down by gender, by group, and by group within each gender. Combining all groups, males contributed more than females in every round. Assuming each round for males and females to be independent draws from the same distributions, a *t*-test rejects the hypothesis that the mean contributions of males and females are equal at beyond the 1% level.

Combining both genders, the community subjects contribute more on average than either the strangers or the questionnaire subjects in every round but one, while the strangers contribute more on average than the questionnaire subjects in six of the ten rounds and less on average in four of six rounds. Treating the rounds as independent draws from the same distributions, the hypothesis that the mean contribution of the community subjects is equal to that of the strangers is rejected by a *t*-test at the 5% level, as is the hypothesis that the mean contribution of the community subjects is equal to that of the questionnaire subjects. The hypothesis that the mean contribution of the strangers is equal to that of the questionnaire subjects, however, cannot be rejected at the 10% level.

A comparison of the contributions of each subject gender broken down by groups suggests that the differences noted above arise largely from the behavior of the male community subjects. The community males contribute more on average than either the strangers males or the questionnaire males in every round but one, while the strangers males and questionnaire males behave similarly until the last two rounds. The hypothesis that the mean contribution of the community males is equal to that of the strangers males is rejected by a *t*-test at the 1% level, as is the hypothesis that the mean contribution of the community males is equal to that of the questionnaire males, but the hypothesis that the mean contribution of the strangers males is equal to that of the questionnaire males cannot be rejected at the 10% level. Conversely, pairwise comparisons of the mean contributions of the community, strangers, and questionnaire females reveal no significant differences at the 10% level.

An examination of Table 1 reveals a tendency for average contributions to decline with each successive round of the experiment. This is a common phenomenon in public goods experiments, and is typically attributed to either learning or strategic behavior on the part of the subjects (see, e.g. Andreoni (1988)). It calls into question, however, the assumption

Table 1
Average contributions per round, by gender, group, and group within gender

	Rd. 1	Rd. 2	Rd. 3	Rd. 4	Rd. 5	Rd. 6	Rd. 7	Rd. 8	Rd. 9	Rd. 10	Total
All groups											
Males ($N = 61$)	39.31	43.69	44.15	42.87	37.52	39.20	43.43	37.54	34.54	33.56	395.80
Females ($N = 64$)	32.80	41.06	41.80	40.05	36.92	36.16	35.41	34.70	33.50	30.06	362.45
Both genders											
Strangers ($N = 45$)	34.27	40.67	44.89	42.02	37.33	35.20	39.87	37.98	35.53	28.27	376.02
Questionnaire ($N = 40$)	37.28	40.90	38.20	39.50	37.25	36.75	37.25	31.50	28.35	28.33	355.30
Community ($N = 40$)	36.60	45.68	45.50	42.68	37.05	41.28	40.78	38.55	37.95	39.15	405.20
Males											
Strangers ($N = 23$)	37.48	41.30	45.87	42.91	38.22	35.83	42.39	36.96	34.91	33.17	389.04
Questionnaire ($N = 19$)	39.63	42.47	38.58	42.11	37.05	38.42	41.21	30.53	24.21	26.63	360.84
Community ($N = 19$)	41.21	47.79	47.63	43.58	37.16	44.05	46.89	45.26	44.42	40.95	438.95
Females											
Strangers ($N = 22$)	30.91	40.00	43.86	41.09	36.41	34.55	37.23	39.05	36.18	23.14	362.41
Questionnaire ($N = 21$)	35.14	39.48	37.86	37.14	37.43	35.24	33.67	32.38	32.10	29.86	350.29
Community ($N = 21$)	32.43	43.76	43.57	41.86	36.95	38.76	35.24	32.48	32.10	37.52	374.67

Table 2
Regression results: strangers, questionnaire, and community[a]

Independent variable	Coefficient	Standard error
Dependent variable: contribution		
Constant	49.77	2.51**
Round	−1.14	0.29**
Gender	−4.56	2.75*
M-community	6.85	2.91**
F-community	1.33	2.77
M-questionnaire	−4.70	2.89
F-questionnaire	−2.09	2.76

[a] $N = 1250$.
* Significant at 10% level.
** Significant at 5% level.

that each round represents an independent draw from the same distribution. Hence, Table 2 contains the results of a regression based on the results of the experiments. The dependent variable in the regression is the contribution of the ith subject in the tth round, and the independent variables are an index for the round of play, a dummy variable for gender (one if subject i is female, zero if male), and additional dummy variables for community males, community females, questionnaire males and questionnaire females (one if subject i fits the category, zero if not). Because the possible contribution levels are bounded by 0 and 60, the dependent variable is censored and ordinary least squares will yield biased estimates. In the data, about 7% (91 of 1250) of the observed contributions were zero and about 26% (322 of 1250) were 60. Hence, the results presented in Table 2 were estimated using a two-sided Tobit model.

