

Conditional Cooperation and Social Group

Experimental Results from Colombia

Peter Martinsson, Clara Villegas-Palacio, and Conny Wollbrant



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Abstract

In contrast to previous studies on cross-group comparisons of conditional cooperation, this study keeps cross- and within-country dimensions constant. The results reveal significantly different cooperation behavior between social groups in the same location.

Key Words: conditional cooperation, experiment, public goods, social group

JEL Classification: C91, H41

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Introduction

Voluntary contribution to public goods is frequently found both in the field and in the laboratory (e.g., see Gächter 2007). Fischbacher et al. (2001) developed a one-shot public goods experiment in which subjects are asked for 1) an unconditional contribution to a public good, as in standard public goods experiments; and 2) a conditional contribution to the public good, given all possible average contributions (rounded to the nearest integer) of other group members. By investigating the profile of conditional contributions, subjects can be grouped into contributor types, such as free riders and conditional cooperators. (In other words, their degree of cooperation is conditional on their beliefs about others' cooperation.) Early evidence from experiments employing the type classification following Fischbacher et al.'s approach used university students in Western countries as subjects (see, e.g., Gächter [2006] for an overview). Generally, conditional cooperators are the dominating type (Fischbacher et al. 2001); however, most conditional cooperators are not perfect conditional contributors, but contribute slightly less than others. Kocher et al. (2008) replicated the experiment by Fischbacher et al. (2001) in three different countries and found differences in both the distribution of types and the share of conditional cooperation. Herrmann and Thöni (2009) conducted the same experiment in two

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rural and two urban locations in Russia and found that their fractions of conditional cooperators varied 48–60 percent within location, but that the differences between the locations were insignificant. The evidence from studies testing the effect of cultural background on behavior, using a standard multi-period public goods game, has been mixed as well (e.g., Brandts et al., 2004; Burlando and Hey, 1997; Herrmann et al., 2008).

When comparing experimental findings between locations, we identified three dimensions along which different locations may differ: 1) cross-country differences (e.g., religion and social norms), 2) within-country differences (e.g., rural versus urban areas), and 3) social group differences (e.g., age, trust, and income). Given these differences, it is not surprising that different locations yield different behavior. In this vein, Heinrich et al. (2005) found that those who see greater payoffs for cooperation in everyday life exhibit greater levels of prosociality in experimental games. La Ferrara (2002) found that relatively wealthy individuals are less likely to be a part of any group because benefits from cooperation do not outweigh the cost of membership for them. This opens up the question of whether preferences for cooperation vary across social groups.

The objective of the present paper is to investigate cooperative behavior in different social groups by keeping cross- and within-country differences constant. We used university students recruited from two universities in Medellín, Colombia, who differed in social-class: 1) socio-economic strata 2 and 3 (i.e., the “medium-low” group), and 2) socio-economic strata 4, 5, and 6 (i.e., the “high” group).¹ We used the design of Fischbacher et al. (2001) to measure cooperative behavior in a public goods context.

1. Experimental Design and Procedure

We conducted a standard linear public goods experiment, following the same format as Fischbacher et al. (2001), where subject i 's payoff in tokens is given by:

$$\pi_i = 20 - c_i + 0.4 \sum_{i=1}^4 c_i, \quad (1)$$

¹ There are six social strata in Colombia: 1 (low-low), 2 (low), 3 (medium-low), 4 (medium), 5 (medium-high), and 6 (high). Strata 1–3 receive domestic public service subsidies, such as provision of water, electricity, and gas; 5–6 pay additional contributions toward the cost of public services. Stratum 4 receives no subsidies, but this group does not contribute either. The strata are indicators of people's socio-economic conditions.

where 20 is the endowment and c the amount invested in the public good. Each group consisted of four randomly matched members. The marginal return from the public good was set to 0.4, ensuring a conflict between the dominant strategy to contribute zero (i.e., to free ride) and the full contribution Pareto optimum solution.

