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Obedience to Rules with Mild Formal Sanctions: The Roles of Informal Sanctions and Voting

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Governments sometimes promote rules backed by sanctions too weak to make obedience privately optimal. Factors that may help make such rules effective include the presence of informal sanctions by peers, and implementation through voting. I study the impact of non-deterrent formal sanctions on voluntary contributions to a public good in a laboratory experiment. I find that informal sanctions strengthen the effect of formal ones in most conditions. Specifically, in this finitely repeated game, there are flat trends or upward trends when both formal sanctions and informal sanctions are present. This might be due to the fact that the low-contributors were punished by their peers for every point they contributed less than the group average. However, voted implementation of a non-deterrent formal sanction has no significant effect on contribution in my data.

Keywords: experiment, voluntary contribution, formal sanctions, peer-to-peer punishment, voting
JEL classification: C91, C92, D78, H41

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1 Introduction

Possibly the most common tool used to induce people to follow laws and fulfill legal requirements, such as paying taxes or not throwing trash on the street, is threatening non-compliers with pecuniary sanctions such as fines or penalties. The sanctions imposed are rarely sufficient on their own to ensure compliance, given the low probability of detection and consequent difficulties in enforcement. Two likely reasons why many people comply with such mildly enforced laws, nonetheless, are (a) the fear that others who agree with the rationale behind the laws are willing to impose informal sanctions, including forms of social disapproval, on those who violate them, and (b) that selection of the laws and penalties by vote builds support for them and/or imbues them with moral authority. The impact of voting and of the fear of informal sanctions may also interact, if majority vote outcomes raise the perceived likelihood that others will impose informal sanctions when rules are violated.

In this paper, I define formal sanctions (FS) as centrally administered fines and penalties. I define informal sanctions (IS) as punishment administered horizontally by peers. I focus on non-deterrent formal sanctions (NFS) which refer to formal sanctions too weak for a selfish and rational individual to obey. People's responses to FS and to IS has been studied under controlled conditions in numerous laboratory decision-making experiments [see Gächter and Herrmann (2009) and Chaudhuri (2011) for reviews on informal sanctions].[1] The effects of combining IS and FS, and the effects of voting on the impact of NFS, have only recently begun to be studied, however. Andreoni and Gee (2011) study the coexistence of FS and IS. They observe a full 2×2 set of combinations with and without informal sanctions and with and without formal sanctions. They let the use or not of formal sanctions be determined endogenously by the subjects. However, the authors deal only with a deterrent formal sanction, so the idea that IS might be complementary to FS makes little sense in their setting (deterrent FS should in principle be self-sufficient). In line with this, their interpre-

[1] Formal sanctions were studied mainly in relation to tax compliance, with experimental studies of the topic focusing on the possibly differential effects of variation in the size of penalties versus the probability of detection (Anderson and Stafford, 2003; Torgler, 2002). The topic of informal sanctions attracted the attention of those interested in voluntary collective action, with publications in psychology (Yamagishi, 1986) and political science journals (Ostrom, Walker, and Gardner, 1992) preceding those in economics by a decade or more.

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tive stance is that the crowding out of IS by FS is self-evidently desirable, much the opposite of the idea that non-deterrent FS and IS are likely to be complements, as I conjecture.[2]

Recently, Engel (2014) found that formal sanction is an effective institution for subjects who have stronger social preferences. In Engel's study, the FS is a punishment coming from an unknown third-party. Since the third party can choose freely how much to punish each player, from a player's perspective, the fine rate was not fixed and it could be deterrent or non-deterrent.[3] This is similar to a combination of NFS and IS in my setting. However, it is hard to identify the effect of NFS and the effect of IS in Engel's study.

Kube and Traxler (2011) found the combination of IS with NFS to be more effective than IS-only in encouraging contributions to a public good. But they did not study the performance of NFS-only, so the proposition that IS aids the efficacy of NFS ((a) above) remains untested, to my knowledge. Tyran and Feld (2006) and Kamei (2016) found that NFS significantly raised contributions to a public good when chosen by vote but not when imposed exogenously by the experimenter, supporting (b) above. But they did not study the influence of voting on the effectiveness of combined NFS + IS. In the current study, I begin to fill these gaps.

In addition, I explore whether the democracy effect found by Tyran and Feld (2006) is still significant after controlling for a self-selection. When a policy or institution is chosen by a majority vote, it may be more effective because it consists of more "cooperative types" (i.e., people who vote for the policy/institution). This selection complicates the effect of voting influences (i.e., a pure democracy effect). Dal Bó, Foster, and Putterman (2010, hereafter DFP) explored this question in a prisoner's dilemma game. In the experiment, subjects can vote on whether to have a payoff modification changing a prisoners' dilemma to a coordination game. After having subjects vote on the institution, they either counted the vote or overrode it. DFP then compared groups with identical shares of votes for the institution,

[2]Other detailed differences between Andreoni and Gee (2011) and this study include (a) the fact that their deterrent FS punishes only the lowest contributor, not all who contribute to their private accounts, and (b) that the way in which they endogenize adoption of FS is not by voting but by making implementation of FS a threshold public good, the provision of which depends on achieving a certain level of voluntary contributions.

[3]Results showed that the punishment was deterrent in 102 out of 254 cases.

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and of individual members of such groups who voted identically, under both the endogenously and the exogenously assigned institution. They found that the institution leads to significantly more cooperation when adopted by vote (i.e., a democracy effect), even after controlling for selection. Similar to DFP's method to deal with the selection effect, Sutter, Haigner, and Kocher (2010, hereafter SHK) addressed this issue in different institutions.[4] In the experiment, subjects decided whether to vote or not. Voting was costly but was influential in the choice of an institution (simple voluntary contribution mechanism [VCM], VCM with informal sanction or VCM with informal reward). SHK found a democracy effect — an institution implemented endogenously through voting was more effective than an institution implemented fully exogenously. To deal with the concern that it may be caused by the self-selection effect, SHK conducted a control experiment. They had subjects vote on the institutions but a computer then randomly decided whether the vote will be binding. If the random outcome sets the vote aside, the computer randomly assigns one of institutions. In this control experiment, SHK found that whether an institution was chosen by counted votes or by overridden votes has no significantly different effect on the contribution, after controlling for a voter dummy, the number of voters in the group, institution dummies, and periods. This suggests that the self-selection was not a main concern.[5]

[4]Sutter, Haigner, and Kocher (2010) is very similar to my design in that they studied whether institutions performs better when they are chosen by vote. In addition, they used two methods to deal with a possible selection effect, one is to compare subjects' social orientation in different treatments, the other is similar to Dal Bó, Foster, and Putterman (2010)'s overridden procedure. However, Sutter, Haigner, and Kocher (2010) differs from my paper in a fundamental respect — the institutions we choose. Sutter, Haigner, and Kocher (2010) focus on Informal Sanction and Informal Reward, while I focus on non-deterrent formal sanction. Other detailed differences between Sutter, Haigner, and Kocher (2010) and this study include (a) voting is costly in their design, (b) they use a unanimity rule but not a majority rule, and (c) subjects do not play VCM games before they make an institutional choice.

[5]If a selection effect is important, subjects under an institution implemented endogenously through voting will contributes more than subjects under an institution implemented exogenously. This is because yes-voters contribute more than no-voters. Thus, a group consisting of more yes-voters (the endogenous groups) should be more cooperative than a group consisting of some yes-voters and some no-voters (the exogenous groups). SHK found that the voted implement variable is not significant. This finding suggested that the selection

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Furthermore, DFP investigated whether the democracy effect might be due to a signaling effect of knowing how the group's majority voted. The authors implemented a condition in which groups whose vote was overridden had the majority vote reported to them. They found that when subjects had the same information about the group vote, cooperation was greater when the vote counted than when it did not count. Thus, most of the effect of endogenous implementation by the majority appeared not to be a signaling effect. In Kamei's study, subjects played a voluntary contribution game and voted on whether to adopt NFS. Results on the impact of voting were qualitatively similar to those of DFP, after controlling for selection, and findings on whether that result is attributable to signaling.

To study the effect of voting in the case of NFS and its combination with IS and whether that effect (if present) is attributable to signaling, I follow essentially the same procedure as DFP. Given my interest in comparing the combined impact of NFS + IS to that of NFS-only, this requires observing the three conditions of play — simple VCM, NFS, and NFS + IS — under three choice situations: voted choice, exogenous overriding of vote with vote feedback, and exogenous overriding of vote without vote feedback. For completeness, I also study an IS-only condition under the three situations. In addition, I add a fourth situation studied by SHK but not studied by DFP: I observe the effects of each condition when assignment is entirely exogenous and there is neither any voting nor any mention of a vote. I do this mainly because it makes exogenous implementation more straightforward.[6]

My results confirm (a) above: the availability of IS strengthens the impact of NFS. This is so not only in the no voting condition, but also when vote count and when vote not count, whether with or without vote feedback. The effectiveness of IS in this respect is easily understood in material terms: my data show that when added to the NFS, the cost of contributing to one's private account due to expected informal sanctions makes contributing to the public account the more profitable alternative at least until one matches the group average contribution. Somewhat unlike Tyran and Feld (2006), however, I find that NFS-only has a significant short-term effect even when assigned without vote. The effect of NFS quickly decays without

effect is not important.

[6]I do this also because it affords an opportunity to check whether the steps — of deciding how to vote, voting, and learning that the vote has been overridden — have their own effects on the performance of the institutions being studied. See footnote 41.

