

Water Cooler Ostracism¹

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Preliminary and Incomplete. Comments welcome.

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Abstract:

Previous studies have demonstrated communication has the ability to increase contributions to a public good. Still many subjects nonetheless exhibit free-riding behavior. Within social situations however, free-riding individuals may be informally punished through social ostracism: ostracized group members may be shunned from communication by the group yet may still maintain formal ties. In this study we examine the effectiveness of non-monetary social ostracism as a punishment mechanism to improve contributions to the public account. Social ostracism may occur in the workplace where workers produce a public good amongst their inputs. Since these workers are all on the same rank, no worker has the ability to punish free riding behavior. Yet, the group as whole has the ability to punish free-riding group members through various social mechanisms (e.g. name calling, ostracism, etc). We find social ostracism modestly increases contributions to the public account. We also find subjects vote in favor of ostracizing free-riding group members who respond to their social ostracism by reducing own contribution to the public account. Last, we find an individuals' volume of non-coordinating chat is significantly and positively correlated with their contributions to a public account.

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1 Introduction

The objective of our paper is to study the effects of non-monetary ostracism on contributions to a shared public account using a laboratory experiment. Although many previous studies have examined different forms of non-monetary punishment, none to our knowledge have examined the role potential social ostracism may play as an influencing factor to the provision of a public good. The outside world is rife with examples where there is a potential for social ostracism. For example, public goods are often produced in circumstances where there is an absence of a manager who has the authority to punish free-riders. Likewise, the group may not have the authority to remove free-riders from the activity that generates the public good (i.e. place of employment or athletic team) but the group may still possess the option of various forms of non-monetary punishment; with ostracism from the group's social activities being one form of possible non-monetary punishment. In the case of social ostracism, the ostracized group member may still participate and contribute to the activity that generates the public good but may be removed from the social aspects of the group (e.g. ignored at the water cooler).

In this paper, we first discuss relevant literature and, with which, conjecture that social ostracism may attenuate free-riding behavior. The rest of the paper is organized as follows. Following the discussion of relevant literature, in Section 3 we introduce the experiment design, discuss procedures, and form hypotheses. We analyze data and report results in Section 4. Sections 5 and 6 provide discussion and conclude.

We find social ostracism increases contributions to a public account but only after previous experience with a VCM. Also, subjects' contributing greater amounts to the public account will vote in favor of ostracizing a group member contributing comparatively less to the public account. Further, we find subjects reduce their own contribution to the public account in response to being socially ostracized. However, we cannot ascertain as to whether this response is a form of counter punishment or a product of increased social distance.

2 Previous Studies

Typically, in Voluntary Contribution Mechanism experiments (VCM), subjects are split into groups and provided an endowment that can be split into public and private accounts. Each individual's allocation to the public account is then added together with other group members' allocations to the public account. The value of the public account is the total contribution to the public account multiplied by a constant; with the marginal per capita return (MPCR) being the constant divided by the number of group members. An individual earns the amount they kept in their private account plus a share of the value of the public account.

Maximum earnings in VCM experiments are obtained when an individual contributes nothing to the public account while all group members contribute their entire endowment to the public account⁴. As such—assuming a monetary payoff maximizing agent-economic theory predicts subjects would contribute nothing to the public account in hopes that other group members would fully contribute to the public

⁴ This is not strictly true. There are studies with interior socially optimal allocations to the public account; yet we know of no linear public good experiments where the MPCR is low enough to imply a socially optimal individual contribution of zero.

account. This type of behavior is known prominently in the literature as “free-riding” or the “public goods problem”.

This ‘public goods problem’ has been studied experimentally for several decades now. Despite the individual incentive to free-ride under the VCM, subjects continue to contribute to the public good in laboratory experiments (e.g. Ledyard, 1993) as well as in the field (e.g. Ostrom, 1990; Gaspart and Seki, 2003). In general however, most laboratory experiments have shown it is difficult to maintain high public good contribution levels over time (e.g. Isaac and Walker, 1984, 1988a, 1988b; Andreoni, 1988; Corson, 1996).

Communication has been shown to greatly attenuate free-riding behavior and foster high contributions (Isaac and Walker, 1988b; Salley, 1995). Although merely “cheap talk”⁵, communication in VCM experiments typically lead to increased contributions to the public account due to subjects coordinating their allocation decisions while also allowing for some degree of non-monetary punishment through the shaming of low contributors (generally, name calling or expressions of personal distaste for group members’ contributions). Brosig, Ockenfels, Weimann (2003) suggest that the increased incidence of pro-social behavior in “face to face” communication experiments result from social cues (e.g. body language and facial expressions) and loss of anonymity. However, Bochet, Page, and Putterman (2006) find that anonymous chat room like communication also leads to contributions to a public account in a manner that is nearly as efficient as face to face communication. Bochet et al. (2006) find that numerical communication⁶, or numerical cheap talk, has no significant effect on contributions when compared to a VCM without any form of communication.

As with communication, the ability to monetarily punish free riders has been shown increase contributions to the public account in VCM experiments. Fehr and Gächter (2000) studied repeated VCM games with ‘strangers’ and ‘partners’ with costly punishment; concluding that subjects are willing to punish free-riders, even if it is costly, and the punisher does not benefit from inflicting a punishment. Moreover, the authors observe a positive correlation with amount the free-riders deviate from other group members’ contributions to the public and the punishment doled out by their group members. Although these relationships are also seen in several other studies (e.g. Fehr and Gächter (2002), Masclet, Noussair, Tucker and Villeval (2003) and Bochet et al. (2006)), Nikiforakis (2007) finds that the potential for counter punishment can negate gains from monetary punishment. Furthermore, the allocation of costly punishment may be explained by Bolton and Ockenfels (2000) ERC⁷ model rather than an explicit desire to punish low contributors.

Masclet, Noussair, Tucker, Villeval (2003) examine the role non-monetary punishment may lead to increase contributions to a public account in a VCM. Masclet et al. (2003) compare the contributions to a public account in a VCM with monetary punishment scheme identical to Fehr and Gächter (2002) to a punishment scheme involving non-monetary punishment⁸. Masclet et al. (2003) find contributions to the

⁵ Subjects are under no obligation to follow through with their stated allocation decisions.

⁶ Subjects could enter non-binding contributions to the public account whilst also viewing the non-binding contributions of other group members

⁷ Subjects with inequality adverse preferences may reduce the earnings of low contributors in effort to increase their earnings in comparison to other players

⁸ In the non-monetary punishment sessions, subjects could assign points to their group members indicating their disapproval with the group member’s allocation decision.

public account increase when either punishment mechanism is present⁹. Furthermore, there is a significant negative relationship between the assignment of punishment (monetary and non-monetary punishment) and the amount the punished deviated from the group's average contribution to the public account. Noussair and Tucker (2005) compare non-monetary and monetary punishment schemes to a scheme with both non-monetary and monetary punishment. When both punishment types are available, earnings are significantly greater than when only non-monetary or monetary punishment is present; yet, contributions to the public account are not significantly different between sessions with both monetary and non-monetary punishment and sessions with only monetary punishment.

Group formation and behavior within groups (such as 'small' and 'large' groups) has been discussed in Olson, (1971). Recently, Ahn, Isaac, and Salmon (2008) observe endogenous group formation where subjects are allowed to enter and exit groups with unrestricted and restricted entry. They find that the rules governing entry and exit cannot be ignored when looking at group-size formation and contributions. Moreover, an unintended "punishment" mechanism of "denying entry to a low contributor does appear to be capable of increasing contributions" but "the existence of [any] punishment opportunities does not necessarily increase contributions". Ahn et al. further provide reasoning why studying endogenous group formation is not only important anthropologically, but also economically. When group formation is endogenous individuals can actually exhibit greater efficiency when they face certain restrictions on group entry and exit (Ahn, Isaac, and Salmon (2009)). Specifically, when groups have an entry restriction, individuals contribute more to the public good and form group sizes closer to optimal than if the group has no entry restriction or an exit restriction. However this study did not use communication or punishment (subjects choose to leave the group)^{10&11}. Brekke et al. (2011) examine pro-social behavior by subjects with endogenous group formation in a linear public goods game with donating to charity as an individual choice. Those members who chose the group which had donations to charity in addition to take-home money experienced higher contributions which stayed high and other groups (that did not have a donation to charity) experienced the standard declining pattern despite the endogenous formation¹².