We asked our subjects to indicate how much they would like to contribute, both unconditionally and conditionally, to the public good. In the case of conditional contributions, subjects were asked how much they would like to contribute, conditional on the average contribution of the other members of the group, which included all integers numbers from 0 to 20 (i.e., the strategy method). To ensure incentive compatibility for all decisions, the payoff-relevant decision for three randomly selected members was the unconditional contribution. By using their average unconditional contribution, the contribution of the fourth member was given by his/her conditional contribution for that specific average contribution. Then, each member's monetary payoff could be calculated using equation (1). After the experiment, subjects were asked to guess the total contribution of the other three group members, and accuracy of guesses was monetarily rewarded.

The experiments were conducted at one socio-economic “medium-low” university (Universidad Nacional de Colombia) and one “high” university (Escuela de Ingeniería de Antioquia), both in Medellín, Colombia.² At both places, we ran two sessions with 24 subjects each; students of mathematics, psychology, and economics were excluded. The procedure of the experiment was the same at both places. Examples and individual exercises were used to ensure that subjects understood the experiment. Each session lasted approximately 90 minutes and the payoffs were calibrated to reflect opportunity costs. For the medium-low group, each token equaled COP 750, while the corresponding figure was COP 1,000 for the high group.³ Average

² At Universidad Nacional de Colombia (the medium-low experiment group), approximately 80% of the student population belongs to strata 2 and 3, 11% to stratum 4, and only 5% to strata 5 and 6 (see Rico 2005). This is a public university where the cost of a six-month term is about the minimum monthly salary for students of stratum 3. At Escuela de Ingeniería de Antioquia, a private university, students mainly belong to strata 4, 5, or 6, and the cost is 10 times higher.

³ In cases with samples with different opportunity costs, either the absolute amount in the experiment or the opportunity cost can be kept constant. We decided to keep the opportunity cost constant. It should be noted that Kocher et al. (2008) did not find a significant stake effect in one-shot public goods games. COP = Colombian pesos; the exchange rate at the time of the experiment was US\$ 1 = approximately COP 2,000. A lunch in the medium low-social class university costs approximately 75% of a lunch at the high social-class university.

earnings were COP 25,000 for the high group and COP 23,000 for the medium-low group. (Both figures include a show-up fee of COP 5,000.)

2. Results

We followed the standard approach when defining the four contributor types (see Fischbacher et al. 2001). Conditional contributors submitted a contribution table showing a monotonically increasing own contribution for an increasing average contribution of the other members.⁴ Free riders were characterized by a zero contribution for every possible average of the other members. Unconditional contributors submitted the same positive contribution independent of others' average contribution. Hump-shape contributors (also known as triangle contributors) showed monotonically increasing contributions up to a given average level of others' contributions, after which their contributions decreased. The category referred to as "others" constituted the remaining participants.

Table 1 displays the distributions of types by social group. The dominating type is conditional cooperators, comprising 51 percent and 62 percent of the high group and the medium-low group, respectively. This is very close to the figures reported by, e.g., Fischbacher et al. (2001) and Fischbacher and Gächter (2006). Interestingly, 25 percent of the subjects in the high group were classified as free riders, compared to 4 percent in the medium-low group. We rejected the null hypothesis of no differences in distribution of types between groups at the 5-percent significance level ($p = 0.03$; Chi2-test).⁵ This is explained by a rejection of the hypothesis of no differences in share of free riders between the two groups at the 1 percent significance level ($p = 0.004$; Chi2-test). Table 1 also presents the average unconditional contribution for each type; the difference between the groups is statistically insignificant at conventional levels.

⁴ We also included those without a monotonically increasing contribution, but with a highly significant (at 1%) positive Spearman rank correlation coefficient between own and others' contributions (see Fischbacher et al. 2001; Fischbacher and Gächter 2006).

⁵ This result is robust to systematic exclusion of types, e.g., excluding "others" ($p = 0.026$, Chi2-test).