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the support of IS, however, regardless of whether NFS is chosen by vote.

The remaining of the paper is structured as follows. In Section 2 describes our experimental design in details, and Section 3 we derive predictions on contribution levels and on voting behavior. Section 4 reports the experimental results. Section 5 concludes the paper.

2 Design

2.1 The four conditions (simple VCM, IS, NFS, and IS + NFS)

I study the potential interaction of NFS and IS both with and without voting using the familiar social dilemma design of the finitely repeated linear voluntary contribution mechanism (VCM).[7] I prefer a repeated to a one-shot game because learning may be important and because the difference between the trends in contributions is one of the most distinctive differences of voluntary contribution behavior without and with IS. I prefer finite repetition for its simple predictions under classical assumptions of self-interest, rationality, and common knowledge of these. I use a partner design to statistically isolate the subjects in each group from others within their multi-group experimental sessions. Each group has 5 subjects so that tied votes cannot occur and because I anticipated richer interactions (e.g., peer-to-peer punishment) with slightly larger subject groups. I have each group play a standard VCM with neither formal nor informal sanctions in Phase 1 (the first six periods). This format allows that in voting treatments, votes on whether to use NFS will be informed by some understanding of voluntary contribution dynamics. All treatments are accordingly identical until the end of Phase 1, when subjects receive new instructions referring to the institutions that might be available in their treatment for Phase 2 (the second and final set of six periods). I use a familiar endowment, 20, but an MPCR of 0.3, which seems adequate considering the group size.[8] The payoff of subject i in a period of Phase 1 is given by

[7] The finitely repeated VCM games are common in literature, for example, Markussen, Putterman, and Tyran (2014) and Sutter, Haigner, and Kocher (2010).

[8] MPCR stands for marginal per capital of return from a contribution to a public goods. That is to say, comparing with keeping 1 token to his/her personal account, how much a subject earns by contributing 1 token to public account. An MPCR of 0.4 and a group size of 4 has been common beginning with Fehr and Gächter (2000).

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$$\pi_i = 20 - g_i + 0.3 \sum_{i=1}^{5} g_i, \tag{1}$$

where 20 is the endowment, g_i is the amount subject put in the group account, 0.3 is the MPCR and 5 is the group size.

In Phase 2, subjects play under one of four possible conditions: simple VCM, IS, NFS, and IS + NFS. In the IS treatments, there are definitely opportunities to give informal sanctions in Phase 2, and the transition from Phase 1 to Phase 2 involves either replacement of VCM by IS or replacement of VCM by IS + NFS. The instructions read to and by subjects after Phase 1 explain the nature of NFS, in treatments without IS, or the nature of both NFS and IS, in treatments with IS. When IS is available, it costs a subject 1 point to reduce the earnings of the targeted individual by 2 points. I chose a relatively low punishment effectiveness (see Nikiforakis and Normann (2008)) so that IS would be less likely to render NFS strictly redundant. I added the constraint that punishment received cannot drive the recipient's earnings for the period below zero, so as to reduce the possibility that subjects would need to pay the experimenter. However, I require subjects to pay for punishment they choose to give even if it drives their earnings below zero, due to the importance from a theoretical standpoint of having punishment be costly to give.[9] When subjects play under IS-only, the payoff of a subject i is given by

$$\pi_i^{IS} = \max\left\{0, 20 - g_i + 0.3 \sum_{i=1}^{5} g_i - 2\Sigma_{jSji}\right\} - \Sigma_{jSij}, \tag{2}$$

where 2 is the Punishment effectiveness (cost to receiver), $_{Sji}$ is the expenditure for a subject $j \neq i$ to punish subject i, and $_{Sji}$ is the expenditure for subject i to punish subject $j\,(j \neq i)$.

[9]In the event, periods with IS saw only 8 out of a total of 480 period-by-subject observations in which first stage earnings minus punishment received was negative before invoking the zero minimum, and 20 observations in which earnings for a period after subtracting off costs of giving punishment were negative. Periods with IS + NFS saw only 6 out of 690 period-by-subject observations in which first stage earnings minus punishment and fines received were negative before invoking the zero minimum, and 13 observations in which earnings for a period after subtracting off costs of giving punishment were negative. The instructions factually informed subjects that negative earnings in any period would be covered by the positive earnings of other periods.

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Because the VCM permits various degrees of cooperation, I let formal sanctions received under NFS vary proportionately with points allocated to a subject's private account. The subject earns 0.3 points per point allocated to the group account versus 1 point per point she assigns to her private account, but she loses 0.4 points for each point so assigned under NFS. With $1 - 0.4 = 0.6 > 0.3$, the formal sanction in and of itself is clearly non-deterrent. Modification of payoffs (1) for NFS is straightforward, so no equation need be shown, conserving space. When both NFS and IS are in place, the rule that earnings prior to one's cost of punishment cannot fall below zero holds, and the payoff function becomes

$$\pi_i^{NFS+IS} = \max\left\{0, \left[(1-0.4)^*(20-g_i) + 0.3\sum_{i=1}^{5} g_i - 2\Sigma_{jSji}\right]\right\} - \Sigma_{jSij}, \quad (3)$$

where 0.4 is the fine rate.[10]

2.2 The mechanism of how IS is assigned in Phase 2

My design takes the presence or absence of IS as a strictly exogenous treatment variable, in part to simplify a large number of conditions and situations addressed elsewhere in this paper, and in part because I wanted to take seriously the argument that IS may be a default condition, rather than an institution generated by subjects' choices. In the no-IS treatments, the possibility of informal sanctions is never mentioned in the instructions, there are no opportunities to engage in IS, and the only change possible when transitioning from Phase 1 (which includes periods 1 – 6) to Phase 2 (which includes periods 7 – 12) is replacement of VCM condition by NFS. Table 1 shows how treatments are assigned by IS, NFS, and the voting mechanism.

[10] It can be argued that greater realism would be achieved if a fixed amount were collected from subjects in periods played under NFS, representing a cost of having a formal sanction system in place (Kamei, Putterman, and Tyran, 2015; Markussen, Putterman, and Tyran, 2014). I omitted this element from the present design so as not to further reduce the likelihood of observing voted NFS. Also, the association of NFS with fixed costs may rarely in practice deter decisions to use it, since the state exists whether or not NFS is used to back one additional law. It is rare for discrete adjustments of enforcement capacity, and therefore of taxation, to be tied to the passage of any one law.

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Table 1: Treatments and number of groups

(A) No IS (Phase 2 never includes IS)

		NFS		NoNFS	
no voting (NV)		8		7	
Voting — vote count (VC)		5		3	
Voting — vote not count with feedback (VNCf)	Voting — vote not count without feedback (VNCnf)	6	6	2	2

(B) IS (Phase 2 always includes IS)

		NFS		NoNFS	
no voting (NV)		8		7	
Voting — vote count (VC)		3		5	
Voting — vote not count with feedback (VNCf)	Voting — vote not count without feedback (VNCnf)	6	6	2	2

The numbers of groups in IS and non-IS treatment are shown in Panel (A) and (B), respectively.

2.3 The mechanism of how NFS is assigned in Phase 2

In both IS and no-IS treatments subjects are uncertain whether their group will interact in Phase 2 with or without NFS, when the instructions that follow Phase 1 end. That question is determined in one of three ways, yielding the nested division of treatments shown by the rows in Table 1. The top row (i.e., the "no voting (NV)" treatments) shows treatments in which assignment of NFS for Phase 2 is determined randomly and there is neither voting nor mention of the possibility of voting. The remaining two rows (i.e., the "voting – vote count (VC)" and "voting – vote not count (VNC)" treatments) show treatments in which assignment of NFS is determined following a vote. After the vote, the computer randomly determines whether or not the vote counts (i.e., determines what institution the group

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plays under), as in DFP and in SHK's control experiment.[11] The "VC" treatments refers to groups whose vote counts, while the "VNC" treatments refers to groups whose vote does not count (i.e. whose vote are overridden). The "vote not count with no feedback about what the majority of group vote for (VNCnf)" and "vote not count with feedback what the majority of the group vote for (VNCf)" treatments differ only with respect to whether group members learn for what the majority voted. In the "VNCnf" treatments, subjects receive no information about how their group's majority voted. In the "VNCf" treatments, subjects are told whether their group's majority had voted for or against the use of NFS. Subjects in both the feedback and the no feedback treatments were told about the possibility of feedback so that, before the outcome of the decision on overriding or not overriding the vote was announced, their situations were identical.

The treatments in Table 1 thus correspond to four ways of assigning or not assigning NFS for Phase 2: (1) no voting (NV); (2) vote counts (VC); (3) vote not count without feedback (VNCnf); and (4) vote count with feedback (VNCf_gF if the group's majority voted for NFS and VNCf_gA if the group's majority voted against NFS).

The four assignment methods listed above interact with the division between IS and no IS treatments to partition my data into sixteen categories of Phase 2 play. In Phase 2, that is, subjects can be playing under one of four conditions (VCM, IS, NFS, IS + NFS) reached in one of four ways (NV, VC, VNCf and VNCnf). When analyzing behaviors at the group level, it is also important in those cases in which feedback is given to distinguish "feedback for" (VNCf_gF) and "feedback against" (VNCf_gA) — i.e., groups learning that their majority vote, although overridden, was for NFS versus those receiving the alternative (always accurate) information.