The subject of ostracism has been a common research topic in the psychological literature¹³. Durkheim (1933) was one of the first to study social punishment and determined ostracism is present in various team-related activities. Baumeister and Leary (1995) and Smith et al. (1999) find ostracism is a punishment do to the psychological concept of belonging for human security and mental health. These

⁹ However, in the later periods of non-monetary punishment conditions, contributions to the public account are less than the contributions in monetary punishment conditions. Moreover, subjects' earnings between non-monetary and monetary punishment sessions are similar due to the efficiency loss from costly punishment.

¹⁰ In some cases in Ahn et al. (2009) subjects had to apply for group exit (in the restricted exit case) and exit was approved by the group. However, since this exit procedure was initiated by the exiting subject it should not be thought of as punishment.

¹¹ Also, recently Charness and Yang (2008) provide a mechanism for endogenous group formation, exit and merger under a public goods setting. However, no communication was provided and feedback given to subjects is substantially different than our design.

¹² There is a recent string of literature (e.g. Chen and Li, 2008) that finds that altruistic behavior is higher when participating with in-group member and less with an out-group member, when groups are endogenously formed. We wanted to test a base line for the punishment mechanism in our experiment before proceeding to endogenizing group identity or examining the role of social punishment in in-group versus out-group members.

¹³ Since then there is a sub field of research in psychology on ostracism and a rich psychological taxonomy of the various types of ostracism can be found in Williamson (2001) and further discussed in Sommer and Williamson (1997).

negative feels brought about by ostracism can occur even in situations with minimal social contact (such as minimal online contact) and result with ostracized subjects reporting more negative feelings and a less sense of belonging.

Psychologists also examine ostracism from a behavioral viewpoint, such as which emotions various forms of social punishment trigger and other behavioral consequences (e.g. Williams, 2007)¹⁴. Jones et al. (2009) find evidence of ostracism in information removal (removal of information by choice rather than the standard definition of asymmetric information). Ostracized subjects were told the information they failed to receive was the result of the other group members not sharing with them, thus being 'out-of-the-loop'. Also due to the information removal subjects may fail to recognize themselves as part of the group; since information sharing is often a group characteristic.

Ostracizing non-contributors (or low) has existed in many different forms in social situations (e.g. Wiessner, 2005; Williams et al. 2000; Boehm, 1999)¹⁵. Outside of experiments Hirsleifer and Rasmusen (1989) provide a theoretical equilibrium of ostracism in prisoner's dilemmas and conclude that ostracism can be effective in cooperation but hurts the non-excluded members of the group as well as the ostracized members if members prefer not to decrease the group size. Economic experiments directly involving ostracism are limited with a few notable exceptions. Cinyabuguma et al. (2005) study ostracism in an experiment where group members face a lump sum cost for casting a vote in favor of ostracizing a group member¹⁶ (with ostracism requiring a majority of group members voting in favor of ostracizing a particular group member). Their results show nearly full contributions to the public account for members who have not been excluded from the experiment¹⁷, while members that have been ostracized contribute little to the public account.

Maier-Rigaud et al. (2010) examine ostracism in a linear public goods experiment with costless voting. Their experiment includes complete ostracism where members are completely removed from the experiment (they cannot earn any experimental tokens nor could they donate to the public good and could not be allowed back in), all members are told how many votes of ostracism each received and there was no form of communication. The authors find that despite the potential detriment to group size, low contributors were ostracized and there was a positive net effect on earnings.

Obviously, communication serves as a vehicle for coordinating individual decisions in groups, doling out non-pecuniary punishment, and as a means for shortening social distance. Since we are most concerned with the effect social ostracism has on individual contributions to a public account it is paramount we limit individuals' ability to coordinate allocation decisions. With unrestricted communication subjects

¹⁴ While our experimental study provides only a potential for short term partial/social ostracism there is psychological discussion about partial versus complete as well as short-term and long-term ostracism. Often the effects of partial ostracism mimic the case where full ostracism is present; partial ostracism being only partial exclusion from communication or an activity as opposed to full exclusion.

¹⁵ Historically Greif et al. (1994) concluded that the rise of the merchant guild during the high Middle Ages developed a set of property rights, and attributes such as ostracizing a merchant who deviated from regular procedure of merchants for fear of not being able to operate in many communities. This system allowed alien merchants to operate in many different communities.

¹⁶ Ostracized subjects only faced a lower endowment in the same game and could not vote to ostracize other subjects.

¹⁷ However, in the Cinyabuguma et al. (2005), the group size of the non-expelled group could only decrease- implying a decrease then the potential earnings.

may coordinate strategies, which consequently result in individual contributions to the public account that are in adherence to the group's agreed upon amount. If a punishment mechanism is present in this case, it would rarely be utilized; as there would be no incentive to punish¹⁸. Also, by restricting communication, communication becomes regarded as solely a social activity-unrelated to allocation decisions. This focus on unrelated social activity may also lead to an enhanced sense of group identity; which may not only lead to increased contributions to a public account but also increase the disutility of being socially ostracized.

Research demonstrates contributions to a public account are greater if there is an enforcement mechanism present to deter free riders. Although social ostracism is non-monetary in nature, Masclet et al. (2003) shows the availability of non-pecuniary punishment can lead to pro social behavior. Moreover, because there is evidence social ostracism creates negative emotions to the individual being ostracized we believe that social ostracism may be an effective form of non-monetary punishment. As such, we conjecture contributions to a public account in VCM experiments may increase if there is a possibility of social ostracism.

3 Experimental Design, Procedures, and Hypothesis

3.1 Experimental Design

Each session of the experiment subjects participate in J periods with each period containing at most 4 stages: (1) Chat Stage, (2) VCM Stage, (3) Vote Stage, and (4) Payoff Stage. In half of the periods, the outcome of the Vote stage determines participation in the next period's Chat Stage (VOTE), while in the other half of the periods all subjects participate in the Chat Stage (NO-VOTE). Subjects are randomly assigned into groups of five at the beginning of the session. They participate in these groups for $J/2$ periods and are randomly re-matched into new groups of five at the start of period $J/2+1$.

The within session treatment is participation in the VOTE stage. To control for potential order effects, by way of learning/experience, we employ an AB, BA, AA and BB design. As such, in the AB/BA sessions, if subjects within a session participate in a Vote stage in period 1, they continue participating in the Vote Stage every period until the conclusion of round $J/2$. At the conclusion of period $J/2$, subjects are randomly re-matched into new groups and no longer participate in the VOTE stage for the remainder of the experiment. Likewise, if subjects do not participate in the VOTE Stage in the first $J/2$ periods, they will participate in the VOTE stage in periods $J/2+1$ through J . In AA/BB sessions, subjects participate in either all VOTE or NO-VOTE conditions for the entire J periods.

¹⁸ In a pilot study, we found this is the case. Giving subjects both unrestricted chat and a punishment mechanism results in high contributions and unused punishment.

	Sessions	Subjects	Groups	Average Earnings
Treatment 1: (VOTE, NO-VOTE)	3	60	24	15.94
Treatment 2: (NO-VOTE, VOTE)	3	60	24	16.26
Treatment 3: (VOTE, VOTE)	1	20	8	17.01
Treatment 4: (NO-VOTE, NO-VOTE)	0	-	-	-

In VOTE stages, subjects can vote to remove group members from the chat stage. Subjects who are removed from the chat do not participate in the chat until the voting portion of the experiment (or experiment) ends or until a majority of their group members vote in favor of adding them back into the chat stage. For simplicity, we identify subjects who have been removed from the Chat stage by their group members as *Partial Members* and dub those who are eligible to participate in all stages *Full Members*.

3.1.1 Chat Stage

In the CHAT stage, subjects are allowed to communicate with members of their group. In the NO-VOTE portion of a session, all subjects participate in this stage. However, in the VOTE portion of the session, participation in the Chat stage is dependent upon the outcome of the previous period’s VOTE stage. Subjects are allowed to chat about any topic save for their past, current, and future decisions in the experiment¹⁹. Forbidding the discussion of in-game decisions was done both to prevent subjects from coordinating their allocation to the public account and to ensure that chat was seen as a social environment^{20,21}. If a subject has been removed from chat, (s)he can neither send chat messages to their group members nor observe the messages sent by other members of their group. In all periods the chat stage lasts 75 seconds.