Table 1. Distribution of Subject Types, Average Unconditional Contribution, and Guessed Contribution

	High socio-economic group			Medium-low socio-economic group		
	<i>Distribution</i>	<i>Avg. uncond. Contribution</i>	<i>Avg. guessed contribution</i>	<i>Distribution</i>	<i>Avg. uncond. Contribution</i>	<i>Avg. guessed contribution</i>
Unconditional cooperators	0.00%	0.00 (0.00)	0.00 (0.00)	4.17%	0.50 (0.71)	0.00 (0.00)
Conditional cooperators	54.17%	9.64 (4.68)	9.88 (4.78)	62.50%	9.33 (5.12)	9.50 (4.93)
Hump-shape contributors	8.33%	6.50 (7.85)	11.00 (7.53)	8.33%	8.75 (7.46)	8.25 (6.40)
Free-riders	25.00%	3.83 (7.02)	6.50 (7.43)	4.17%	0.50 (0.71)	2.00 (0.00)
Others	12.50%	8.00 (4.47)	7.67 (4.23)	20.83%	6.60 (3.95)	7.30 (4.16)

Note: Avg. uncond. contrib = average unconditional contributions; standard errors are in parentheses. Avg. guessed. contrib = average guessed contributions, with standard errors in parentheses.

The relationship between the subjects' own conditional contribution and the average contribution of other group members is shown in figure 1. When the average contribution of others was zero, subjects in the medium-low group contributed more than those in the high group. Also, the difference in slope between the perfect conditional cooperation line and the plotted line, which represents degree of self-serving bias, was significantly larger in the high group. The regression results confirm the results shown in figure 1.

Using two-sided Mann-Whitney U-tests, we found no significant difference in mean unconditional contribution between groups; it was 7.98 tokens in the medium-low group and 7.68 in the high group ($p = 0.75$). These levels of unconditional contributions, around 40 percent of the endowment, are in line with earlier findings (e.g., Kocher et al. 2008).

We elicited beliefs about others' contribution in the unconditional case, and found no significant differences in beliefs between the high group (8.83) and the medium-low group (8.23, where $p = 0.71$). Furthermore, regression results revealed that both groups can be classified as imperfect conditional cooperators (table 2). In addition, the high group displayed a significantly higher level of self-serving bias, which is similar to findings from the analysis of the conditional contribution tables.

Figure 1. Average Own Conditional Contribution versus Average Contribution of the Other Three Group Members

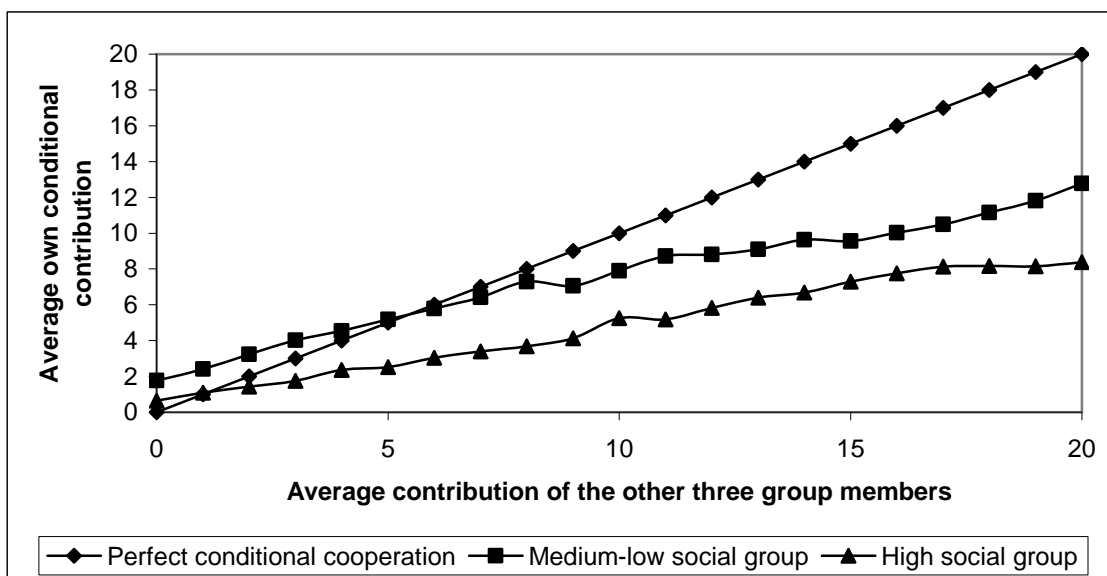


Table 2. Regression Results

Dependent variable: Unconditional contribution in tokens	Tobit coefficient
Gussed contribution	1.171*** (8.71)
Gussed contribution x high socio-economic group	-0.426** (-2.41)
High socio-economic group	2.573 (1.46)
Constant	-1.986 (-1.53)
Sigma	4.079
Pseudo R-squared	0.157
Number of observations	94

Note: *** denotes significance at the 1% level, ** at the 5% significance level, and * at the 10% significance level; t-statistics are in parentheses.