[11] Same as in DFP, subjects in our experiment, did not have information about the likelihood of vote being counted, neither do they know the likelihood of being assigned NFS when their vote are overridden. In our experiment, subjects were told that "$\cdots$ for some groups, the vote of the majority of members will determine the outcome, but for other groups, the vote will not be counted." And subjects were told that "$\cdots$ whether your vote counts or not is in no way related to how you vote or to the decisions members of your group made during the previous 6 periods." There are two reasons why we did not tell subjects the likelihood. We did so in order to prevent (1) a demanding effect — for example, the fact that subjects are more likely to assign to an NFS procedure may make them more likely to vote for NFS, and (2) a possible disappointment effect regarding that vote are more likely to be overridden than to be counted.

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2.4 The number of groups in each category

In the NV treatment, to assure as near as possible to equal numbers of groups playing with and without NFS, I programmed the computer to randomly assign groups to a fixed number of predetermined statuses, rather than to conduct an independent random draw of status for each group. For example, in a session having 4 groups, it was determined in advance that two groups would end up using NFS and two groups would not use it. Each group thus had an equal chance of playing under each condition, ex ante. However, deviations from equal splits occurred because low show-up rates reduced the number of groups in some sessions. In this case, we always make sure that there is enough groups playing with NFS, which is our main focus of the paper.

To obtain as near as possible to equal numbers of groups in the VC, VNCnf, and VNCf situations, I pre-determined (to the extent show-up and thus number of groups permitted) that two-thirds of groups in each session would have a "vote not count" outcome and one-third a "vote count" outcome, since after pooling of the thirds from feedback and no feedback treatments, the numbers of groups in each situation would be the same. Random assignment of groups to predetermined slots as opposed to independent random determination of each group's ex post outcome affects ex ante probabilities in the same qualitative fashion as discussed in the previous paragraph.

In the VNC treatment, I assigned more groups to play with NFS than play without NFS. Specifically, two-thirds of groups are assigned to play with NFS, while the other one-thirds of groups are assigned to play without NFS. It is because that we need NFS groups not only for comparing with groups in other condition (group without NFS), but also for exploring the effect of voted implementation. In the VC treatment, the number of cases to be observed in each category is endogenous to voting behavior, I defer further discussion to the Result section.

3 Predictions

Predictions under classical assumptions of rationality and self-interest as well as common knowledge of these assumptions are straightforward but worth reviewing briefly. Rational selfish subjects who assume others to be of the same type would contribute nothing to the group account in the VCM since

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$0.3 < 1$. They would spend nothing on punishing under IS since it would be known that none would punish in the last period and thus punishing low contributors to induce higher contributions by threat cannot be credible. So, contributions would again be zero under IS. Contributions are again predicted to be zero under NFS, since $0.3 < (1 - 0.4) = 0.6$. Since one earns $20 \times 0.6 = 12$ with NFS rather than 20 per period with VCM, and since one cannot rule out casting the decisive vote given the absence of communication, universal voting against NFS is the weakly dominant strategy for each individual and is predicted. Giving informal sanctions when NFS is in place is ruled out by the same logic as in the IS-only case. Hence, there would also be zero contributions under IS + NFS. Accordingly, it is also weakly dominant strategy to vote no in the IS treatments. From dozens of past VCM experiments, one can safely predict that most actual contributions will initially be positive, averaging around half of the endowment, and that they will decline with repetition (Ledyard, 1997).

Based on results in literatures, we can predict that the contribution may be positive when mechanisms such as IS, voting, etc are given.[12] For example, from Tyran and Feld (2006) and Kamei (2016), I might expect that NFS will mildly, but probably not significantly, boost contributions in the no voting situation. From Kube and Traxler (2011), I can expect that contributions are higher under NFS + IS than under IS-only, and given that informal sanctions aimed at low contributors are so common in other experiments, it seems reasonable to expect that contributions will also be higher under NFS + IS than under NFS-only. From DFP and Kamei (2016), I expect that contributions will be higher under VC_NFS than under VNC_NFS in groups with identical numbers of yes votes, regardless of whether there is feedback about the vote.

These results in literature can be explained by the assumption that, there is a rather general possibility of a direct subjective payoff from adhering to a norm or law.[13] An often assumed advantage of democracy is that a greater

[12] While it is a potentially interesting exercise to predict behaviors from an explicit model, for example that of Fehr and Schmidt (1999), I avoid doing so because it is unclear *a priori* which of the numerous social preference models proposed in recent years will best organize my data and because adequately characterizing my results on a descriptive level leaves little space for such discussion in a paper of conventional length.

[13] In my paper, this payoff is investigated specifically in my paper only insofar as it is related to the process and outcome of voting.

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level of compliance with laws may be achieved with less expenditure on enforcement and punishment because democratically-determined law carries greater legitimacy, especially among those who voted for it. In addition to such direct effects of democracy, vote outcomes may affect the compliance of conditional cooperators, that is, individuals whose willingness to comply with a norm or law is an increasing function of the number of peers whom they expect to comply (Fischbacher and Gächter, 2010). To such individuals, the fact that a majority favored a law may suggest that many will comply with it, increasing their own willingness to comply. This factor implies that a vote can, in principal, affect compliance even if it is merely advisory or is for some reason overridden and the rule is imposed by a different mechanism. Based on this assumption, I expect that some subjects will vote for NFS.

4 Results

A total of 390 subjects, all of whom were undergraduate or masters degree students at various universities in Vienna, participated in sessions lasting an average of 90 minutes at the Vienna Center for Experimental Economics at the University of Vienna. The subjects earned an average of €13.69 each, with a minimum of €7.00 and a maximum of €18.80.[14] The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007) in English.[15]

In this paper, I begin by comparing behaviors under the VCM, IS, NFS, and NFS + IS conditions in 5.1, initially emphasizing the no voting situations. I then analyze the votes in 5.2, consider how voting affected the performance of conditions NFS and NFS + IS, and discuss the evidence for pure democracy and signaling effects in 5.3 and in 5.4.

[14] 48% of the subjects were female, about 36% were majoring in business, management or economics, 32% in social sciences and humanities, and the remainder in natural sciences, mathematics, engineering and other fields. Roughly two thirds were enrolled at the University of Vienna, the rest at other universities in Vienna, mainly Vienna University of Technology, University of Natural Resources and Applied Life Sciences, Vienna and Vienna University of Economics and Business. Subjects were recruited using the ORSEE system (Greiner, 2004). As this was the first economics experiment conducted at the university in some time, almost all subjects can be assumed to have been inexperienced.

[15] Subjects were informed that they would need strong English language skills to participate.

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4.1 Is NFS more effective with the help of IS?

Figure 1 compares average contributions in each period by condition, with panel (a) showing the data of NV treatments (NV), (b) the data of groups whose condition was determined by their majority vote (VC), (c) the data of groups whose condition was determined by vote not count (i.e. vote being overridden) (VNC),[16] and (d) all of the data, combined. Recall that in Phase 1, all groups are in the identical VCM condition without detailed knowledge of how the second phase will be played, so differences in Phase 1 are neither treatment nor condition specific. I show the Phase 1 curves to reassure the reader that they adhere to the usual properties of (a) beginning in the neighborhood of half of the endowment and (b) trending downwards with repetition. While the figure makes clear that there are some non-trivial, albeit random, differences as to how Phase 1 was played by groups randomly assigned to different treatments, I reserve discussion of controlling for unintended selection of subjects with differing disposition for later. I now only consider Phase 2 comparisons (both Period 7 [i.e., the first period in Phase 2] and Phase 2 as a whole) without reference to differences in prior experience.

The focus of my paper is on the effects of IS and of voting choice on NFS. With respect to the first issue, the figures appear to tell a fairly consistent story. In the aggregate (panel d) and under NV and VC situations taken individually (panels a and b), there is considerable support for the expectation that the combination of NFS with IS leads to higher and more sustained contributions to the public good than either IS-only or NFS-only, although the differences with respect to NFS-only are less consistent.[17] In

[16]Here, the data of groups receiving no feedback and those receiving feedback of each possible majority outcome are combined to save space.

[17]Mann-Whitney tests pooling group level data from all situations find the difference in contributions between NFS + IS and IS to be significant at the 1% level both in Period 7 and in Phase 2 as a whole. Similar test results are obtained for groups in the NV treatment only and for groups in the VC treatment only, although the results for groups in VNC situations are mostly insignificant. In comparisons of NFS + IS to NFS-only, the latter often shows higher contributions in the first period of Phase 2, Period 7, with the difference significant at the 5% level or better for the pooled data and for the groups of the NV treatment only and those in the VC situation only. Thereafter, contributions under NFS + IS tend to catch up with and overtake those under NFS-only as the former exhibit an upward and the latter a downward trend. While overall Phase 2 contributions are higher under NFS + IS than under NFS-only for all groups pooled, the difference falls short of significance at the 10%

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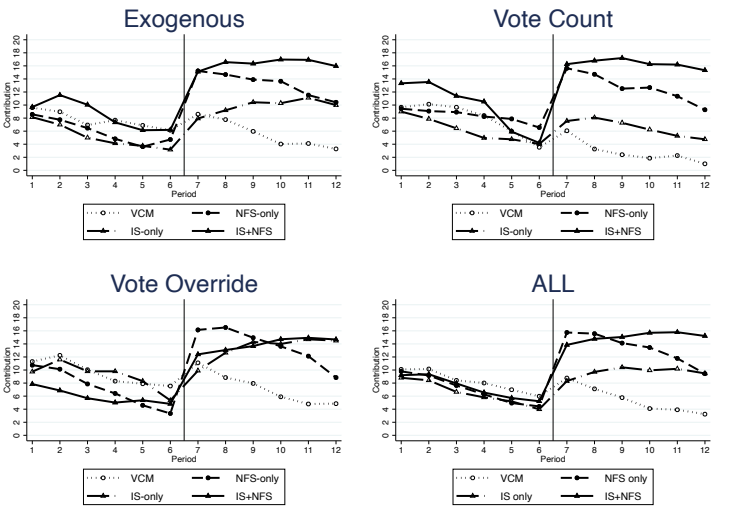


Figure 1: Average contribution by period and situation

the VNC situations (panel c), NFS, IS and NFS + IS have a similar effect of raising contributions, overall, although the trends over time differ as remarked below.[18]

Result 1. In general, NFS + IS has a significantly greater impact on contributions than IS-only, NFS-only and VCM, with an exception when the institution is assigned exogenously by vote not count.