3.1.2 VCM Stage

In each period, subjects are provided an endowment of E that can be allocated between two accounts: (1) Public and (2) Private. Each group’s total allocation to the public account is then multiplied by constant (α) and then divided equally among the group members—resulting in a marginal per capita return (MPCR) of (α/n) , with n being the total number of subjects in a group. The payoff for each round (Equation 1) is therefore the portion of their endowment they select to keep in their private account plus their share of the group’s total allocation to the public account.

$$U_i = E_i - X_i + \frac{\alpha}{n} \sum_{i=1}^n X_i \quad \text{Equation 1}$$

¹⁹ Subjects were told they were not allowed to discuss the experiment and that their chat was being monitored. If a subject was found discussing their decisions, they were first warned by an experimenter and if there was a failure to comply with the warning the result would be their removal from the experiment. Although non-compliance was rare, 4 subjects were warned however no subject failed to comply with the warning.

²⁰ In comparison to other experiments with chat, but without forbidden decision discussion, anecdotally we observe a higher incidence of muffled laughter, in-chat jokes, and in chat games (e.g. I spy). Although, this may have led to a loss in anonymity and control, it supports our conjecture that the chat stage was viewed as a social opportunity.

²¹ During chat stages, above the chat box in bold red lettering were the words “Reminder: Do not discuss your decisions”.

In all sessions, each group was made up of 5 subjects with the MPCR is set equal to .3 -implying (α) of 1.5. Each subject is given an endowment (E) of 250 cents. All subjects (in all periods) participate in the VCM stage regardless of the outcome of the Voting stage (if they are participating in the Vote stage). To control for the variable memory of participants, subjects are shown their group members' allocation to the public account in the previous three periods in the current portion of the experiment (VOTE or NO-VOTE)²² as well as each members' status (PARTIAL or FULL).

3.1.3 VOTE

In VOTE periods of the experiment, each subject is shown their allocation decisions in the current period and in the previous 3 periods. Subjects are also revealed the allocation decisions of their group members in the current period (and previous 3 periods), their group's total contribution to the public account (current period), the value of the public account (current period), and their individual earnings (current period). FULL members can then select members of their group who they wish to demote to PARTIAL membership status or promote back to FULL membership status. An individual is demoted to PARTIAL membership status if a strong majority of FULL members select to demote a FULL group member to PARTIAL membership status. The removal threshold of a member from chat stage was 51%. The threshold was the same for adding a member back to the CHAT stage²³ (promotion back to full membership status). Only FULL members participate in the VOTE stage and are eligible to vote²⁴. Subjects that have been removed from chat do not participate in both the chat stage and the vote stage, beginning in the next period.

In NO-VOTE periods, subjects participated in a stage visually identical to the VOTE stage but without buttons that could be used to remove subjects from the Chat Stage.

3.1.4 PAYOFF

At the conclusion of the Vote Stage subjects entered a payoff stage where they are given a history of their earnings in all of the previous rounds as well as current period. If the subject is participating in a VOTE period, the subject is also told whether they have been removed from or added back to the chat stage. At the conclusion of round 20 subjects are also told the randomly selected periods that determine their earnings for the experiment.

3.2 Procedures

The experiment is programmed in Ztree (Fischbacher, 2007). Subjects are randomly selected students enrolled in classes at Florida State University who had not previously participated in a VCM experiment. Subjects are recruited using the ORSEE recruitment system (Greiner, 2003). Each session took place at the Experimental Social Science (XS/FS) lab at Florida State University. Upon being seated randomly, subjects are given instructions. After which, a short quiz is given to ensure subjects understand the game and decision screens. Upon completion of the quiz, subjects are randomly assigned into groups of five.

²² For example, if the subject is participating in period 13 of the session they are only shown each group member's allocation to the public account in periods 12 and 11.

²³ For example, if two subjects in a group have been demoted to partial membership status, it would take at least 2 subjects to vote in favor of promoting a group member back to Full status. Only in the case of a group made up of 2 full members and 3 partial members is unanimity required.

²⁴ To avoid coordination problems in the voting stage, all full members had five potential votes they could cast; one for each member of their group. Only full members could be removed from chat and likewise only partial members could be added back into chat. Full members could see contributions from the current period and last three periods.

They would participate in these groups of five for 10 periods and then are randomly re-matched into new groups of five at the start of period 11²⁵.

3.3 Hypotheses

Hypothesis 1: *On average, contributions to the public account are positive in both VOTE and NO-Vote treatments.* It is well-established subjects participating in VCM experiments make non-zero contributions to the public account.

Hypothesis 2: *Contributions to the public account are greater in the VOTE portion of the experiment, when compared to the NO-VOTE portion.* We believe that removal from communication is a form of social punishment. Even though the punishment does not affect the payoff maximizing Nash Equilibrium of no-contributions to the public good, communication is a catalyst for strengthening group identity and a sense of belonging for each group member.

Hypothesis 3: *Subjects vote to ostracize subjects from the Chat who make low contributions to the public account.* Individuals may develop (through communication) an identity whereby they do not want people of a different set of beliefs (i.e. free-riders) in the same group. As such, if the majority of the groups' members are high contributors, we believe they will 'punish' low contributors by removing them from the social aspect of the game.

Hypothesis 4: *On average, contributions are not as high as previous studies²⁶ (as total percent contribution of social optimum) due to the lack of coordination within communication in our experiment.* Because individuals will not be allowed discuss their future or past decisions, contributions to the public account are less than previous studies with unrestricted chat communication. Although the restricted chat may foster the formation of a group identity—raising contributions—lack of coordination will impose a lower ceiling of contributions as a percentage of social optimum.

Hypothesis 5: *If a subject has been removed from the chat stage they are added back into chat if their contributions increase substantially compared to their contributions in the previous period.* We anticipate group members removing the ostracism punishment in response to an ostracized subject increasing their contribution to the public account.

4 Results

In this section we report findings of the experiment. Each session of the experiment is divided into two parts. In one part (or both parts), subjects can vote to remove group members from the chat stage (VOTE). Likewise, in the other part (or both), all subjects participate in the chat stage (NO VOTE). Regardless of the treatment, groups are randomly re-matched at the start of period 11.

4.1 Contribution to the Public Account

Overall the average contribution to the public account is 120.24 and not significantly different from the average contribution to the public account in either of the two within session treatments (Table 2).

²⁵ Both group number and member number were randomly changed.

²⁶ Isaac and Walker, 1988b; Salley, 1995; Bochet, Page, and Putterman (2006)

Result 1: *Without the ability to coordinate decisions, contributions to the public account are less than what is normally observed in VCM experiments with communication.*

The average contribution to the public account is significantly less than other experiment with communication as seen in Isaac and Walker (1988b), Salley (1995), and Bochet et al. (2006) and is similar to previous VCM experiments without communication, punishment, or endogenous group formation. This is not unexpected. In all sessions, subjects are forbidden discussing their decisions²⁷. By removing the ability to discuss decisions, subjects are unable to coordinate their contributions to the public account; thereby decreasing the incentive to contribute to the public account.

	NO VOTE	VOTE	STAGE 1	STAGE 2
PUBLIC	108.35	129.17	132.95	107.54
	(12.28)	(9.38)	(10.41)	(10.64)
Group clustered standard errors (24, 32, 32, and 32)				

Table 3 presents average public account contributions in each of the stages and voting conditions. Comparing sessions where voting occurs in the first stage of the experiment with session where there is no voting in the second stage, there are no significant differences between public account contributions. However, subjects participating in sessions with potential social ostracism in the second stage make higher contributions to the public account compared to sessions without potential ostracism in the second stage ($P=0.00$).

	NO VOTE	VOTE
STAGE 1	135.61	130.96
	(16.71)	(13.68)
STAGE 2	81.09	127.38
	(14.70)	(13.29)

Figure 2 illustrates a general finding from Table 2; that is, before controlling for the order of VOTE, contributions to the public account are greatest in VOTE parts. Further, the contributions in VOTE stages are first order stochastically dominated by contributions in NO-VOTE parts²⁸. Additionally, Figure 3 and Table 3 show under VOTE conditions, contributions to the public account are no different whether or not VOTE occurs in the second part of the session. Mann-Whitney test results further demonstrate this finding ($Z = .894$).

