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**Working Paper**

## Ostracism and the provision of a public good

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**Ostracism and the Pro-  
vision of a Public Good  
– Experimental Evidence**

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# **Ostracism and the Provision of a Public Good Experimental Evidence**

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# Ostracism and the Provision of a Public Good Experimental Evidence\*

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## Abstract

We analyze the effects of ostracism on cooperation in a linear public good experiment. Our results show that introducing ostracism increases contributions. Despite reductions in group size due to ostracism, the net effect on earnings is positive and significant.

**Keywords:** Experiment; Public Good; Ostracism.

**JEL Classification:** C92; H41.

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# 1. Introduction

Theoretical research on the voluntary provision of public goods indicates that selfish individuals have incentives to free ride, leading to an inefficient provision under voluntary contribution. In contrast to this, people in experimental laboratories (e.g. Ledyard, 1995, and Zelmer, 2003) and in the field contribute to the provision of public goods. Experimental results have, however, consistently shown that it is difficult to sustain a high contribution level. Several mechanisms aimed at fostering cooperation have been explored experimentally. The availability of costly monetary punishment mechanisms increases contribution levels almost to full cooperation (see Fehr and Gächter (2000) and follow-up studies such as Bochet et al. (2005)). Interestingly, the effect on net earnings is neither positive nor significant once the cost of punishment is considered. A variant of this is non-monetary punishment communicated through disapproval. Masclet et al. (2002) found increased contribution rates when points indicating disapproval were allocated, but this effect did not persist over time.

Cinyabuguma et al. (2005) investigated ostracism based on majority voting in a public good experiment, where a lump sum cost was imposed on those members voting for ostracism if the member they voted for was excluded in that period. The excluded members were then assigned to another public good experiment. Their results show an almost maximal level of contribution to the public good among non-excluded members. Masclet (2003) designed a multi-period public good experiment, where each period consisted of two successive public good phases, the first relating to production and the second to some social activity. After the first phase, each participant could ostracize members for one period (only one vote was required for ostracism) from the second phase, i.e. the social activity, either at no or at some cost depending on the treatment. In both cases increased contribution levels in the first phase resulted.

We investigate the effect of ostracism, based on majority voting, on contributions in a public good experiment. There exist many examples of local public goods, such as team work or access to local areas, where it is feasible to ostracize individuals when monitoring and punishment are decentralized.<sup>1</sup> In contrast to Cinyabuguma et al. (2005) where the potential reduction in contributors was low since each group consisted of 16 members, we study how the level of contribution and net earnings are affected by introducing the strongest possible punishment mechanism i.e. life-time ostracism. The direct effect of ostracizing a member is that the group size decreases, which automatically reduces maximal contribution levels to the public good for all remaining periods. We choose a rather small group size (six members) and thus make ostracism indirectly costly through the rather substantial loss in potential future contributions.

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1 See Gaspart and Seki (2002) for an empirical example of a local public good fishery with elements of ostracism.

## 2. Experimental design and procedures

Our computerized experiment (Fischbacher, 1998) consists of two treatments: (i) a traditional public good experiment and (ii) a public good experiment with ostracism.<sup>2</sup> Each treatment consisted of ten periods followed by ten periods of the other treatment. We control for the order effect by running the experiment in both orders, using independent samples. Each session, i.e. ordering of the two treatments, involved eight groups with six participants each. Participants were randomly assigned to groups.

In each round, participants simultaneously choose how much to contribute to the public good out of an endowment of 10 tokens. Participant  $i$ 's payoff is calculated according to the following function

$$\pi_i = 10 - g_i + 0.6\sum_j g_j,$$

where  $g$  is the contribution to the public good. The marginal payoff for the contribution to the public good is 0.6, while the marginal payoff from the private good is 1. At the end of each period, participants are informed about individual contributions and their net earning. In the ostracism treatment, there is a second stage in each period, where participants either cast a vote for ostracizing another member or refrain from voting. In order to exclude reputation effects, participants remained anonymous and votes could therefore only be cast based on contributions in the ongoing period. Each participant was informed about the aggregate number of votes received. Due to the strict majority rule, the minimum number of votes required for ostracism was three if the group consisted of five or six members, two if the group consisted of three or four members and one when there were two remaining participants. Since the marginal benefit from the public good is set to 0.6, and is independent of the size of the group, the decision to exclude a member out reduces the maximum group return by one-sixth of the total maximum return. Ostracized participants continued to receive 10 tokens for all remaining periods and were excluded from further decision-making.