For the other conditions, my anticipation based on previous experimental results that contributions would be higher under IS than in the ordinary VCM condition also appear to be supported, although the difference at group level is significant only when all data are pooled.[19] As in Tyran and

level in a two-tailed test ($p = .129$, as opposed to $p = .065$ if a one-tailed test is performed). See Table A.3.

[18] In Mann-Whitney tests using groups in VNC situation, contributions for Phase 2 as a whole are significantly higher under IS than under VCM, with $p \approx .08$, under NFS than under VCM, with $p \approx .02$, and under NFS + IS than under VCM, with $p \approx .01$. Out of all conditions, NFS is the only condition that has contributions significantly higher than those under VCM in Period 7, with $p \approx .01$.

[19] A Mann-Whitney test using data of all groups under VCM and all groups under IS finds

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Feld (2006), voted NFS (i.e. VC_NFS) appears to raise contributions relative to VCM, but in contrast to their results, this is true also for subjects in NV and in VNC situations.[20] Subjects continuing in the VCM condition in Phase 2 show the usual Period 7 uptick of contributions (conventionally called a "restart effect") before continuing their downward slide.

A noticeable feature of the contribution graphs for Phase 2 is that whereas subjects in the VCM and NFS treatments tend to display some decay of contribution with repetition, as is typical in VCM experiments generally, those in the IS and NFS + IS conditions tend to show at least some initial upward movement, with either no or less overall decay. I estimated regressions and tested hypotheses that linear time trend coefficients for VCM (the omitted category), NFS, IS, and NFS + IS significantly differ from zero and from each other in the NV, VC, VNCnf, VNCf, and in the pooled data of all four situations. The tests (shown in Appendix Table A.1) confirm that there are significant downward trends in the VCM and NFS conditions, with the exception of VCM condition in VNCf situations, which lacks a significant trend. They also show that the trends in IS and NFS + IS conditions generally differ significantly from those in the NFS-only condition, with the exception of the trend in IS condition in VC situations being significantly different from the trend in NFS + IS condition in VC situations. The trend under IS-only is not significantly different from zero (a flat trend) except in the VNCf situations, where contributions are significantly increasing. The tests find flat trends for contributions in the NFS + IS condition in NV, VNCnf and VC situations, but a significant increasing trend in both VNCf situation and in the pooled data under this combined condition.

Result 2. The trends for contribution in NFS + IS conditions differ signif-

average Phase 2 contribution to be higher with IS with $p = 0.03$, but there is no difference for Period 7 alone and there are also no significant differences of contribution in VCM versus IS groups if the data of single treatments (no voting) or situations (e.g., vote counts) are taken alone. See Table A.3.

[20]For groups choosing between NFS and VCM by vote, contributions are significantly different both in Period 7 and in Phase 2 as a whole with $p = 0.03$. For those to whom are assigned NFS or VCM by NV, both differences are significant with $p = 0.02$. For groups in VNCnf, only the Phase 2 difference is significant, with $p = 0.05$; for those in VNCfgF, both differences are significant with $p = 0.10$. For all observations in VNC situations, contributions are higher with NFS than VCM with $p \approx 0.01$. And for all groups pooled, NFS contributions exceed those in VCM in both the period and the phase with $p < 0.001$. See Table A.3.

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icantly from those in the NFS-only condition. There are significant downward trends in the NFS condition, while there are flat trends or upward trends in the NFS + IS condition.

An obvious explanation would be targeting of informal sanctions at low contributors, spurring them to contribute more. Appendix Figure A.1 confirms that substantial amounts of informal sanctions were indeed given in both IS and NFS + IS conditions, and that roughly three quarters (in IS) and two thirds (in NFS + IS) of all informal sanctions given were directed at group members who contributed less than the group average during the period in question. Overall, a smaller amount was spent on sanctioning in the NFS + IS than in the IS treatment, with the difference most pronounced in the middle periods of the phase — a difference that might be explained by perceptions of complementarity between or even redundancy of IS in the presence of NFS.[21] I estimate regressions which follow a specification first used by Fehr and Gächter (2000). Results, shown in Appendix Table A.2, indicate that for below-average contributors in all conditions permitting informal sanctions, punishment received was increasing in the difference between own and other group members' average contribution, significant at the 1% level.

Note that the formal sanction is 0.4, and the amount gained by allocating a point to one's private rather than public account is $1 - 0.3 = 0.7$. Therefore, we might expect that it is profitable for an individual to contribute another point under NFS + IS, if (a) those who fail to comply with the norm anticipate an average punishment, at least 0.3 point, by peers, and (b) the subjective cost of norm-violation is not negative. The table shows significant coefficients exceeding 0.3 for all pooled observations and for those separated by treatment and situation.[22] Under IS-only, it is better to put a point in the group account if the coefficient exceeds 0.7, and this is the case according to all of the regressions except that for observations in the VNCnf situation. The fact that the coefficients on the positive deviation term are

[21] The fact that a higher proportion of informal sanctions were perversely "misdirected" at high contributors in the NFS + IS condition than under IS-only might be explained by prosocial subjects tending to believe NFS sufficient in the NFS + IS condition, leaving more of the sanctions in that condition to be the work of the minority of subjects inclined to resist pressures to cooperate.

[22] Note that the dependent variable is the loss to the subject receiving the sanction and thus already doubles the number of sanction points given by the punisher.

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either insignificant or positive means that there is no incentive to contribute more than the group's average.[23] But with low contributors raising their contributions to avoid punishment, that average is an upwardly moving target, which helps to explain the upward trends in contributions.

Result 3. In general, low-contributors in NFS + IS condition were punished significantly greater than 0.3 point from their peers for every point they contributed less than the group average. This helps explain the upward trend for contributions in NFS + IS.

4.2 Do subjects vote for NFS?

240 subjects voted on whether their group should operate under NFS in Phase 2, understanding that a decision randomly taken by the computer would determine whether their group's majority vote decides their Phase 2 condition, that the computer will randomly determine the condition if the vote does not count, and that in the latter event how the majority voted may or may not be made known to group members.[24] Exactly half were in the IS treatment and were thus choosing between NFS + IS and IS-only; the other half were in the treatment with neither opportunity for nor mention of IS and were choosing between NFS and VCM. 43.3% of those in the IS treatment voted for NFS versus 68.5% of those in the no-IS treatment, a difference significant at the $p < .001$ level in a chi-square test ($\chi^2(1) = 12.253$). Possibly considerable numbers of subjects expected IS to boost contributions sufficiently without the help of NFS. Despite the fact that those voting for NFS were a minority overall in the treatments with IS (8 out of the 24 groups in IS treatments), those voting for NFS were a majority overall in the treatment without IS (19 out of the 24 groups in the no-IS treatments).

Result 4. Subjects in the no-IS treatments were significantly more likely to vote for NFS than subjects in the IS treatments (68.5% vs. 43.3%, $p < .001$ by a chi-square test).

[23] A positive significant coefficient on positive deviation could be a sign of perverse punishment: the further the contribution is above the group average, the more likely is one to be punished. Similar results are found for some treatments in Önes and Putterman (2007).

[24] I provided subjects no specific information about the probability with which each outcome would occur for various reasons. See footnote 17. In the event, no subject asked what the probabilities were, suggesting that the matter did not raise concerns for them.

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In Table 2, I report probit regressions to explain individuals' votes, with errors clustered by group. Pooling all 240 voting observations, I find in column (1) a large and highly significant negative effect of being in treatments with IS, a smaller highly significant positive effect of own contribution in Period 1, and generally negative but insignificant coefficients on other group members' average contribution in Phase 1. Separate estimations for only individuals in treatments without IS and for only those in treatments with IS, shown in columns (3) and (5) respectively, confirm the significant positive effect of own initial contribution. The result on the effect of IS accords with the aggregate outcomes mentioned above. The result on own initial contribution suggests that subjects who came into the experiment with more cooperative inclinations and perhaps with more optimistic beliefs about others' willingness to cooperate were significantly more likely to vote for NFS, perhaps because optimism about the ability to encourage cooperation, preference for cooperation, or both are associated with contributing more in the initial VCM condition. Columns (2), (4) and (6) show versions of the same regressions including four additional personal characteristic variables: gender, an economics or business major dummy, year of study, and self-reported political orientation. We obtained this supplementary data in the end-of-session survey. Their addition has no important effects on the other coefficients.

Result 5. Subjects who contributed more in the first period were significantly more likely to vote for NFS than the others.

