

Religion and Cooperation in a Public Goods Experiment

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Abstract

Recent studies suggest that religion is associated with numerous socially beneficial outcomes, including economic growth and reduced crime. One explanation is that religion is positively associated with attitudes that are more favorable toward social interaction and cooperation. We test whether religious affiliation and participation in religious services affect cooperative behavior in a repeated public goods games played by adult subjects. The level of contributions to the public good is not influenced by either religious affiliation or participation. However, the decline in group account contributions with repetition of the game is smaller among religious subjects than those who report no religious affiliation, suggesting that religious beliefs may be beneficial for sustained cooperation.

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1. Introduction

Empirical evidence suggests that religion is associated with numerous socially beneficial outcomes, including economic growth and reduced crime (e.g., Barro and McCleary 2003, Evans et al. 1995).¹ One explanation is that religion is associated with attitudes that are more favorable toward social interaction and cooperation (Guiso et al. 2003). This may be because religious instruction teaches individuals to be more other-regarding, or because the inherently social nature of religious participation fosters cooperation. Alternatively, individuals may possess another trait that drives both religious behavior and secular cooperation.

A few studies have used economics experiments to test the association between religion and trust, cooperation, and other-regarding behaviors. Several employ the dictator game to isolate altruistic behavior. Eckel and Grossman (2003, 2004) find that attendance at religious services is positively associated with contributions to charities designated as recipients. Tan (2006) reports that donations to an anonymous partner are influenced positively by religious belief, but negatively by religious participation. Tan (2006) also studies behavior in an ultimatum game, which captures preferences for fairness and altruism, and finds that first mover offers are not significantly related to religion. However, the amount recipients are willing to accept is positively related to being spiritual and negatively related to religious ritual and salvation. Two studies use trust experiments to capture behaviors consistent with trust, reciprocity, and altruism. Fehr et al. (2003) report that Catholics exhibit more trust than do non-Catholics. Tan and Vogel (forthcoming) show that trusting behavior increases with the trustee's degree of religiosity. Finally, Orbell et al. (1992) employ a prisoner's dilemma game, which

¹ Iannaccone (1998) reviews the economics of religion.

reflects cooperative and altruistic tendencies. Frequency of attendance was positively and significantly correlated with choosing the cooperative option among subjects recruited from a relatively homogenous Mormon town, but not among subjects recruited from a religiously heterogeneous town.²

Our study adds to the literature in several ways. We examine the role of religion in a standard public goods game, an experiment designed to capture cooperative behavior. We examine dynamic decision making by repeating the game for several rounds and providing feedback about others' choices after each round. Finally, we use older adult subjects, as opposed to undergraduates, thus sidestepping a potential concern about the irreligious nature of college students.

2. Methods

We recruited 64 subjects over age 50 from the greater Williamsburg, Virginia area through an advertisement in the local newspaper. Subjects played 10 rounds of a public goods experiment in 8 groups of 8.³ Variation in the religious composition of groups and the subject pool occurred randomly.⁴ Each subject was given 10 tokens to divide between a private account and a public account. Tokens contributed to the private account earned \$1 for the individual and tokens contributed to the group account earned \$0.25 for all 8 members of the group. The Nash equilibrium is for subjects to contribute nothing to the group account, but it is socially optimal

² These studies all follow the standard experimental practice of randomly recruiting and sorting subjects into decision-making groups. Two experimental studies examine whether religion promotes in-group cooperation by deliberately varying the religious composition of subject pools or pairs (see Johansson-Stenman, Mahmud, and Martinsson 2005 and Ruffle and Sosis 2007).

³ Instructions for the experiment are available from the authors upon request.

⁴ An advantage of this approach is that it avoids any mention of "religion" in the recruiting process.

for subjects to contribute everything to the group account. Subjects received feedback about others' decisions after each round. After 10 rounds, one round was randomly selected for payment. Subjects earned \$14.05 on average and were paid privately in cash after the session.