The regression results generally parallel the pairwise comparisons. The decline in contributions as the experiment progresses is confirmed; the coefficient on 'round' is negative and significant at the 5% level. Male strangers contribute approximately 12% more than female strangers (evaluated at the 10th round), and the effect is marginally significant. Male community subjects contribute nearly 18% more than male strangers (again evaluated at the 10th round) and the effect is statistically significant at the 5% level. While female community subjects also gave more than female strangers by a smaller amount (about 4%), the effect was not statistically significant. The estimated effect of the questionnaire is to lower contributions, but there is no significant difference between the contributions of male questionnaire subjects and male strangers or between female questionnaire subjects and female strangers.

4. A postscript and conclusions

Untangling the links between group identity, gender, and economic behavior may be more complex than simply comparing gender differences amongst group members and nonmembers. At the end of the experiment, we ran one last session, with eight women who belong to the same sorority and seven men who belong to the same fraternity as subjects.

Table 3
Regression results: strangers, questionnaire, community and Greek[a]

Independent variable	Coefficient	Standard error
Dependent variable: contribution		
Constant	49.28	2.38**
Round	−1.09	0.26**
Gender	−4.48	2.66*
M-community	6.78	2.81**
F-community	1.32	2.68
M-questionnaire	−4.62	2.80
F-questionnaire	−2.05	2.68
M-Greek	−19.53	3.84**
F-Greek	−13.75	3.59**

[a] $N = 1400$.
* Significant at 10% level.
** Significant at 5% level.

Moreover, we chose a sorority and fraternity that often socialize together. Since fraternities and sororities are social groups that specially emphasize their group identity and their philanthropic activities, we expected these subjects to contribute more than strangers. In fact, exactly the opposite occurred. As Table 3 shows, the members of the fraternity/sorority group contributed less than did their counterparts in the strangers groups, by large and statistically significant amounts. This effect is stronger for males.

It seems that gender and membership in a social group are not enough to predict a difference in behavior; members of different groups behave differently. One possible explanation for this is a self-selection bias. Membership in social groups is largely endogenous, based on characteristics of the people involved. If fraternities and sororities attract students who are more competitive than the typical student, while the band attracts students who are more cooperative than the typical student, we would expect to see these differences reflected in the experimental results. [9]

Stereotypes about fraternity and sorority members abound, but there is little hard evidence on how they differ from the general student population along the competitiveness-cooperativeness dimension. [10] Even less is known about band members (or members of other groups generally). One approach to controlling for these differences would be to assess subjects' competitiveness directly. Modern psychology places competitiveness and cooperativeness at opposite ends of the "agreeableness" dimension of the Five Factors Model of personality, which can be measured using the NEO Personality Inventory of Costa and McCrae (1992) or the Personal Characteristics Inventory of Mount and Barrick (1995).

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[9] We do know that 87% of our fraternity/sorority subjects were business, pre-business or economics majors, but 79% of the volunteer pool subjects were also. By comparison, only 10% of the band subjects had these majors.

[10] One study comparing self-assessments of first-year woman students who are likely sorority joiners to those who are uninterested yields mixed results. For example, likely joiners are more likely to rate themselves as highly competitive (52% versus 43% for the uninteresteds) but are also more likely to rate themselves as highly cooperative (78% versus 71.5%). Similarly, likely joiners are more likely to consider being very well off financially as an important objective (75.8% versus 64.3% for the uninteresteds) but are also more likely to feel the same about participating in community action (39.1% versus 24.4%). See National Panhellenic Conference (1999).

Another possible explanation for the difference in behavior of members of different social groups lies in the activities that the groups undertake. The success of some groups depends on the ability of their members to work together to accomplish some task. The experience of working together to achieve a group goal may teach the members to rely on each other, which can carry over into other interactions. Conversely, other groups consist of people who share a common interest, but do not otherwise require much collaboration among members. Along these lines, we might expect that members of the marching band, whose success in performance requires highly precise teamwork, would be more cooperative than average, [11] while the fraternity and sorority members, whose groups are largely social, would not. To investigate this possibility further, future research might compare other groups that involve considerable collaboration (dance troupes, acting companies, etc.) with groups that do not (philatelic or numismatic clubs, political or cultural societies, etc.).

The experiments reported here give results that are generally consistent with the literature on the effects of gender on voluntary contributions in public goods experiments, a conclusion that is easy to reach given the conflicting results of that literature. As often is the case, male subjects contributed more than females, although the difference was neither large nor strongly significant. The use of a pre-experiment questionnaire intended to generate a sense of community led to lower contributions, although again the effect was not significant. Our findings do not, however, support the predictions of the feminist critique of the economic model of rational self-interest, if that critique is that women are socialized to be more thoughtful of the well-being of those with whom they have a social relationship than are men. Instead, they suggest that the effects of gender and group identity on behavior are more complicated, involving the nature of the social groups involved. Future efforts into the investigation of gender differences in behavior should bear in mind these issues when considering experimental design.

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[11] Why this should impact only the males remains a mystery; perhaps there is something to the notion of "male bonding".

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