4.3 Is NFS more effective when chosen by voting? The No IS case.

I observe individual and group play with only NFS under five distinct situations, namely (1) NV, (2) VC, (3) VNCnf, (4) VNCfgF, and (5) VNCfgA. Further controlled comparisons require that I control also for each individual's own vote (which could be seen as sub-partitioning conditions (2) – (5) into eight individual-level categories). Controls for prior experience and perhaps for personal characteristics are desirable to more fully rule out selection effects. Although non-parametric tests have the advantage of not requiring distributional assumptions, I also use regression analysis so as to allow for such controls.

In analyzing the impact of having adoption of NFS be determined by vote, I focus on three steps: [1] check for a "democracy effect" or "endogen-

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Table 2: Determinants of voting

Dependent variable: voting for NFS (Votefor)						
	All Voting Treatments		Treatments without IS		Treatments with IS	
	(1)	(2)	(3)	(4)	(5)	(6)
IS	−0.565***	−0.546***				
	(0.18)	(0.20)				
Own Period 1 contribution	0.0533***	0.0577***	0.0508***	0.0474***	0.0559***	0.0804***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Others' Phase 1 contribution	−0.0258	−0.0126	−0.0266	−0.0276	−0.0248	0.0141
	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.06)
Constant	0.0857	0.287	0.116	0.424	−0.511	−0.86
	(0.25)	(0.52)	(0.29)	(0.71)	(0.33)	(0.81)
Demographic Controls	no	yes	no	yes	no	yes
Observations	240	220	120	120	120	100
Wald Chi-squared	43.92***	47.53***	18.07***	22.44***	10.61***	26.96***
Pseudo R-squared	0.0959	0.1368	0.0599	0.0944	0.0619	0.1901

Notes: All results are from probit regressions and clustered by group. Numbers in parentheses are standard errors. The dependent variable is Votefor, which is an indicator variable for whether subject voted for NFS. The independent variables are as follows: IS (= 1 for subjects in a treatment with IS; = 0 otherwise), Own period 1 contribution (individual's Period 1 contribution) and Others' phase 1 contribution (average Phase 1 contribution of others in the individual's group). Besides these independent variables, the female dummy (= 1 if female; 0 otherwise), Year of Study (1 = freshman to 5 = master's students), Political View (1 = very conservative to 7 = very liberal) and Major in Econ or Business dummy are included in columns (2), (4) and (6). I omitted the estimated coefficients of these variables to conserve space, since these are not related to our hypothesis. Results are similar when OLS regressions with robust standard errors are used. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

eity premium" in the sense of DFP by comparing contributions in situation VC to those in situation VNCnf above, which parallels DFP's principal method; [2] check for an informational effect of voting by comparing contributions in situations VNCfgF and VNCnf, paralleling the additional exercise in DFP,[25] and [3] as another way of checking for a democracy effect in the sense of SHK by comparing contributions in situation VC to those in situation NV. Check [3] differs from checks [1] and [2] because, in the absence of votes, controls for selection can only be based on information about other individual characteristics including the propensity towards cooperation exhibited in Phase 1, and characteristics such as gender.

Table 3 shows the number of groups observed in each of situations (1) – (5) above, average contribution in the groups in the first period of Phase 2, average contribution in Phase 2 as a whole, and average contribution for the same groups in Phase 1, which may help to reveal selection problems. It is worth bearing in mind that overall, NFS is associated with startlingly high Phase 2 contributions given the theoretical prediction of no contributions, and that contributions are also significantly higher under NFS than those in the baseline VCM condition in the aggregate and in every situation allowing comparison. However, the effect of NFS shows little sign in my data of being greater when implemented by vote.[26] Non-parametric tests for differences by situation using group level observations find no statistically significant differences.[27]

My regression analysis of data from the treatments that permit controlling for own vote uses the 120 individual-level period 7 contributions or Phase 2 (period 7 – 12) average contributions of situations (2) – (5), in alternate columns adding also controls for own Period 1 and others' Phase 1 contributions. Treatments without IS, discussed in the present sub-section, are shown in Table 4.

I next focus on the more complete specifications and on the coefficients pertaining to cases in which NFS is implemented and to voters who favored NFS. Consider first the difference in contribution of Yes voters in the VC vs. VNCnf situations. According to Wald tests, in fact, in no two situations

[25] See Section IV.B in DFP.

[26] It is possible that the lack of a significant positive effect of voting on NFS is a consequence of the already very high levels of contribution when NFS are implemented exogenous — a potential ceiling effect.

[27] See the Appendix, Table A.4.

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Table 3: Average contribution in groups that play under NFS without IS in Phase 2

	NV (no voting) (1)	VC (vote counts) (2)	VNCnf (vote not count, no feedback) (3)		VNCfgF Vote not count, feed-back FOR (4)	VNCfgA Vote not count, feed-back AGAINST (5)
			For	Against		
Period 7 only	15.23	15.64	15.47		16.83	n.a.
			15.32	16.2		
Phase 2 as a whole	13.23	12.70	13.26		14.15	n.a.
			12.93	14.93		
Same groups in Phase 1 as a whole	6.00	8.35	7.68		6.69	n.a.
			7.57	8.23		
Number of groups	8	5	6		6	0
			5	1		

Note: I show results for situation (3) — vote not count, no feedback — both as a whole, in the top number of each cell of this column, and separately for groups in which the majority voted for NFS, to the left, and groups in which the majority voted against NFS, to the right.

in which NFS is implemented without IS are coefficients significantly different for Yes voters whose situations differ with respect to the vote counting, feedback being given, or the content of the feedback. Next, I consider voters who are against NFS. I find that there is an endogeneity premium in period 7 — contributions are significantly higher among no voters in the VC situation than for those in the VNCnf situation ($p < 0.10$ and $p < 0.05$, without/with controlling for own experience, respectively). But, the finding of this democracy effect for No voters is not supported in data of Phase 2 as a whole.

To test for differences with the NV treatment, I perform similar exercises in which I include the 75 no voting treatment observations. In this case, however, I have to drop controls for own vote, which I do by combining the situation dummy variables that were separated by individual voter type

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Table 4: The effect of democracy (individual level data) in no-IS treatments

	Contribution in period 7		Average Contribution in Phase 2	
Dependent Variable	(1)	(2)	(3)	(4)
VC_NFSn	17.75***	15.19***	14.19***	11.06***
	(2.23)	(2.63)	(1.53)	(2.22)
VC_NoNFSn	6.22***	3.67	2.70**	−0.31
	(2.10)	(2.47)	(1.21)	(2.18)
VNCnf_NFSn	11.89***	9.102***	10.78***	7.81***
	(2.10)	(2.37)	(2.80)	(2.74)
VNCnf_NoNFSn	7.667***	4.44	7.17***	3.073
	(2.57)	(3.23)	(1.85)	(2.82)
VNCfgF_NFSn	14.33***	12.17***	14.64***	12.24***
	(2.57)	(2.67)	(3.05)	(3.37)
VNCfgF_NoNFSn	1.667	0.472	2.00	0.0425
	(3.64)	(3.67)	(1.85)	(1.39)
VC_NFSy	14.65***	11.35***	12.00***	8.45***
	(1.53)	(2.13)	(1.94)	(2.79)
VC_NoNFSy	5.833**	1.867	2.972**	−0.952
	(2.57)	(2.91)	(1.29)	(1.72)
VNCnf_NFSy	17.00***	12.94***	14.33***	10.27***
	(1.38)	(2.10)	(1.27)	(1.82)
VNCnf_NoNFSy	17.50***	11.96***	8.208***	2.829
	(3.15)	(3.67)	(1.94)	(2.73)
VNCfgF_NFSy	17.46***	14.03***	14.03***	10.59***
	(1.29)	(1.86)	(1.34)	(2.11)
VNCfgF_NoNFSy	14.43***	10.43***	9.00***	4.98*
	(2.38)	(2.80)	(2.60)	(2.43)
Own Period1 contribution	—	0.30***	—	0.207**
		(0.08)		(0.08)
Others' Phase 1 contribution	—	0.0262	—	0.175
		(0.17)		(0.16)
clustered by group	no	no	yes	yes
Observations	120	120	120	120
R-squared	0.8566	0.8735	0.8508	0.8655
p-value for Wald tests of differences of contribution rate by situation for yes-voters				
VC_NFSy = VNCnf_NFSy	0.2552	0.4181	0.3256	0.4014
VC_NFSy = VNCf_gF_NFSy	0.1624	0.1636	0.3978	0.3955
VNCnf_NFSy = VNCf_gF_NFSy	0.8082	0.5494	0.8731	0.8507
p-value for Wald tests of differences of contribution rate by situation for no-voters				
VC_NFSn = VNCnf_NFSn	0.0584*	0.0400**	0.2967	0.2881
VC_NFSn = VNCf_gF_NFSn	0.3179	0.3580	0.8959	0.7366

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Table 4: The effect of democracy (individual level data) in no-IS treatments (Continued)

	Contribution in period 7		Average Contribution in Phase 2	
Dependent Variable	(1)	(2)	(3)	(4)
VNCnf_NFSn = VNCf_gF_NFSn	0.4635	0.3332	0.3610	0.2703

Note: All results are from OLS regressions. Numbers in parentheses are standard errors. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.
VC denotes situations where "vote count" and VNC denotes situations where "vote does not count (vote overridden)"; VC_NFS and VC_NoNFS denote an implementation of NFS (NoNFS) by majority votes, VNC_NFS and VNC_NoNFS denote the implementation of NFS (NoNFS) by vote overridden (i.e. vote but vote not count), nf denotes information on majority vote was not released to subjects, fgF and fgA denote the information that majority of group was voting for NFS (voting against NFS) and this information was released to subjects. The last letter in each situation, "n" and "y", denote the individual vote of the subject (against or for NFS). I omitted the estimated coefficients of some control variables (VNCfgA_NFSn, VNCfgA_NoNFSn, VNCfgA_NFSy and VNCfgA_NoNFSy) because no subjects were in these situations in the event.

in the previous analysis. To further control for selection effects, in alternate specifications of Appendix Table A.5 I add controls for the same individual characteristics as were included in some specifications in Table 2.[28] A third variable, year of study, is added as a check, but only in alternative estimates because its inclusion causes the loss of additional observations.[29] The Wald tests find no statistically significant differences in contributions under NFS (without IS) between subjects in the NV treatment, those in VC, or subjects in VNCnf, VNCfgF, or VNCfgA.[30]

[28]Versions of the Table 4 and Table 6 regressions were also estimated with added controls for personal characteristics. Since their inclusion has no significant effects on the other coefficients, I have not reported them. Controls for individual characteristics are more critical to the analysis in Table A.5 given the inability to control for selection effects by means of individual vote in this case.