²⁷ During the instructions, in order to spark conversation, subjects are prompted by the experimenter to discuss Halloween, FSU football, or their favorite foods. All sessions received the same prompts and instructions were given by the same experimenter.

²⁸ 2 sample Kolmogorov Smirnov test. $P=.00$

Figure 1: CDF of Contribution to Public Account by Treatment

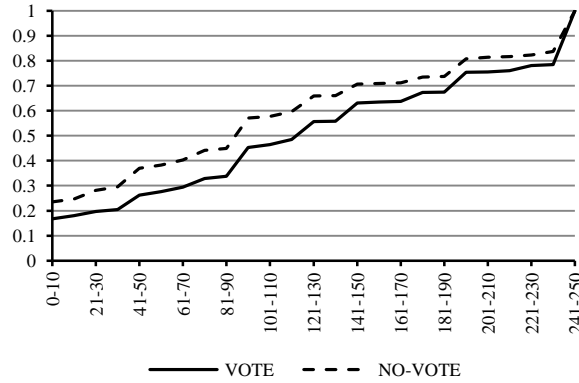


Figure 2: CDF of Contribution to Public Account by Stage of NO-VOTE

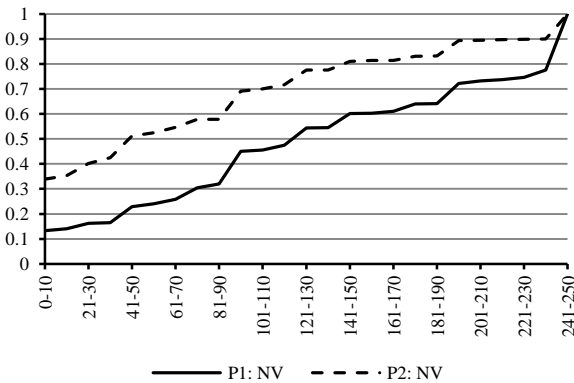
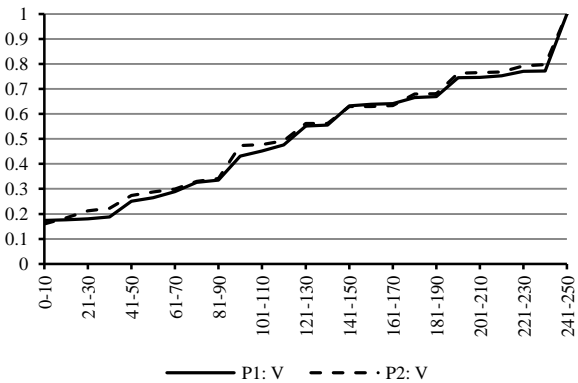


Figure 3: CDF of Contribution to Public Account by Stage of VOTE



Surprisingly, in first stage NO-VOTE, contributions to the public account are not significantly different than first stage VOTE. However, Table 3 and show larger contributions are seen when VOTE is in the second stage when compared to second part NO-VOTE. Further, contributions to the public account in NO VOTE part 2 also first order stochastically dominate (FOSD) those in VOTE stage 2 ($P=0.00$). Mann-Whitney test confirm the result ($Z=9.88$).

Figure 4: CDF of Contributions to the Public Account in Stage 1

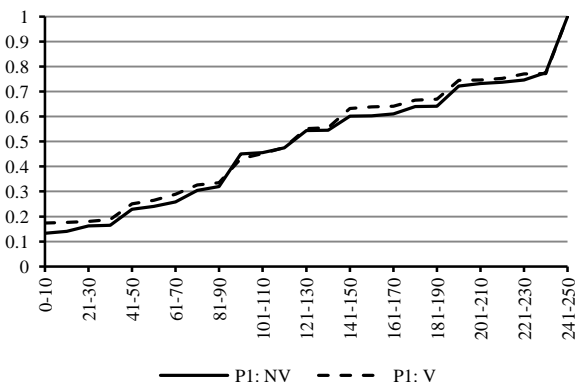
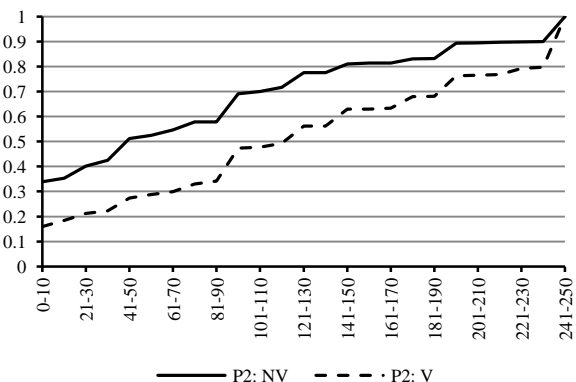


Figure 5: CDF of Contributions to the Public Account in Stage 2



Below, Figure 6 presents the average contribution to the public account in each of the seven sessions by period. As witnessed in typical VCM experiments (and in Table 2), contributions are generally greatest in the early periods of the stage and drop off as the session progresses. Within individual sessions there are modest positive restart effects in period 11, but only in sessions four and six is it significant ($P=0.04$). When pooling sessions by the order of the within session treatments, there are significant increases in contributions to the public account (in period 11) when moving from NO VOTE to VOTE periods ($P=.00$) as well as when moving from VOTE to NO-VOTE ($P=.04$).

Figure 6: Average Contribution to Public Account by Session

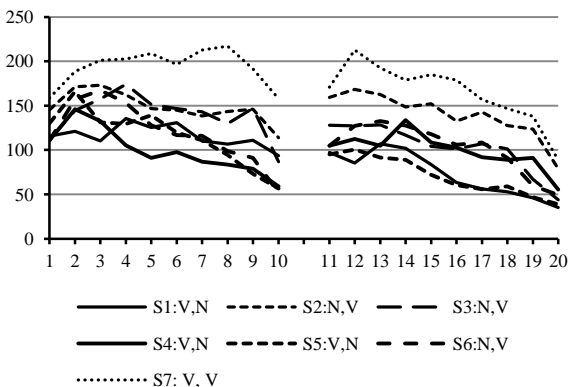


Figure 7: Average Contribution to Public Account by Treatment

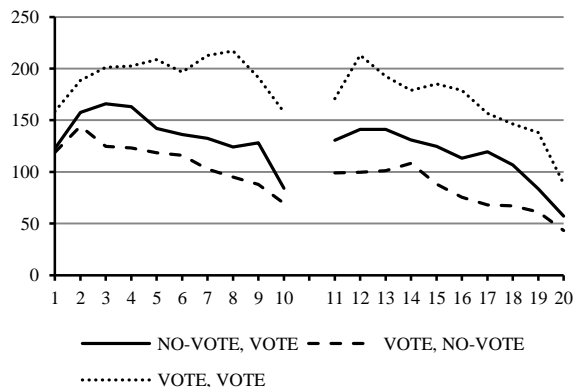


Figure 7 presents contributions to the public account by the within session treatment. Initial contributions at the start of the second stage (period 11) are significantly greater in sessions with possible ostracism in comparison to sessions without ostracism in period 11.

	VOTE	NO VOTE
STAGE 1	91(177)	52(133)
STAGE 2	93(160)	165(59)
LOWER LIMIT (UPPER LIMIT)		

In VOTE stages, there are more instances of zero contributions in part 1 and fewer contributions of 250 when compared to stage 2 VOTE; however these differences are not significant. The opposite of this is seen in NO-VOTE. Contributing nothing to the public account is significantly more common in second stage NO-VOTE and FULL contribution is substantially more common in stage 1.

Result 2: *Experience with a VCM without the potential ostracism in the first part leads to fewer instances of zero contributions to the public good and greater number of full contributions in comparison to the reverse order.*

Comparing the diagonals in Table 4, we find when NO-VOTE occurs in the first stage subjects are less likely to make contributions of zero in VOTE stage 2 and are more likely to contribute their entire endowment to the public account in comparison to subjects in sessions where VOTE occurred in stage 1.

	CONTRIBUTION
TREATMENT 1: VOTE, NO-VOTE	95.59 (10.19)
TREATMENT 2: NO-VOTE, VOTE	125.24 (11.44)
TREATMENT 3: VOTE, VOTE	179.23 (8.51)
Group clustered standard errors in parentheses(24)	

Table 5 generalizes the result seen in Table 4. The average contribution to the public account is significantly greater in treatment 2.