## 3. Results

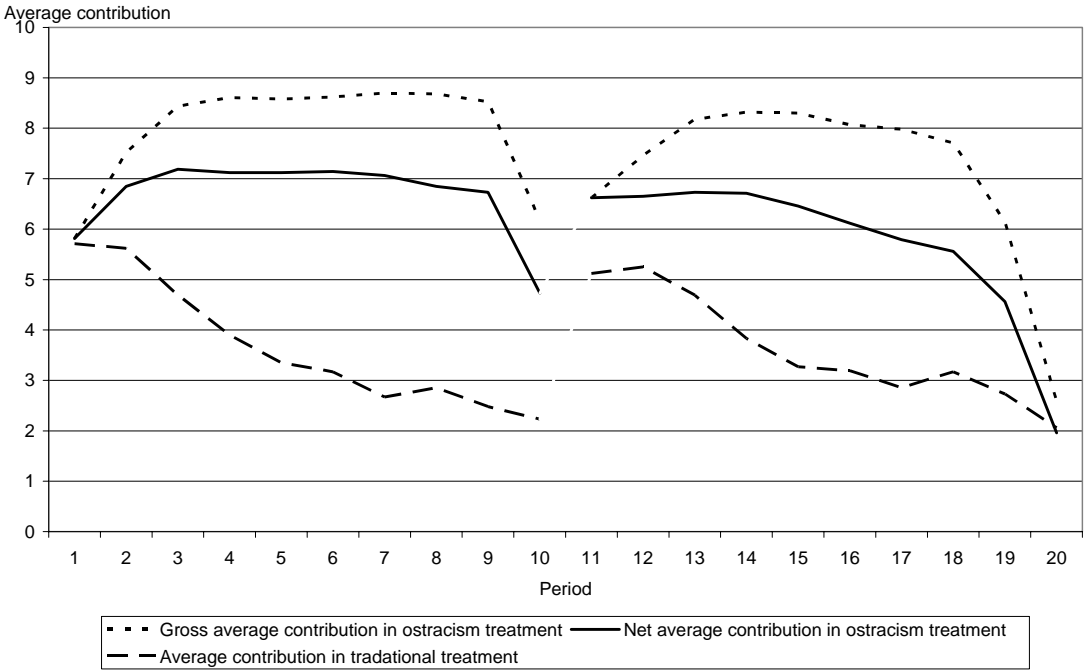
96 students were recruited from different departments at Bonn University, Germany, to participate in the two experimental sessions. Figure 1 depicts the time series of average contributions for the two sessions, separated by the type of treatment; public good experiment with and without ostracism. We distinguish between *gross* average contribution based on non-ostracized participants, and *net* average contribution based on the original group size (six participants). As expected, we find a sharp decline in the average contributions in the traditional public good experiment after the initial periods in both sessions. In the ostracism treatment, in contrast, the gross average contributions increased to a level above 80% after the first periods, while the net

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2 Before each treatment, participants received information about the structure of that treatment only.

average contribution is around 70%.<sup>3</sup> Thus, even when considering the reduction in potential contributors due to ostracism, absolute contributions are higher than in the traditional case. In a Wilcoxon test we reject equality between the treatments at 1% significance level. Voting behavior in the beginning of the ostracism treatment was rather active with 70% of votes cast in the first period followed by a sharp decline reaching 22%, in the eighth period, before increasing again as a response to lowered contribution levels. In the first period with ostracism, 9 members out of 16 groups<sup>4</sup> were ostracized followed by 7 in the second period. During the next six periods, 9 members were ostracized while the number increased again with 4 members in each of the last two periods.

**Figure 1 Average contribution to the public good over time.**



In Figure 2, we present the average net earnings in both treatments. As shown in the figure, average net earnings are higher in the ostracism treatment, which is supported by a Wilcoxon test that rejects equality at 1% significance level.

Focusing on group averages over all periods, rather than on averages in each period, we reject at 1% significance level using a Wilcoxon sign test that the average contributions to the public good are the same between ostracism and traditional treatment based on gross earnings while we reject the hypothesis at a weak 7% significance level for net earnings.

3 As costs of exclusion are reduced in the last periods, end game effects were observed in all treatments.  
 4 Due to majority voting at most one member can be ostracized per group and period.