[29]Due to a mishap in the handling of data files, 2 subjects' observations in the IS treatments are recorded without gender, an additional 2 observations are missing major and an additional 16 observations are missing year of study and political view. I report estimates for each subsample with and without the controls, so that the effect of adding controls can be distinguished from that of dropping observations.

[30]I also tested the differences between each situation by organizing my data slightly differently from the approach shown in Tables 4, 6 and A.5. First, in regressions resembling those of Table 4 and 6, I checked for an information effect by comparing a dummy variable

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Result 6. Subjects' contributions do not differ significantly depending on the process through which NFS was assigned to them. Overall, both for Period 7 and for Phase 2 as a whole, there is no sign of an endogeneity premium, nor is there an indication the informational feedback increased contributions, nor is the result of exogenous implementation different among subjects who voted but had their vote overridden and subjects who never voted. If anything, I find an endogeneity premium for voters who vote against NFS. This democracy effect is shown only in period 7 but not in Phase 2 as a while.

4.4 Is NFS + IS more effective when NFS is chosen by voting?

I can look for observations of NFS + IS under the same five situations as were listed in section 5.3 for NFS-only. Table 5 reports the information paralleling that in Table 3 for the NFS + IS groups by situation.

At first glance, the data in Table 5 seem potentially consistent with a positive effect of the vote counting, especially when contributions in the NV condition (1) are not considered. Comparing VC with VNCnf situations, there is an impression of a democracy effect in both Period 7 (average contribution 11.20 in VNCnf situation versus 16.27 in VC situation) and Phase 2 as a whole (12.34 in VNCnf situation versus 16.34 in VC situation). The Period 7 difference is significant at the 5% level in group-level Mann-Whitney test, but the Phase 2 difference is not. Also, comparing subjects in VNCfgF, in column (4), it seems that much of this apparent democracy effect may be attributable to the informational impact of knowing how the group voted — i.e., average contribution when NFS is imposed by VNCfgF lies between that in the VC and that in the VNCnf situations but closer to the former. But neither the information effect nor the residual pure endogeneity premium, which should together account for the difference between the VC and VNCnf conditions, is individually significant in either Period 7 or Phase 2, according to Mann-Whitney tests.

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for subjects in the situation of a VNCfgF to another dummy variable for subjects only in those groups in VNCnfgF (although subjects were not so informed). As when all groups in the VNCnf situation are pooled under the same situation dummy, I found no significant difference. Second, in regressions paralleling those of Table A.5, I checked for a difference between subjects in the NV treatment and the pooled set of subjects in situations of VNC. Here, too, no significant differences were found.

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Table 5: Average contribution in groups that play under NFS + IS in Phase 2

	NV (no voting) (1)	VC (vote counts) (2)	VNCnf (vote not count, no feedback) (3)		VNCfgF (Vote not count, feed-back FOR) (4)	VNCfgA (vote not count, feed-back AGAINST) (5)
			For	Against		
Period 7 only	15.13	16.27	11.20		14.60	12.60
			13.60	10.72		
Phase 2 as a whole	16.32	16.34	12.34		15.77	15.20
			14.23	11.96		
Same groups in Phase 1 as a whole	8.50	9.82	5.32		6.70	6.40
			8.10	4.76		
Number of groups	8	3	6		3	3
			1	5		

As before, I attempt to advance the analysis by controlling for individual votes and Phase 1 experience, estimating multivariate regressions at the individual level. I have 120 individual level observations for Period 7 and the same number of average individual contribution observations for Phase 2 as a whole on which I can estimate regressions that control for own vote in the treatments with IS. Again, Period 1 contribution is a significant positive predictor of contribution under NFS + IS in these regressions. For these treatments, other group members' average contribution in Phase 1 also shows a significant effect on own average Phase 2 contribution.

Unlike the corresponding regressions for the treatments without IS, there is one pair of statistically significant Wald test results for differences in situation dummy variables (see Table 6). Both for Period 7 and for Phase 2 as a whole, contributions are significantly higher ($p < 0.10$ and $p < 0.01$, respectively) among yes voters in the VNCfgF situation than for those in VNCnf situation. A separate test, not shown, finds a significant difference from subjects in the VNCfgF and those in VNCnfgF, although this holds for Phase 2 as a whole only ($p < 0.001$). Thus, the data support the presence

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of an information effect: despite the vote override, yes voters whose groups are told that their majority voted for NFS contribute more under NFS + IS than yes voters in the VNCnf situations. However, I did not find the same effect for No voters. According to Wald tests, in fact, in no two situations in which NFS is implemented with IS are coefficients significantly different for No voters whose situations differ with respect to the vote counting, feedback being given, or the content of the feedback.

Regressions that drop controls for individual voting and add observations from the NV situations are shown in part (b) of Table A.5.[31] These results provide further support for the presence of an information effect. In the regression variants controlling only for gender and major subject (economics or business), among individual characteristics, the difference between contributions in the VNCfgF situation and in the VNCnf situation is significant at the 10% level both for Period 7 and for Phase 2 as a whole. The difference is not significant, however, if only those groups in the no feedback situation

[31] We can see results supporting the indications that the VNCnf reduced contributions compared to the NV treatment, perhaps due to some kind of disappointment or unhappiness with having voted but receiving no feedback about the overridden vote outcome. These two groups are similar in (1) subjects in these two groups do not have information about whether the majority of their group members favor NFS or not, and (2) subjects in these two groups know that the institution assigned to them (i.e. NFS or NFS + IS) are not based on their own preference, but are assigned by computer. The only treatment difference in these two groups are that subjects in NV groups did not vote, but subjects in VNCnf groups voted. In part (b) of Table A.5., the regressions support its significance at the 5% level in the Period 7 regression with no controls but not that with three personal characteristic controls, and at the 10% level in the Phase 2 regressions with no controls but significance falls just short of 10% ($p \approx 10.2\%$) with all four controls. This finding raises a potential warning about the method that DFP employ — disappointment or some other negative affective impact of the vote not count, rather than a positive effect of determining the scheme used by voting, may account for the contribution difference between subjects in the vote counts situation and those whose vote is overridden without feedback.

My study is not the first one to question the democracy effect. SHK found that subjects contributed less in the control experiments (when subjects were told that they can vote but that their votes may be overridden) than the endogenous treatments (in which subjects were told that they can vote and that their votes will count with a probability of 100%), after controlling for a voter dummy, the number of voters in the group, institution dummies, and periods. However, SHK found that the negative effect is due to the *possibility* of a vote being overridden, rather than due to the *fact* of a vote being overridden.

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Table 6: The effect of democracy (individual level data) in IS treatments