4.1.1 Regression Results: Allocation to the Public Account

In Table 7 , we first present regression results predicting individual i 's allocation to the public account (PUBLIC) in period t of stage x . We use five models, each of which is a pooled tobit. We drop the first period in VOTE and NO VOTE stages due to the use of lagged dependent variables as explanatory variables. When we exclude periods 1 and 11, we observe 383 observations at the lower threshold (0) and 488 observations at the upper limit. Reported standard errors are clustered on group (56).

Variable descriptions are as follows: LAGPUBLIC is subject i 's contribution to the public account in the previous period. STAGE1VOTE is a dummy variable that is equal to one if subject i is participating in a

session where ostracism is possible in stage 1. Likewise, STAGE2VOTE is a dummy variable; equal to 1 if ostracism is possible in stage 2. STAGE2 is a dummy variable that is equal to one if the subject is participating in the second stage of the session. PERIODS is period in stage and ranges between 2 and 10. REMOVED is dummy variable that is equal to one if the subject was voted out of the chat in the previous period (or has PARTIAL membership status). ADDED is also a dummy variable that indicates whether or not a subject has been added back into the chat stage (promoted to FULL membership status). If a subject has been added back into the chat stage ADDED takes a value of one; zero if otherwise. MESSAGES is the number of chat messages subject i sent their group mates in the chat stage, in a given period. OUT is the number of PARTIAL members in subject i 's group. Summary statistics for each of the variables can be found in Table 6.

	OBS	AVERAGE	STD. DEV	MIN	MAX
PUBLIC	2520	119.77	90.68	0	250
LAGPUBLIC	2520	125.60	87.41	0	250
STAGE1VOTE	2520	0.29	0.45	0	1
STAGE2VOTE	2520	0.29	0.45	0	1
STAGE2	2520	0.5	0.50	0	1
PERIODS	2520	6	2.58	2	10
REMOVED	2520	0.04	0.20	0	1
FORGIVEN	2520	0.004	0.06	0	1
MESSAGES	2520	3.29	2.36	0	19
OUT	2520	125.60	87.41	0	2

As can be expected an individual's own contribution to the public account in the previous period is significant and positive.

Result 3: *Contributions to the public account are significantly less in the second stage of the experiment.*

In all regressions, contributions to the public account are significantly greater in the first stage of the experiment. This result is not surprising as average contributions were previously seen to be less in the second stage of the session regardless of the potential for ostracism. Contributions further decrease as the stage (and session) advances.

Result 4: *Potential social ostracism has a significant effect on contributions to the public account but only in the second stage of the session.*

In none of the presented regressions does the potential for social ostracism in the first stage have an effect on the contributions to the public account. However, in all five of the regressions, potential social ostracism has a significant positive effect on contributions; if the possibility of social ostracism occurs in the second stage of the experiment²⁹. The unusual relationship between the two variables may have

²⁹ Contributions to the public account are substantially greater in session 7-indicating a possible session effect. We don't have a reason why there would be a session effect for this particular session, but it was observed that before the session the participants were more talkative while waiting outside for us to begin seating for the experiment in

multiple roots. First, ostracism in our experiment only arises naturally. During the instructions portion of the experiment subjects are never explicitly told they may punish a group member-for not contributing to the public account -by removing them from chat³⁰. As such, the reasoning behind removing someone from chat only becomes well known until after an individual has experience with free riders (or as one). That is, for example, until a large number of subjects realize they can be punished for free riding and/or realize voting someone out of the social aspect of the experiment is punishment, ostracism cannot be a form non-monetary punishment. Since subjects successfully ostracize group members more often in the second stage of the experiment we suspect this to be the case³¹. Alternatively, a status quo for an adequate amount to contribute to the public account may be developed in the first stage of the experiment but may only be enforced in the second stage. In this case, the use of social ostracism as punishment would not directly serve as an instrument to increase contributions to the public account, but instead as means to enforce an existing social norm.

	M1	M2	M3	M4	M5
LAGPUBLIC	0.95*** (0.06)	0.93*** (0.06)	0.93*** (0.06)	0.92*** (0.06)	0.92*** (0.06)
STAGE1VOTE	-2.64 (12)	-1.66 (12.29)	-1.52 (12.28)	-4.36 (12.42)	-2.93 (12.37)
STAGE2VOTE	20.98* (11.61)	24.11** (11.86)	23.96** (11.87)	24.24** (11.77)	27.97** (12.37)
STAGE2	-29.56** (13.36)	-30.2** (13.56)	-30.2** (13.55)	-34.02** (13.67)	-34.2** (13.67)
PERIODS	-7.34*** (0.76)	-7.27*** (0.76)	-7.24*** (0.76)	-7.47*** (0.76)	-7.32*** (0.77)
REMOVED	-	-26.64*** (9.68)	-37.04*** (10.87)	-25.91** (10.97)	-17.08 (12.62)
ADDED	-	-	95.66** (37.92)	96.89*** (37.74)	99.62*** (36.86)
MESSAGES	-	-	-	3.68*** (1.05)	3.85*** (1.03)
OUT	-	-	-	-	-10.11+ (6.57)
CONSTANT	56.28*** (10.81)	57.92*** (10.86)	57.86*** (10.88)	50.85*** (11.08)	49.69*** (11.11)
SIGMA	88.6	88.44	88.25	87.87	87.8

comparison to other sessions of the experiment. If we re-estimate the regressions in table 7 and withhold observations from session seven, STAGE2VOTE is marginally significant in 4 out of the five regressions with similar point estimates. Adding a dummy variable for session seven results in insignificant coefficient estimates for STAGE2VOTE, however point estimates are similar.

³⁰ The word punishment is also never used. Doing so we believe helped prevent experimenter demand effects

³¹ There are 25 instances of a subject being voted out of the chat stage; 18 of which occur in the second stage.

	(4.87)	(4.87)	(4.85)	(4.86)	(4.87)
LOG. L.	-10459.9	-10456.5	-10451.6	-10442.3	-10440.2
OBS.	2520	2520	2520	2520	2520
Group clustered standard errors in parentheses (56)					
***p≤.01, **p≤.05, *p≤.1, and +p≤.15					

Result 5: *Being socially ostracized significantly decreases own contribution to the public account.*

In four of the five regressions³², the coefficient estimate measuring the effect of individual social ostracism is significant and negative-when subjects are socially ostracized their contributions to the public account decline. We conjecture ostracized group members may be decreasing their contributions to the public account in an effort to counter punish the group for ostracizing them. Such a counter punishment is potentially powerful because it may lead to a break down in any coordination that has arisen tacitly over the stage. Another possibility is that being socially ostracized increases social distance between group members who have been removed from chat and those that remain in chat. This increased social distance between FULL and PARTIAL members may lead to the ostracized withholding larger portions of their endowment because of a feeling of not belonging to the group.

Result 6: *Subjects who are voted back into the chat stage by group mates contribute significantly greater amounts to the public account in comparison to subjects who remain ostracized.*

Although subjects who have been removed from the chat stage contribute less to the public, subjects added back into the chat stage contribute significantly greater amounts to the public good in comparison to subjects who remain ostracized³³. We conjecture that after suffering for a period(s) of ostracism some PARTIAL group members increase their contributions to the public account as a signal of tacit cooperation. In total, 10 of the 25 subjects who are demoted to PARTIAL group member status are upgraded back to FULL membership status³⁴.

Result 7: *Subjects with a comparatively high chat volume contribute significantly greater amounts to the public account.*

Sending messages to group members is significant and positively correlated with contributions to the public account in all regressions. Subjects who chat more with their group members make significantly greater allocations to the group's shared account. Hypothetically, this result may simply be an artifact of ostracism itself; those who have been socially ostracized cannot send any messages and at the same time make significantly lower contributions to the public account when compared to FULL group members.

We do not think this is the case. In Table 8 we present regression results predicting contributions to the public account for group member who have not been ostracized. In the first of the three regressions (M6), we find the number of messages a subject sends in given period is positively correlated with amount they

³² We suspect the high correlation between the OUT and REMOVED is the cause of the lack of significance on REMOVED in

³³ There is obvious reverse causality taking place with the ADDED independent variable which we will discuss later. We use this variable to control for the difference between contributions to the public account between subjects that remain PARTIAL members and those that are promoted back to FULL membership status.

³⁴ In only two instances is a subject promoted back to FULL membership status in the first stage of the experiment.

contribute to the public account and is significant at a 1 percent level, even after omitting PARTIAL group members.