After subjects completed all decisions but before they were paid, each completed a survey containing two questions on religion. One question asked subjects to report their affiliation as Catholic, Protestant, Jewish, Muslim, "other," or "none." A second asked how many times in a typical month the subject participated in organized religious services. Of 64 subjects, 37 were Protestant, 18 were Catholic, 3 were members of another denomination, and 6 reported no affiliation.⁵ Eighteen did not attend services, 10 attended once a month, 6 two to three times a month, 23 four times, and 7 attended more than four times a month.

3. Results

We use the data to test two hypotheses:

Hypothesis 1. Average contributions to the group account will be higher among those affiliated with any religion than those who are not, and will increase with the frequency of attendance at religious services;

Hypothesis 2. Contributions to the group account by religious subjects will exhibit a smaller decline with repetition compared to contributions by nonreligious subjects.

To test Hypothesis 1 we first examine differences in average group account contributions by religious affiliation and attendance frequency. Subjects with no religious affiliation contributed more on average (5.08 tokens) than Catholics (4.04) and other religious (3.00); Protestants contributed slightly more than the nonreligious (5.24). Mean contributions were

⁵ No subjects were Muslim, and because of the small number of subjects identifying themselves as Jewish or some other religion, these were pooled into one category in the empirical analyses.

higher among subjects who did not attend religious services, at 5.15 tokens, compared to means of 4.47, 5.01, and 4.30 among those who attended once a month, two to three times a month, and four times a month, respectively. Only for subjects attending more than four times a month did contributions (5.66) exceed those of non-attenders. We tested for differences in contributions between the various religious and nonreligious subgroups using two-sample Wilcoxon rank-sum tests; none were statistically significant. Thus far, we find no support for Hypothesis 1.

To test Hypothesis 2, we examined mean contributions across rounds for subgroups defined by religious affiliation (Figure 1) and frequency of attendance (Figure 2). Among Protestants, and to some degree Catholics, contributions were relatively stable across rounds. In contrast, contributions by the nonreligious declined with repetition. There is less variation in contribution patterns for attendance subgroups. A few groups exhibit a slight downward trend in contributions, but for two subgroups contributions increased slightly. Thus, the data offer some support for Hypothesis 2, but only regarding differences between religious affiliates and non-affiliates.

We next estimated regressions of group account contributions controlling for race, sex, and income.⁶ In Columns 1-3 of Table 1 the dependent variable is the subject's average contribution. None of the religious affiliation or attendance indicators has a significant coefficient, so we again see no support for Hypothesis 1. In Columns 4-6 the dependent variable is the subject's 10th round contribution minus the 1st round contribution, which is negative for

⁶ Approximately half of the subjects (52%) were female and 5% were nonwhite. We include indicators for income between \$40,001 and \$80,000 (39% of subjects), income above \$80,000 (35%) and missing income data (14%), where the omitted category represents income of \$40,000 or less (10%). In models 1-3, none of these coefficients is significant at conventional levels, although the nonwhite coefficient is negative and has *p*-values from 0.16-0.24. In models 4-6, the female coefficient is negative and significant at the 5% or 10% level.

subjects whose contributions decreased. To account for subjects who decrease their contribution because their initial contribution was relatively high, we control for the subject's first round contribution divided by the contributions made by all group members. In column 4, the Protestant coefficient is positive and significant, suggesting that the decline in contributions is significantly less negative among Protestants than the nonreligious. The coefficients on the other affiliation indicators are both positive but insignificant. In column 5, attending services more than four times a month has a positive effect, but is insignificant. In column 6, the coefficient on Protestant retains its significance once attendance frequency is controlled. The coefficients for all three affiliation indicators increase in magnitude, and an F -test indicates that they are jointly significant ($p < 0.08$). Upon controlling for affiliation, attending services four times a month has a negative effect, but we are unable to reject the null hypothesis that all attendance coefficients are jointly equal to zero. Thus, the Table 1 results offer support for Hypothesis 2, but only with regard to the differences in religious affiliates versus non-affiliates.⁷

4. Discussion and Conclusion

This study examined the association between religious affiliation and attendance and repeated cooperative behavior in an experimental setting. We found that average contributions