	Contribution in period 7		Average Contribution in Phase 2	
Dependent Variable	(1)	(2)	(3)	(4)
VC_NFSn	11.67***	9.77**	15.33***	9.25**
	(3.43)	(3.94)	(2.38)	(3.58)
VC_NoNFSn	6.44***	4.97**	5.83***	1.84
	(1.49)	(2.00)	(1.83)	(1.69)
VNCnf_NFSn	10.77***	9.33***	12.20***	8.64***
	(1.27)	(1.74)	(1.21)	(1.36)
VNCnf_NoNFSn	11.00***	9.35***	11.47***	5.50**
	(2.66)	(3.35)	(2.02)	(2.58)
VNCfgF_NFSn	8.00***	8.08***	11.30***	7.48**
	(2.66)	(3.01)	(2.82)	(3.34)
VNCfgA_NFSn	11.45***	9.44***	14.48***	9.60***
	(1.79)	(2.41)	(1.00)	(1.60)
VNCfgA_NoNFSn	8.00***	6.70**	14.03***	8.75***
	(2.42)	(3.03)	(0.36)	(1.75)
VC_NFSy	17.42***	14.23***	16.60***	9.91***
	(1.71)	(2.82)	(1.77)	(2.76)
VC_NoNFSy	9.56***	6.53***	7.78***	3.096
	(1.98)	(2.44)	(2.47)	(2.10)
VNCnf_NFSn	12.38***	10.09***	12.71***	8.98***
	(2.10)	(2.35)	(1.21)	(1.53)
VNCnf_NoNFSn	12.40***	10.05***	12.93***	7.24*
	(2.66)	(3.22)	(3.20)	(3.59)
VNCfgF_NFSn	17.90***	15.30***	18.00***	13.44***
	(1.88)	(2.35)	(0.38)	(1.44)
VNCfgA_NFSn	15.75***	14.62***	17.17***	14.82***
	(2.97)	(2.94)	(1.53)	(0.83)
VNCfgA_NoNFSn	8.25***	5.56	15.17***	9.46***
	(2.97)	(3.44)	(1.79)	(2.24)
Own Period1 contribution		0.30***		0.17***
		(0.08)		(0.05)
Others' Phase 1 contribution		−0.11		0.43**
		(0.21)		(0.17)
clustered by group	no	no	yes	yes
Observations	120	120	120	120
R-squared	0.8223	0.8422	0.9072	0.9201
p-value for Wald tests of differences of contribution rate by situation for yes-voters				
VC_NFSy = VNCnf_NFSy	0.0656*	0.1414	0.0830*	0.7116
VC_NFSy = VNCfgF_NFSy	0.8496	0.6753	0.4469	0.1338
VC_NFSy = VNCfgA_NFSy	0.6279	0.9131	0.8100	0.0515*
VNCnf_NFSy = VNCfgF_NFSy	0.0524*	0.0560*	0.0004***	0.0022***
VNCnf_NFSy = VNCfgA_NFSy	0.3555	0.1966	0.0319**	0.0001***
VNCfgF_NFSy = VNCfgA_NFSy	0.5419	0.8438	0.6024	0.1627

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Table 6: The effect of democracy (individual level data) in IS treatments (Continued)

	Contribution in period 7		Average Contribution in Phase 2	
Dependent Variable	(1)	(2)	(3)	(4)
p-value for Wald tests of differences of contribution rate by situation for no-voters				
VC_NFSn = VNCnf_NFSn	0.8072	0.9033	0.2531	0.8499
VC_NFSn = VNCfgF_NFSn	0.3997	0.6885	0.2854	0.6839
VC_NFSn = VNCfgA_NFSn	0.9564	0.9293	0.7455	0.9130
VNCnf_NFSn = VNCfgF_NFSn	0.3481	0.6646	0.7704	0.7196
VNCnf_NFSn = VNCfgA_NFSn	0.7565	0.9594	0.1592	0.4472
VNCfgF_NFSn = VNCfgA_NFSn	0.2832	0.6631	0.2976	0.5199

Note: All results are from OLS regressions. Numbers in parentheses are standard errors. VC_NFS and VC_NoNFS denote an implementation of NFS (NoNFS) by majority votes, VNC_NFS and VNC_NoNFS denote the implementation of NFS (NoNFS) by vote overridden (i.e. vote but vote not count), nf denotes information on majority vote was not released to subjects, fgF and fgA denote the information that majority of group was voting for NFS (voting against NFS) and this information was released to subjects. The last letter in each situation, "n" and "y", denote the individual vote of the subject (against or for NFS). I omitted the estimated coefficients of some control variables (VNCfgF_NoNFSn and VNCfgF_NoNFS*y*) because no subjects were in these situations in the event. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

that had in fact voted for NFS are included.[32] The variants that add a control for years of study, losing additional observations, are also significant but only in the case of Phase 2 as a whole.

Result 7. For treatments with IS there is an indication of support for an endogeneity premium effect in Period 7 for the group level non-parametric tests. There is a similar indication of support for an endogeneity premium effect in period 7 and in Phase 2 as a whole for multivariate regression with controls for own vote but not for experience and personal characteristics.

Result 8. For treatments with IS there is an indication of support for a positive signaling effect — groups whose votes are overridden and receive

[32]While this finding slightly undermines the conclusion that a feedback effect is present, recall that the test with control for own vote did find a significant difference. The latter result, in a variant of Table 4 and Table 6, deserves more weight than the one reported in the present paragraph, which fails to control for own vote. The regression variants distinguishing no feedback groups according to their majority votes are not included in the main Appendix but are available on request in Appendix B.

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feedback of a majority for NFS contribute significantly more than groups whose votes are overridden and do not receive any feedback. This positive signaling effect is significantly supported in both regressions without control for own vote and those with such control.

5 Concluding discussion

I study the questions of whether availability of informal sanctioning (IS) opportunities adds to the efficacy of non-deterrent formal sanctions (NFS) and whether, if so, this effect is enhanced when those sanctions are chosen by vote. Along the way, I revisit two questions: whether adding NFS improves the effectiveness of IS, and whether being chosen by vote in and of itself enhances the effectiveness of NFS. I also take the opportunity to compare two methods for investigating the endogeneity premium question: the one introduced by Dal Bó, Foster, and Putterman (2010) that permits controlling for selection effects with information on the individual's vote by generating observations of exogenously imposed institutions after voting and the overriding of votes; and the simpler method of comparing observations of subjects operating under the institution imposed without opportunity to vote to those of subjects in groups operating under it after its adoption by vote. The latter method does not permit controlling for individuals' votes, so I attempt to control for selection effects by using own initial behavior, experience, and personal characteristics in multivariate regression equations.

Taking all conditions together and in the no voting treatments, my data support the hypothesis that adding IS strengthens the effect of NFS on contributions, at least when considering the six period sequence of Phase 2 interactions as a whole. This result did not find support in the "vote count" and "vote not count" situations taken by themselves, however. The reverse idea that adding NFS strengthens the effect of IS, supported in Kube and Traxler's exogenous one-shot experiment (2011), is also supported in my no voting situation, vote count situation, and in my pooled data from all treatments and conditions.

Unlike Tyran and Feld (2006), my data support neither the idea that the effectiveness of NFS is increased by voting nor the idea that NFS is ineffective in the absence of voting. For whatever reason, my subjects respond to NFS with significantly higher contributions even when it is imposed without a vote. I likewise do not find contributions under NFS + IS together to be significantly higher when NFS is adopted by vote than when it is imposed.

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In my treatment with IS, I do find support for an effect of voting on effectiveness of NFS (that is, of the NFS + IS combination) when the comparison is to the vote not count situation without feedback, paralleling the principal approach in DFP. However, that difference is only significant when I fail to control for individual vote and experience. Moreover, unlike DFP, I find evidence that most of the effect of voting in the treatment with IS, if there is one, is attributable to the signaling or informational effect of learning about the preferences of other group members from their votes; an effect is present, that is, even if the vote is declared void and the institution is imposed exogenously.

Although not all of these findings lend themselves to easy interpretation, many of my results are consistent with past findings and with intuition. I find the usual decay of contributions from a substantial initial level in a finitely repeated VCM, and the usual sustaining of contributions when informal sanctions are available, with the latter effect explained, as usual, by decisions to voluntarily impose costly sanctions mainly on low contributors. NFS + IS tends to perform better than NFS-only mainly because availability of IS allows contributions to be more sustained over time.

The original question motivating my study is: why do we observe in society so much use of sanctions too low to be deterrent in material terms, and why do such sanctions often appear to have effects on behavior? While I found support for the view that availability of informal sanctions helps to make non-deterrent formal ones more effective, the conjectures that NFS is effective only with the help of IS or only thanks to the empowerment, legitimacy, or signaling conveyed by voting, were not supported by my data. It is possible that, the sample size is a concern in my experiment. Or, possibly, my subjects understood themselves to be engaged in a situation in which the good of all is at odds with individual gains, and perhaps most were already characterized by a bias towards cooperation or a conditional willingness to contribute provided that others did. While raising the MPCR but leaving it below the return from private allocation should have no effect, according to standard theory, it is well known that higher MPCRs are associated with higher contributions to the public good in experiments (Zelmer, 2003). A higher MPCR lowers the private cost of contributing, though that cost remains positive, so it could tip the balance between the cost and benefit of contributing for subjects who assign small positive values to contributing or bestowing benefits on others.

The effect of a non-deterrent sanction, much like raising the MPCR, is

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also to reduce the opportunity cost of contributing. For most subjects, that reduction may have been sufficient to raise their subjectively optimal contributions substantially. Higher anticipated contributions by others also raise the preferred contributions of conditional cooperators through the indirect channel of conditional cooperation. Finally, introduction of a sanction for allocating funds to the private accounts could conceivably have had an "experimenter demand effect," reinforcing subjects' senses that contributing to the public good is a sign of virtue. Clearly more work is needed before we understand more fully why non-deterrent sanctions are often effective, and what roles reinforcing informal sanctions and public assent by voting play in the process. Further research with larger samples is necessary.