There are three possibilities for this relationship. First, it may be that those who have a higher volume of chat also bring with them a greater propensity to contribute to the public account. I.e. there may be some underlying individual trait that is driving the result. Second, when an individual has a high volume of chat in given period, it may indicate that the group was having a relatively active conversation in general; leading to decreased social distance and resulting in an increase in pro-social contributions. Last, it may be that cumulative chat shortens social distance and thereby leads to relatively more pro-social behavior in the form of increased contributions to the public account.

The latter two explanations do not seem to explain the observation. When we use the group’s total lines of chat in a given period (PERIODMESSAGES) as an explanatory variable (see M7 in Table 8) and the group’s cumulative lines of chat (see M8 in Table 8) up to a given period (TOTALMESSAGES), only PERIODMESSAGES turns out to be statistically significant. However, when we use MESSAGES, PERIODMESSAGES and TOTALMESSAGES (see M9 in Table 8) as independent variables, we find only MESSAGES remains significant and at the 1 percent level. This suggests relatively more “chatty” subjects have a greater propensity to behave in a more pro-social manner in the form of higher contributions.

Table 8: Regression Results (FULL Group Members)				
Dependent Variable: Contribution to the Public Account				
	M6	M7	M8	M9
LAGPUBLICS	0.93*** (0.06)	0.93*** (0.06)	0.94*** (0.06)	0.92*** (0.06)
STAGE1VOTE	-4.21 (12.48)	-4.94 (12.51)	-1.71 (12.25)	-5.29 (12.51)
STAGE2VOTE	24.13** (11.8)	25.61** (11.72)	21.87+ (13.53)	23.16* (13.54)
STAGE2	-33.94** (13.7)	-35.33*** (13.69)	-28.74** (14.49)	-34.12** (14.7)
PERIODS	-7.47*** (0.8)	-7.46*** (0.81)	-6.5*** (1.48)	-6.94*** (1.49)
MESSAGES	3.59*** (1.08)	-	-	3.07*** (0.98)
PERIODMESSAGES	-	1.02** (0.48)	-	0.38 (0.48)
TOTALMESSAGES	-	-	-0.02 (0.03)	-0.01 (0.03)
CONSTANT	50.48*** (11.35)	46.3*** (12.78)	57.61*** (11.14)	47.58*** (12.85)
SIGMA	88.79631 (5.1)	88.89749 (5.09)	89.15062 (5.08)	88.75484 (5.09)
GROUPS	56	56	56	56
LOG L.	-10071.605	-10075.73	-10079.101	-10070.396

OBS	2417	2417	2417	2417
Group clustered standard errors in parentheses (56)				
***p≤.01, **p≤.05, *p≤.1, and +p≤.15				

4.2 Demotion to PARTIAL Membership and Promotion to FULL Membership

Social ostracism is rare in our experiment; there are 25 instances of a subject being voted out of the chat (103 total periods of ostracism suffered). However 671 total votes for ostracism are cast. 293 votes in favor of ostracism are cast when potential ostracism occurs in the first stage; 378 votes occur when there is potential ostracism in the second stage. Predictably, the average contributions of ostracized subjects are significantly lower than FULL group members (Table 9).

Regardless of the order of the within session treatment, FULL group members contribute significantly greater amounts to the public account than ostracized group members. Generally FULL members contribute equal amounts in the first stage of the experiment while PARTIAL members contribute less (at marginally significant level³⁵).

	PARTIAL	FULL
STAGE 1	34.71 (15.82)	134.84 (14.15)
STAGE 2	41.38 (12.88)	135.89 (13.17)
ALL	39.37 (9.93)	135.35 (9.53)

Group clustered standard errors (32)

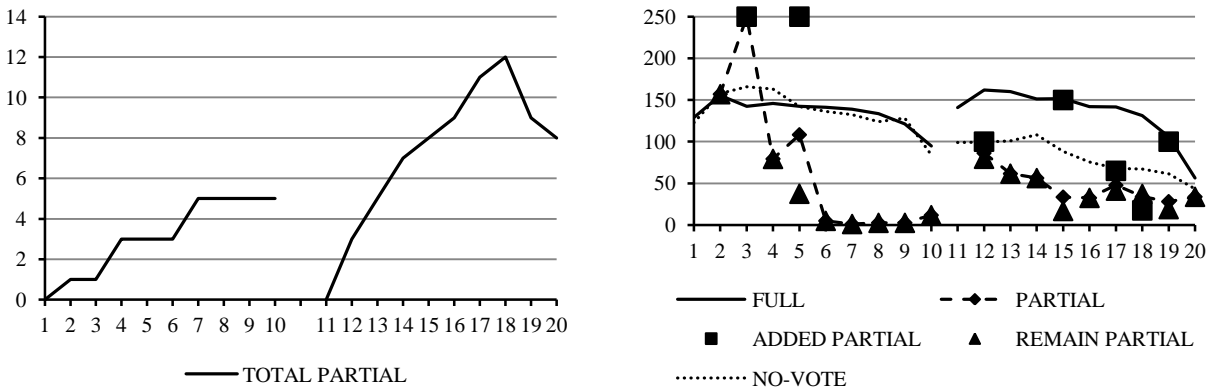
When VOTE is in the first stage, 7 subjects are voted out of the chat group; 18 subjects are ostracized when VOTE occurs in the second stage. Figure 8 presents the number of subjects that are ostracized by period and suggests groups are more successful removing group members from the chat stage when VOTE occurs in the second stage. Although votes in favor of promotion of a PARTIAL member back to FULL membership status are rare, it is not unexpected³⁶. There are 97 votes in favor of promoting a removed group member back into the chat stage: 26 occur in stage 1 VOTE and 71 occur in stage 2 VOTE.

Figure 8: Total Number of Ostracized Subjects by Period

Figure 9: Average Contribution to Public Account by Membership Status

³⁵ Mann Whitney Test (Z=1.66).

³⁶ Votes for promotion are only possible if a subject is removed. Further, subjects typically respond to ostracism with a decrease in their contribution to the public account.



The dynamics of the contributions to the public account are also interesting- especially when comparing the contributions of PARTIAL members in the first and second stage of the experiment. Although there is no difference in the total average contribution between PARTIAL members in the two stages, PARTIAL members generally contribute non-zero amounts more often later in the experiment. In addition, FULL members contribute greater amounts to the public account in the second stage VOTE conditions than both PARTIAL members in second stage vote and the average contribution in second stage NO-VOTE (Figure 9). Also we find contributions, by PARTIAL group members who are subsequently promoted back to FULL membership status, generally are greater than those who remain partial members. The comparatively larger contributions made by FULL members in second stage VOTE may be in part due to the ostracized subjects maintaining positive contributions in second stage VOTE, thus allowing the tacit cooperation-achieved in the first stage- to continue into the second stage. Also since subjects see their group members' membership status and contributions to the public account, it may be the example of seeing what contributions result in punishment is keeping contributions relatively higher in second stage VOTE. Since there are fewer instances of ostracism in VOTE stage 1, there are also fewer examples to shape the decisions of FULL members in VOTE stage 1.

4.2.1 Regression Results: Vote to Ostracize

In Table 10, using a pooled probit we predict the probability a group member will cast a vote to remove a fellow group member from the chat stage. We present five regressions and exclude observations where it would be impossible for a group member to cast a removal vote (i.e. if the member casting the vote themselves has been ostracized, if member the member has already removed, or if the subject is in the NO VOTE stage). Standard errors are clustered at the group (32)³⁷.

DIFF is the difference between a subject's contribution to the public account and a group member's contribution. DIFFS1 and DIFFs2 are the same variables as DIFF only re-specified to indicate what stage the experiment is in³⁸. MIN is dummy variable that is equal to one if the subject's group member contributed the least to the public account of FULL members in the group. MINS1 is MIN if in stage 1 while MINS2 is MIN if in stage 2. MESSAGES are the number of messages the group member sent during the chat.

³⁷ Clustering standard errors at the subject level does not change results significantly. Because there are fewer groups we conjecture our estimates are relatively more conservative.

³⁸ DIFFS1 is the difference between a subject's contribution to the public account and a group member's contribution if the subject is in stage 1. DIFFS2 is similar, but applies to stage 2.