⁷ The regression results are very robust. We obtained similar results when we used an indicator for any religious affiliation as opposed to none, omitted the race, sex, and income controls, or controlled for subject age (causing a slight drop in observations due to missing values). Results did not differ substantively when session fixed effects were included; in fact the Catholic coefficient became positive and significant in columns 4 and 6, although the session effects were usually insignificant. As another test of Hypothesis 1, we ran models using the contribution in each round as the unit of analysis, including a set of round dummies and clustering standard errors by subject ($n=640$). As a comparable test of Hypothesis 2, we calculated for each subject the change in contributions between each round and the previous round, and used this as the dependent variable in regressions that included round dummies and clustered standard errors. These results were similar to those shown in Table 1 ($n=576$). Finally, controlling for the last round contributions of other subjects (in models using round-level observations) made no difference in the results.

did not differ by the frequency of attendance at religious services; this is consistent with previous experimental findings from a prisoners' dilemma game using subjects from a religiously heterogeneous community (Orbell et al. 1992). Another finding is that religious subjects did not exhibit the oft-observed decline in group account contributions over additional rounds of play. This finding has not been reported elsewhere since no prior experimental study has examined the role of religion in a repeated public goods game.

That religious affiliation is associated with sustained cooperation is consistent with causal mechanisms whereby religious instruction promotes altruism or religious participation reinforces collective action in the same way as social capital. Because we found no evidence that attendance increases group account contributions, our results are more supportive of the first mechanism, but a thorough test of this distinction would require more detailed measures of religious instruction, beliefs, and social capital. Our observation that affiliation and attendance have differing effects on behavior is similar to patterns reported in other studies. For example, Barro and McCleary (2003) observed that upon controlling for religious belief, attendance frequency was negatively associated with economic growth. Also, Tan (2006) found that dictator game contributions are positively associated with some aspects of religiosity, and negatively associated with other dimensions. We find that upon controlling for religious affiliation, weekly attendance is associated with a larger decline in group account contributions over time. One explanation is that frequent attendance may promote ingroup cooperation at the expense of outgroup cooperation, and other studies might examine this further by varying group composition so that some groups consist of known members from the same religious organization, and others consist of strangers.

In closing we note some limitations of our analysis. We cannot rule out that religious affiliation is correlated with, but does not cause, cooperation. Even with their advantages (providing financial incentives, using neutral terms, focusing on narrowly-defined behaviors), economics experiments, like designs using naturally-occurring data, are unable to randomize inherent subject traits. Another concern is that meaningful differences in religiosity may not be captured adequately by denomination indicators. Future experimental research on cooperation may therefore benefit from more nuanced measures of religion, such as those employed in Tan (2006) and Tan and Vogel (forthcoming).