3. Conclusion

There is a growing interest in understanding whether behavior is the same across locations. By holding cross- and within-country dimensions constant, we investigated cooperative behavior between social groups in the same location. Our results suggest that different social groups exhibit differences both in terms of composition of types and extent of conditional cooperation.

As shown by Fischbacher and Gächter (2009), the decline in cooperation over time is caused by imperfect conditional cooperation. Thus, even if the unconditional contributions are similar across locations, the degree of imperfect conditional cooperation and the fraction of free riders are important factors determining the long-term differences in contributions to public goods. As a consequence, policymakers may need to consider different policy schemes. Following Gächter (2006), a social group where most individuals are conditional cooperators needs policies that sustain beliefs for cooperation of its integrants. In contrast, in situations where free riding dominates, policies involving monitoring and penalties may be required to enhance cooperation. Because a substantial part of public goods is local (e.g., teamwork and local environmental public goods governed by common property regimes such as lakes, pastures and irrigation systems), it is important to understand local preference heterogeneity.

References

- Brandts, J., T. Saijo, and A.J.H.C. Schram. 2004. "A Four-Country Comparison of Spite and Cooperation in Public Goods Games," *Public Choice* 119: 381–424.
- Burlando, R.M., and J.D. Hey. 1997. "Do Anglo-Saxons Free Ride More?" *Journal of Public Economics* 64: 41–60.
- Fischbacher, U., and S. Gächter. 2009, forthcoming. "Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Good Experiments," *American Economic Review*.
- Fischbacher, U., S. Gächter, and E. Fehr. 2001. "Are People Conditionally Cooperative? Evidence from a Public Goods Experiment," *Economic Letters* 71: 397–404.
- Gächter, S. 2007. "Conditional Cooperation: Behavioral Regularities from the Lab and the Field and Their Policy Implications." In *Psychology and Economics: A Promising New Cross-Disciplinary Field* (Cesinfo Seminar Series), ed. B.S. Frey and A. Stutzer, 19–50. Cambridge, MA, USA: MIT Press.
- Gächter, S., and B. Herrmann. 2006. "The Limits of Self-Governance in the Presence of Spite: Experimental Evidence from Urban and Rural Russia." Working Paper 2006-13. University of Nottingham, UK.
- Heinrich, J. 2005. "Economic Man in Cross-Cultural Perspective: Behavioral Experiments in 15 Small-Scale Societies," *Behavioral and Brain Sciences* 28: 795–855.
- Herrmann, B., and C. Thöni. 2009. "Measuring Conditional Cooperation: A Replication Study in Russia," *Experimental Economics* 12: 87–92.
- Herrmann, B., C. Thöni, and S. Gächter. 2008. "Antisocial Punishment across Societies," *Science* 319: 1362–67.
- Kocher, M., T. Cherry, S. Kroll, R. Netzer, and M. Sutter. 2008. "Conditional Cooperation on Three Continents," *Economics Letters* 101: 175–78.
- Kocher, M., P. Martinsson, and M. Visser. 2008. "Does Stake Size Matter for Cooperation and Punishment?" *Economics Letters* 99: 508–511.
- La Ferrara, E. 2002. "Inequality and Group Participation: Theory and Evidence from Rural Tanzania," *Journal of Public Economics* 85: 235–73.

Rico, D. 2005. "Evaluación del costo de las matrículas en la Universidad Nacional de Colombia, Sede Medellín." Oficina de Planeación. [Evaluation of the cost of matriculation at the National University of Colombia, Sede Medellín. Office of Planning]. Medellín: Universidad Nacional de Colombia.