Table 10: Regression Results							
Dependent Variable: Vote to Ostracize							
	M10	M11	M12	M13	M14	M15	M16
DIFF	0.76*** (0.23)	-	-	-	-	-	-
DIFFS1	-	-	0.50+ (0.34)	-	0.09 (0.35)	0.05 (0.37)	0.04 (0.36)
DIFFS2	-	-	1.08*** (0.20)	-	0.63*** (0.19)	0.68*** (0.23)	0.66*** (0.23)
MIN	-	.75*** (.09)	-	-	0.63*** (0.09)	-	-
MINS1	-	-	-	.71*** (.11)	-	0.68*** (0.13)	0.66*** (0.13)
MINS2	-	-	-	.80*** (.11)	-	0.59*** (0.11)	0.61*** (0.11)
MESSAGES	-	-	-	-	-	-	-0.047*** (0.02)
CONSTANT	-1.363*** (0.08)	-1.62 *** (.10)	-1.37*** (0.08)	-1.62*** (.10)	-1.59*** (0.09)	-1.60*** (0.10)	-1.43*** (0.10)
OBS	7143	7143	7143	7143	7143	7143	7143
Log L	-2135.00	-2061.56	-2123.50	-2060.61	-2040.16	-2039.48	-2028.22

Group clustered standard errors in parentheses (32)
***p≤.01, **p≤.05, *p≤.1, and +p≤.15

In all five regressions there is a highly significant (and negative) correlation between a group member's contribution to the public good and other group members' vote to ostracize. Generally, group members who contribute less to the public account have an increased probability of having a vote cast in favor of their ostracism. We argue that this occurs from a general desire to punish free riders for low contributions to the public good and implies subjects view social ostracism as mechanism to punish free riders.

Result 8: *Low contributing group members face an increased likelihood of having a vote cast in favor of their ostracism.*

In Table 10, M1 indicates a significant positive relationship between the likelihood an individual will vote to ostracize a group member and the difference between the subject's own contribution and the group mate's contribution to the public account. That is, subject i is likely to vote in favor of removing a subject from chat if they contributed a greater amount to the public account than the other FULL group member. Furthermore, M2 also shows that subjects are more likely to vote in favor of removing FULL group members who contributed the least to the public account.

Result 9: *Regardless of whether the subject is participating in periods 1-10 or 11-20, subjects vote in favor or removing the FULL group members who contribute the least to the public account.*

In Table 10, M2 presents evidence that full group members are more likely to vote in favor of removing group members who contribute the least among full group members. Moreover, regardless of the stage of

the experiment, subjects tend to vote in favor of ostracizing the FULL group member who contributes the least to the public account and moreover this effect is the same, regardless of the stage of the experiment.

Result 10: *Voting behavior is more sensitive to individual differences in the contribution to the public account in the second stage VOTE.*

M3, M4, M5, and M6 show that there is a differential in the voting behavior in VOTE stage 1 and VOTE stage 2 by FULL group members. Although all models indicate that the FULL group member who contributed the least to the public account has an increased likelihood of receiving votes cast in favor of their removal (regardless of the stage of voting) subjects in second stage VOTE are more sensitive to the individual differences between their own contribution to the public account and their group mates' contributions in comparison to the first stage VOTE. That is, subjects in first stage VOTE are more likely to vote in favor of ostracizing only the FULL group member who contributes the least to the public account. But in second stage VOTE, subjects are more likely to vote in favor of ostracizing any group member who contributes less than themselves. This difference in voting behavior between the two stages not only explains why more votes are cast in second stage (and result in more instances of ostracism), but also partially explains why contributions are greater in second stage VOTE; the relatively more liberal application of punishment leads to greater contributions to the public account.

Result 11: *The volume of chat a group member sends during the chat period has a significantly positive impact on an individual's group members' decisions to vote in favor of their ostracism.*

We would expect there to be no relationship between the number removal votes a subject receives and the number of messages they send in a given period. We conjecture this result is being driven by the increased non-monetary cost of removing an active member of the chat stage. The chat stage may be perceived as more pleasant by FULL members if the stage is more energetic. As such, the reasoning behind not removing an active member may boil down to a simple cost benefit analysis by FULL members: the utility loss generated by removing an active member from the chat stage is not worth expected gains (monetary and non-monetary) of their removal. Alternatively, subjects with high chat volume may have effectively shortened the social distance between themselves and their group mates, allowing more lenient enforcement of a tacit social norm. As we have no evidence of either of these two conjectures, both are pure speculation.

Table 11: Regression Results:	
Dependent Variable: ADDED	
	M10
PUBLIC/250	2.18*** (.59)
STAGE2	.63*** (.28)
COSTANT	-2.33*** (.32)
OBS	103
LOG. L	-26.70

Group clustered standard errors in parentheses⁴⁰ (14)
***p≤.01, **p≤.05, *p≤.1, and +p≤.15

In Table 11 we predict the probability a PARTIAL group member will be promoted back to FULL membership⁴¹. We find that subjects who are voted back into the chat stage make higher contributions to the public account in comparison to subjects who remain partial members. We also find PARTIAL members are significantly more likely to be voted back into the chat stage if VOTE occurs in the second stage of the experiment. This second result is likely an artifact, due to the larger instances of ostracism in second stage VOTE.

5 Discussion

We find evidence supporting hypothesis 1. Contributions to the public account are significantly positive in all sessions. We find contributions in all treatments are not as great as seen in previous VCM experiments with unrestricted communication-supporting hypothesis 4. It seems therefore that much of the increased contributions in VCM experiments with unrestricted communication generally arise from the coordination of strategies/decisions rather than shortened social distance.

We find partial support for hypothesis 2. Although, there may be some positive effect on contributions to the public account when there is the potential for social ostracism, it seems to only occur after experience in a VCM. Evidence also indicates that after subjects are demoted from FULL to PARTIAL membership status, they further reduce their contributions to the public account. Because group members are more apt to vote in favor of removing group members contributing less than themselves in second stage VOTE, there are predictably more instances of social ostracism in second stage VOTE. Although, this helps maintain the relatively high contributions by FULL members, because PARTIAL members further reduce their contributions to the public account with each passing period of ostracism, the average contribution to the public account declines. Additionally, there is also evidence suggesting a positive relationship between the total number of FULL members in a group and the average contribution to the public account.

Generally, we find that subjects will vote in favor of ostracizing low contributors; but it is impossible to tell whether this act is punishment for low contributions⁴². Moreover FULL members who contribute the least of the other FULL members in their group generally experience an increase in the expected number of votes in favor of their demotion and thus present evidence supporting hypotheses 3. We also find evidence in support of hypothesis 5. PARTIAL members who increase their contribution to the public account have an increased probability of being promoted back to FULL membership status.

We also find individual chat volume sent during a given period is significant and positively correlated with an individual's contribution to the public account. That is, subjects who are more "chatty", generally

⁴⁰ 14 groups removed a subject from the chat stage.

⁴¹ PUBLIC/250 is the proportion of subject i 's endowment that they contributed to the public account. As we are using a limited dependent variable model, this was done to prevent presenting regression results with significant coefficient estimates of zero.

⁴² It easy to imagine a scenario where one would use ostracism to prevent themselves from "blowing up" at another person.

behave in a more social manner. Although surprising, we conjecture individuals who have a greater propensity to chat with group mates also possess innate trait that tends to positively influence pro-social behavior; in this case, manifesting itself in the form of increased contributions to a public account. Further we find cumulative chat has no significant impact on behavior.

Chat also seems to play a significant role in predicting voting behavior. Subjects who chat more often are less likely to receive votes in favor of their ostracism—even after controlling for their allocation to the public account. We believe subjects who chat more frequently increase the non-monetary utility of group mates in the chat stage and effectively allow them to withhold greater amounts in their public account in comparison to their relatively more tongue-tied group mates. At the margin, a quiet group member who contributes less to the public account may be perceived as being not part of the group. As such, voting to remove a quiet low contributor from the chat stage may be deemed more acceptable. In the chat stage, the absence of a quiet low contributor would have a substantially smaller impact on group dynamics than a verbose low contributor.

6 Conclusions

Contributions to a public account with restricted communication are lower as a percent of social optimum compared to other linear VCM studies (see Isaac and Walker, 1988b among others) with unrestricted communication. However implicit in unrestricted communication is the ability to coordinate with group members. When communication is restricted to topics not pertaining to individual in-game decisions, we find a dramatic decrease in pro-social behavior; suggesting that much of the efficiency gains from communication come largely from the coordination of strategies.