Figure 1. Group Account Contributions by Round and Religious Affiliation

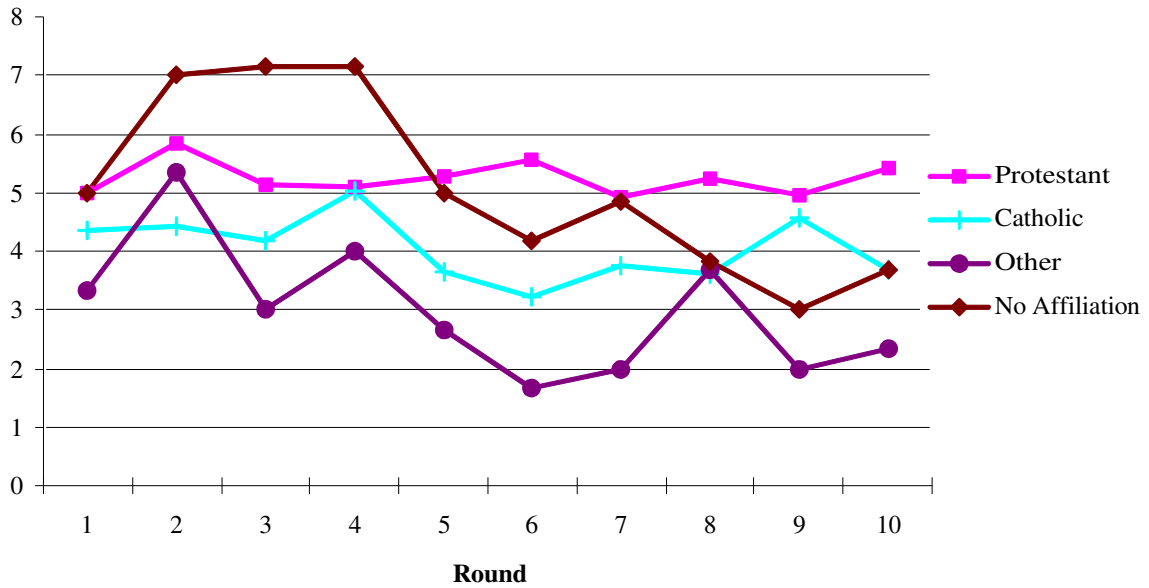


Figure 2. Group Account Contributions by Round and Number of Religious Services Attended per month

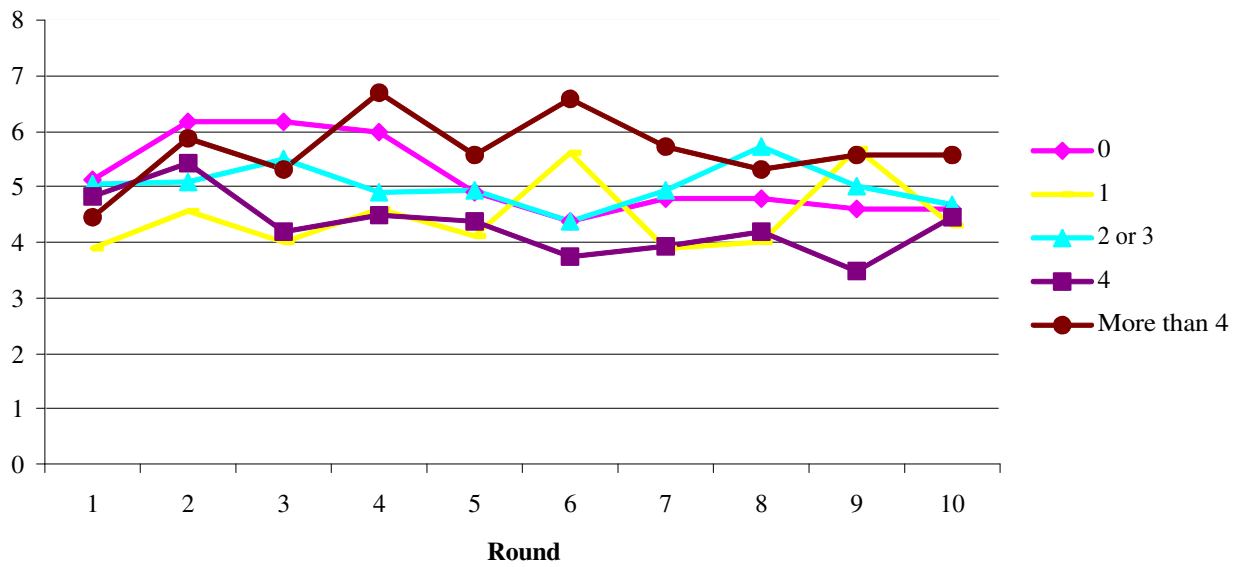


Table 1. Regression Models of Group Account Contributions

| | Dependent Variable: | | | | | |
|---|--|-----------------|-----------------|---|---------------------|---------------------|
| | Average Contribution in Rounds 1 through 10 | | | Contribution in round 10 – Contribution in round 1 | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Subject's share of round 1 contributions | | | | -12.23*** (2.98) | -11.71*** (2.75) | -13.40*** (3.22) |
| Catholic | -0.91 (0.72) | | -0.24 (0.17) | 1.05 (0.83) | | 1.69 (1.24) |
| Protestant | 0.26 (0.22) | | 1.21 (0.87) | 2.07* (1.79) | | 3.09** (2.28) |
| Other | -1.89 (1.03) | | -1.38 (0.73) | 0.48 (0.26) | | 1.11 (0.61) |
| Attends services once a month | | -0.78 (0.71) | -1.49 (1.24) | | 0.31 (0.28) | -1.03 (0.86) |
| Attends services 2-3 times a month | | 0.10 (0.07) | -0.63 (0.43) | | 0.59 (0.43) | -0.64 (0.45) |
| Attends services 4 times a month | | -0.69 (0.78) | -1.41 (1.39) | | -0.48 (0.55) | -1.84* (1.84) |
| Attends services >4 times a month | | 0.41 (0.35) | -0.10 (0.08) | | 1.60 (1.35) | 0.51 (0.41) |