**Figure 2 Net earnings over time.**

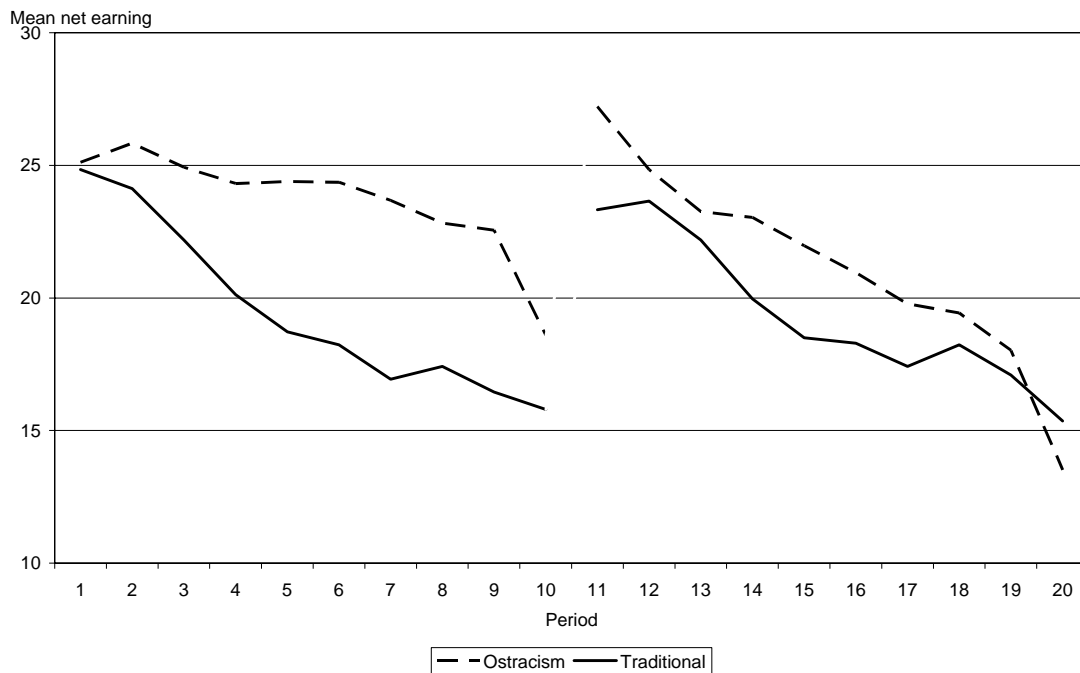


Table 1 shows the results of three separate regression analyses of the treatments with ostracism. In the first column, we estimate what determines the change in contribution from one period to another as a function of the proportion of votes received, the others’ average contribution, the absolute positive deviation from others’ average contribution and the absolute negative deviation from others’ average contribution. As expected, the proportion of votes received from others has a significant and positive effect on the change in contributions.<sup>5</sup> Then we analyzed what determines the proportion of votes obtained in a period as a function of others’ average contribution, absolute positive deviation from others’ average contribution and absolute negative deviation from others’ average contribution (measured in the same period). As expected, negative absolute deviations from others’ average contribution significantly increased the proportion of votes. The last regression analyses under what circumstances participants are ostracized. The results are similar to the previous regression, i.e. negative deviations from others’ average contribution have a significant positive impact on the probability of being ostracized.

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5 The results of a regression using the absolute number of votes and whether or not a vote was received in the previous period were similar.



**Table 1 Regression analysis.**

Dependent variable	Change in contribution to public good (OLS)		Relative amount of votes obtained in percentage (Tobit)		Ostracized (Probit)	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Proportion of votes obtained in previous period	0.021*	0.006	-	-	-	-
Others' average contribution in previous period	-0.482*	0.068	-	-	-	-
Absolute positive deviation in previous period	-0.604*	0.073	-	-	-	-
Absolute negative deviation in previous period	0.305*	0.071	-	-	-	-
Others' average contribution	-	-	-1.444	1.352	-0.685	0.108
Absolute positive deviation	-	-	0.094	1.502	0.010	0.144
Absolute negative deviation	-	-	11.729*	0.972	0.473*	0.624
Constant	3.376*	0.633	-3.008	12.028	-3.024*	1.056
Number of observations		613		709		709

Note: \* denotes significance at 1% level. The last period in the ostracism treatment is not included in the analyses due to end-game effects. Group dummies have been included in the regressions to control for group fixed effects, but omitted above.

## 4. Conclusions

In a traditional public good experiment, the average contribution level typically converges towards zero as predicted by standard theory. Recent research has shown that monetary punishment increases contribution levels. We find that ostracism increases contribution levels and contrary to monetary punishment, also has a significant positive effect on net earnings. Our results go beyond Cinyabuguma et al. (2005) by demonstrating that even in small groups with high costs of ostracism participants are willing to ostracize the lowest contributors even if this decreases maximum possible earnings. As remaining participants step up their contribution levels, the effect of ostracism on net earnings is positive.

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