We find, as in Nikiforakis (2010) and Hirshlifer and Rasmusen (1989), ostracized subjects may be counter-punishing those they deem responsible for their punishment—resulting in a decrease in the average contribution to the public account. Alternatively, the increased social distance created by ostracism may lead to an increase in perceived social distance by the ostracized. Possibly, as a consequence of increased social distance, contributions decline.

Social ostracism seems to be an effective punishment mechanism once subjects have experienced participating in a VCM. The lack of efficiency gains in a VCM with ostracism in the first 10 periods is likely due to the differential application of punishment. When there is potential ostracism in the first stage of the experiment, subjects typically vote to remove only the lowest contributing FULL group member. However, in second stage VOTE, subjects are significantly more likely to vote in favor of ostracism for any group member who makes an allocation decision less than themselves. At the same time, any subject who contributes the least of FULL members is equally likely to receive votes in favor of their removal if in first or second stage VOTE. This results in a comparatively more liberal application of punishment in second stage VOTE. Unfortunately (from an efficiency standpoint) this also results in decreased contributions to the public account from subjects who have been removed from chat; thus attenuating much of the gains of social ostracism.

7 References

- [1] Ahn, T.K., Isaac, R.M., and Salmon, T.C., "Endogenous Group Formation." *Journal of Public Economic Theory*, Vol. 10, No. 2, (2008), pp 171-194.
- [2] Ahn, T.K., Isaac, R.M., and Salmon, T.C., "Coming and Going: Experiments on Endogenous Group Formation for Excludable Public Goods." *Journal of Public Economics*, Vol. 9, (2009), pp. 336-352.
- [3] Baumeister R.F, Leary M.R. "The need to belong: desire for interpersonal attachments as a fundamental human motivation." *Psychological Bulletin*, Vol. 117, (1995) pp.:497–529.
- [4] Bochet, O., Page, T. and Putterman, L., "Communication and Punishment in Voluntary Contribution Experiments." *Journal of Economics Behavior & Organization*, Vol. 60, No. 1, (2006), pp. 11-26.
- [5] Boehm, C., Hierarchy in the Forest: The Evolution of Egalitarian Behavior. Harvard University Press, Cambridge (1999).
- [6] Brekke, K., Hauge, K., Lind, J. and Nyborgm, K., "Playing with the Good Guys: A Public Good Game with Endogenous Group Formation." *Journal of Public Economics*, Vol. 95, No. 9, (2011) pp. 1111-1118.
- [7] Bolton, Gary E. and Ockenfels, Axel. "ERC: A Theory of Equity, Reciprocity, and Competition." *American Economic Review*, March 2000, 90(1), pp. 166-93.
- [8] Brosig J., Ockenfels, A., and Weimann, J., "The effect of communication media on cooperation." *German Economic Review*, 4 (2003), pp. 217–242.
- [9] Cinyabuguma, M., Page, T. and Putterman, L., "Cooperation Under the Threat of Exclusion in a Public Goods Experiment." *Journal of Public Economics*, Vol. 89, No. 4, (2005), pp. 1421-1435.
- [10] Charness et al "Public Goods Provision with Voting for Exclusion, Exit, and Mergers: An Experiment." Working Paper 2008 UCSB.
- [11] Chen, Y. and Li, Sherry Xi, "Group Identity and Social Preferences." *American Economics Review*. Vol. 99, No. 1, (2009), pp. 431-457.
- [12] Durkheim, E., The Division of Labor in Society. Free Press, New York (1933).
- [13] Ertan, A., Page, T. and Putterman, L., "Who to Punish? Individual Decisions and Majority Rule in Mitigating the Free Rider Problem." *European Economic Review*, Vol. 53, No. 5, (2009), pp. 495-511.
- [14] Fehr, E. and Gächter, S., "Cooperation and Punishment in Public Goods Experiments". *American Economic Review*, Vol. 90, No. 4, (2000), pp. 980-994.
- [15] Fehr, E., Fischbacher, U. and Gächter, S., "Strong reciprocity, human cooperation and the enforcement of social norms." *Human Nature*, **Vol. 13**, (2002), pp. 1–25.
- [16] Frey, B. and Oberholzer-Gee, F., "The cost of price incentives: an empirical analysis of motivation crowding out." *American Economic Review*, **Vol. 87**, (1997), pp. 746–755.
- [17] Fischbacher, U. 2007. "Zürich toolbox for readymade economic experiments." *Experimental Economics*, **10** (2007), pp. 171–178.
- [18] Greif, A., Milgrom, P., and Weingast, B., "Coordination, Commitment, and Enforcement: The Case of the Merchant Guild." *Journal of Political Economy*, Vol. 201, No. 4, (1994), pp.745-776.
- [19] Hirshlifer, D. and Rassmusen, R., "Cooperation in a Repeated Prisoners' Dilemma with Ostracism." *Journal of Economics Behavior & Organization*, Vol. 12, No. 1, (1989), pp. 87-106.

- [20] Isaac, R.M. and Walker, J., "Group Size Effects in Public Goods Provision: The Voluntary Contributions Mechanism," *The Quarterly Journal of Economics*, Vol. 103, No. 1, (1988), pp.179-199.
- [21] Isaac, R.M. and Walker, J., "Communication and free-riding behavior: the Voluntary Contributions Mechanism." *Economic Inquiry*, Vol. 26, No. 4, (1988), pp.585-608.
- [22] Isaac, R.M. Thomas, S.H. and Walker, J., "Divergent Evidence on Free Riding: An Experimental Examination of Possible Explanations." *Public Choice*, Vol. 43, No. 2 (1984), pp. 113-149.
- [23] Kroll, S., Cherry, T. L. and Shogren, J. F., "Voting, Punishment, and Public Goods." *Economic Inquiry*, Vol. 45, (2007), pp. 557–570.
- [24] Maier-Rigaud, F.P., Martinsson, P. and Staffiero G., "Ostracism and the Provision of a Public Good: Experimental Evidence." *Journal of Economics Behavior & Organization*, Vol. 73, No. 3, (2010), pp. 387-395.
- [25] Masclet, D. Noussair, C., Tucker, S., and Villeval, M., "Monetary and Nonmonetary Punishment in the Voluntary Contributions Mechanism", *American Economic Review*, Vol. 93, No. 1, (2003), pp. 366-380
- [26] Nikiforakis, N., "Feedback, Punishment and Cooperation in Public Good Experiments." *Games and Economic Behavior*, Vol. 68, No. 2, (2010), pp. 689-702.
- [27] Noussair, C., and Tucker, S., "Combining Monetary and Social Sanctions to Promote Cooperation", *Economic Inquiry*, Vol. 43, No. 3. (2005), pp. 649-660
- [28] Olson, M. The Logic of Collection Action: The Theory of Public Goods and Groups. Harvard University Press, 1971.
- [29] Page, T., Putterman, L. and Unel, B., "Voluntary Association in Public Goods Experiments: Reciprocity, Mimicry and Efficiency." *The Economic Journal*, Vol. 115, No. 506, (2005) pp.1032-1053.
- [30] Salley, D., "Conversation and Cooperation in Social Dilemmas: A Meta-Analysis of Experiments from 1958 to 1992." *Rationality and Society*, Vol. 7, No. 1, (1995), pp. 58-92.
- [31] Smith, E.R., Murphy, J. and Coats, S. "Attachment to Groups: Theory and Measurement." *Journal of Personality and Social Psychology*, Vol. 77, (1999), pp.94-110.
- [32] Sommer K. L., and Williams, K. D., "Social Ostracism by Coworkers: Does Rejection Lead to Loafing or Compensation?" *Personality and Social Psychology Bulletin*, Vol. 27, No. 7, (1997), pp. 693-706.
- [33] Wiessner, P., "Norm enforcement among Ju/'hoansi bushmen. A case of strong reciprocity?" *Human Nature*, **Vol. 16**, (2005), pp. 115–145.
- [34] Williams, K.D., Cheung, C.K.T., and Choi, W., "Cyberostracism: effects of being ignored over the Internet." *Journal of Personality and Social Psychology*", **Vol. 79**, (2000), pp. 748–762.
- [35] Williams, K.D., Ostracism: The Power of Silence. Guilford Press: New York, NY. 2001