Notes: The sample consists of 64 subject-level observations. Coefficients from OLS models are reported, with absolute values of *t*-statistics in parentheses. All models control for race, gender, and income. Statistical significance is indicated by * for the 0.10 level, ** for the 0.05 level, and *** for the 0.01 level.

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Appendix 1. Instructions

Screen 1

Matchings: The experiment consists of a series of rounds. In each round, you will be matched with the same group of 7 other people. The decisions that you and the other people in your group make will determine the amounts earned by each of you.

Investments: You begin each round with a number of "tokens," which may either be kept or invested. At the same time, the 7 people you are matched with will decide how many of their tokens to keep, and how many to invest. Neither of you will be able to see the other's decision until after your decision is submitted.

Earnings: The payoff to you will equal:

\$1.00 for each token you keep,

\$0.25 for each token you invest, and

\$0.25 for each token invested by the 7 other people who you are matched with.

Subsequent Matchings: The groups of 8 people will be the same in all subsequent rounds, so the 7 other people you are matched with in one round are the same people that you are matched with in the next round.

Screen 2

Example: Suppose you have only two tokens for the round, and the earnings from tokens kept, invested, and invested by the others are \$1.00, \$0.25, and \$0.25 respectively.

(1) If you keep both tokens, then your earnings will be: $\$1.00 \times 2 = \2.00 from the tokens kept, plus \$.25 times the number of tokens invested by the other people in your group.

(2) If you invest both tokens, then your earnings will be: $\$0.25 \times 2 = \0.50 from the tokens kept, plus \$.25 times the number of tokens invested by the other people in your group.

(3) If you keep one and invest one, then your earnings will be:

$\$1.00 \times 1 = \1.00 from the token kept, plus

$\$0.25 \times 1 = \0.25 for the token invested, plus

$\$0.25$ times the number of tokens invested by the other people in your group.

Note: In each of the 3 above cases, what you earn from the others' investments is: \$0.00 if the others invest 0 tokens, \$0.25 if the other people invest 1 token (in total) and keep the rest, \$0.50 if the other people invest 2 tokens (in total), etc.

Screen 3

There will be 10 rounds, and in all rounds you will begin with a new endowment of 10 tokens, each of which can either be kept or invested. The 7 other people in your group will also have 10 tokens.

Everybody earns money in the same manner: \$1.00 for each token kept, \$0.25 for each token invested, and \$0.25 for each token invested by the 7 other people.

At the start of a new round, you will be given a new endowment of 10 tokens. You are free to change the numbers of tokens kept and invested from round to round.

Note: You will be matched with the same people in all rounds.

Screen 4

In the following examples, please use the mouse button to select the best answer.

Question 1: Suppose you invest X of your 10 tokens and the total number invested by the 7 other people is Y tokens.

a) Then you earn $(10 - X)*\$1.00 + X*\0.25 .

b) Then your earnings will be at least as high as $(10 - X)*\$1.00 + X*\0.25 .

Question 2: Which is true?

a) You may divide your 10 tokens any way you wish in each round, keeping some and investing some, or you may keep or invest them all.

b) The more you invest in one period the less there is to invest in later periods.

Screen 5

There will be a total of 10 rounds in this part of the experiment.

All people will begin with 10 tokens which they may keep (and earn \$1.00 each) or invest (and earn \$0.25 each), knowing that they will also earn \$0.25 for each token invested by other people in the group. You will begin each round with a new endowment of 10 tokens, irrespective of how many tokens you may have kept or invested in previous rounds.

There will be a total of 10 rounds in this part of the experiment. Your earnings for each round will be calculated for you and added to previous earnings, as will be shown in the total earnings column of the record form that you will see next.