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Appendix A: Tables and Figures

Table A.1: The trend of contribution in each condition, by situation (individual-level data)

Dependent variable: individual's contribution (contribution)

	ALL	Exo	vExo_nF	Endo	vExo_F
NFS*round	−0.134	0.165	0.573	−0.367*	−0.889
	(0.20)	(0.21)	(0.46)	(0.19)	(0.69)
IS*round	1.307***	1.582***	1.557**	0.155	2.689***
	(0.36)	(0.49)	(0.54)	(0.42)	(0.62)
BOTH*round	1.412***	1.297***	2.055***	0.613	1.574**
	(0.24)	(0.37)	(0.47)	(0.37)	(0.65)
Round	−1.112***	−1.128***	−1.866***	−0.825***	−0.731
	(0.16)	(0.17)	(0.31)	(0.07)	(0.61)
NFS	8.335***	7.026***	3.671**	11.17***	10.36***
	(1.21)	(2.01)	(1.36)	(1.96)	(1.23)
IS	−0.384	−1.337	−0.833	3.18	−1.827*
	(1.21)	(1.46)	(1.05)	(1.99)	(0.94)
BOTH	4.637***	6.151***	−2.438***	11.39***	3.073**
	(1.12)	(1.47)	(0.72)	(1.80)	(1.16)
Constant	9.377***	9.577***	14.11***	5.698***	9.460***
	(0.96)	(1.30)	(0.58)	(0.99)	(0.67)
Observations	2,340	900	480	480	480
R-squared	0.234	0.285	0.118	0.385	0.231

p-values of Test of different contribution level and trend by condition

Round= −NFS*round	0.0000	0.0000	0.0018	0.0000	0.0001
Round= −IS*round	0.5421	0.3353	0.4911	0.1244	0.0000
Round= −BOTH*round	0.0871	0.6067	0.5932	0.5631	0.0008
NFS*round=BOTH*round	0.0000	0.0031	0.0083	0.0268	0.0000
IS*round=BOTH*round	0.7727	0.6189	0.3864	0.4137	0.0001
IS*round=NFS*round	0.0001	0.0063	0.0967	0.2623	0.0000
NFS=BOTH	0.0002	0.6074	0.0003	0.9265	0.0001
IS=BOTH	0.0000	0.0000	0.1193	0.0027	0.0007
IS=NFS	0.0000	0.0000	0.0090	0.0048	0.0000

Notes: All results are from OLS regressions and clustered with groups. The sample covers the data only in Phase 2. The dependent variable is the individual's contribution level. In row 1, 2 and 3, the explanatory variables are the interaction of indicator variables for different conditions with round. The explanatory variable in row 4 is "round", i.e. the n^{th} period in Phase 2, which is equal to 1, 2, 3, 4, 5, or 6. The explanatory variables in row 5, 6, and 7 are indicator variables for condition NFS only, condition IS only, and condition IS + NFS The *p*-values correspond to Wald tests based on the regression results. Tobit estimations yield similar results. Robust Standard errors in parentheses. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

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Table A.2: Determinants of getting punished: regression results by situation

Dependent variable: informal sanctions received (received)

Panel (a): Subjects in condition IS-only

	Exo	Endo	vExo_nF	vExo_FgA	All
others_avgc	−0.549***	0.0683	0.585***	−0.319	−0.289***
	(0.16)	(0.28)	(0.21)	(0.20)	(0.09)
posi_devia	−0.0555	−0.13	0.151	−0.340***	−0.133
	(0.14)	(0.14)	(0.16)	(0.12)	(0.09)
nega_devia	1.145***	1.229***	0.439***	0.977***	1.040***
	(0.16)	(0.23)	(0.11)	(0.14)	(0.11)
Constant	3.373***	3.941	−4.611	8.564***	3.033***
	(1.23)	(3.71)	(3.68)	(1.93)	(0.91)
Observations	210	150	60	60	480
R-squared	0.605	0.646	0.653	0.801	0.585

Note: Robust standard errors in parentheses * denotes significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level. To control for time and matching groups, the regression model also contains period dummies and dummies for each independent group. Tobit estimates yield similar results. There are no observations for the override feedback for situation.

Panel (b): Subject in condition NFS + IS

Situation	Exo	Endo	vExo_nF	vExo_FgF	vExo_FgA	All
others_avgc	0.273**	0.0665	0.088	−0.312	−0.279	0.065
	(0.14)	(0.20)	(0.17)	(0.26)	(0.18)	(0.08)
posi_devia	0.530***	0.227	0.122	0.354	−0.0379	0.236***
	(0.13)	(0.15)	(0.11)	(0.24)	(0.11)	(0.06)
nega_devia	0.673***	0.691***	0.425***	0.816***	0.944***	0.621***
	(0.10)	(0.15)	(0.08)	(0.15)	(0.15)	(0.05)
Constant	−4.807*	−0.0881	4.539	4.293	4.721	0.292
	(2.63)	(2.80)	(2.91)	(4.08)	(2.90)	(1.50)
Observations	240	90	180	90	90	690
R-squared	0.577	0.603	0.326	0.532	0.689	0.466

Note: Robust standard errors in parentheses * denotes significance at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level. To control for time and matching groups, the regression model also contains period dummies and dummies for each independent group. Tobit estimates yield similar results.

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Table A.3: Comparison of average contribution in the groups across conditions

(1) Fully Exogenous (Exo)

	VCM	IS	NFS	NFS + IS
observations	7	7	8	8
VCM	—	0.1102	0.0151 NFS > VCM	0.0018 NFS + IS > VCM
IS	0.7979	—	0.2030	0.0109 NFS + IS > IS
NFS	0.0151 NFS > VCM	0.0054 NFS > IS	—	0.0587 NFS + IS > NFS
NFS + IS	0.0077 NFS + IS > VCM	0.0012 NFS + IS > IS	0.7517	—

(2) Vote Count (Endo)

	VCM	IS	NFS	NFS + IS
observations	3	5	5	3
VCM	—	0.2967	0.0253 NFS > VCM	0.0495 NFS + IS > VCM
IS	0.6547	—	0.0472 NFS > IS	0.0253 NFS + IS > IS
NFS	0.0253 NFS > VCM	0.0163 NFS > IS	—	0.4561
NFS + IS	0.0495 NFS + IS > VCM	0.0253 NFS + IS > IS	0.7642	—

(3) Override, no Feedback (vExo_nF)

	VCM	IS	NFS	NFS + IS
observations	2	2	6	6
VCM	—	0.4386	0.0455 NFS > VCM	0.0956 NFS + IS > VCM
IS	1.0000	—	0.7389	0.8668
NFS	0.1290	0.0936 NFS > IS	—	0.5745
NFS + IS	0.8668	0.7389	0.0247 NFS > NFS + IS	—

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Table A.3: Comparison of average contribution in the groups across conditions (Continued 1)

(4) Override, Feedback, For (vExo_FgF)

	VCM	IS	NFS	NFS + IS
observations	2	0	6	3
VCM	—	—	0.0956 NFS > VCM	0.0833 NFS + IS > VCM
IS	—	—	—	—
NFS	0.0956 NFS > VCM	—	—	0.6056
NFS + IS	0.2482	—	0.1967	—

(5) Override, Feedback, Against (vExo_FgA)

	VCM	IS	NFS	NFS + IS
observations	0	2	0	3
VCM	—	—	—	—
IS	—	—	—	0.5637
NFS	—	—	—	—
NFS + IS	—	0.0833 NFS + IS > IS	—	—

(6) Override (vExo)

	VCM	IS	NFS	NFS + IS
observations	4	4	12	12
VCM	—	0.0833 IS > VCM	0.0153 NFS > VCM	0.0108 NFS + IS > VCM
IS	0.5637	—	0.7160	0.6706
NFS	0.0127 NFS > VCM	0.0075 NFS > IS	—	0.9770
NFS + IS	0.5850	0.1149	0.0061 NFS > NFS + IS	—

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Table A.3: Comparison of average contribution in the groups across conditions (Continued 2)

(7) All

	VCM	IS	NFS	NFS + IS
observations	14	16	25	23
VCM	—	0.0291 IS > VCM	0.0000 NFS > VCM	0.0000 NFS + IS > VCM
IS	0.7392	—	0.0139 NFS > IS	0.0006 NFS + IS > IS
NFS	0.0000 NFS > VCM	0.0000 NFS > IS	—	0.1292
NFS + IS	0.0003 NFS + IS > VCM	0.0000 NFS + IS > IS	0.0271 NFS > NFS + IS	—

Note: Numbers to the left and below the diagonal are for tests of differences in average contribution in the groups in the first period of Phase 2. Numbers to the right and above the diagonal are for tests of differences in average contribution for the same groups in Phase 2. A statistically significant test *p-value* is indicated by bold typeface, and the direction of the observed difference is reported below it.

Table A.4: Comparison of average contribution in the groups across situations

A. NFS, Period 7 only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Fully Exogenous (Exo)	Vote Count (Endo)	Override, no feedback, All (vExo_nF)	Override, no feedback, For (vExo_nFgF)	Override, no feedback, Against (vExo_nFgA)	Override, with feedback, For (vExo_FgF)	Override, with feedback, Against (vExo_FgA)
observations	8	5	6	5	1	6	0
(1) Exo	—	0.8836	0.8972	0.8835	1.0000	0.4386	—
(2) Endo	0.0790 R > C	—	0.9266	0.8325	0.7697	0.5839	—
(3) vExo_nF	0.4009	0.4652	—	0.3729	0.3729	0.2963	—
(4) vExo_nFgF	0.7140	0.4647	0.3798	—	0.3729	0.2722	—
(5) vExo_nFgA	0.1213	0.7697	0.3798	0.3798	—	0.8008	—
(6) vExo_FgF	0.4386	0.2012	0.8728	1.0000	0.6171	—	—
(7) vExo_FgA	—	—	—	—	—	—	—

Note: Numbers to the right and above the diagonal are for tests of differences in average contribution in the groups in the first period of Phase 2. Numbers to the left and below the diagonal are for tests of differences in average contribution for the same groups in Phase 1. A statistically significant test *p-value* is indicated by bold typeface, and the direction of the observed difference is reported below it (R indicates variable in row heading, C indicates variable in column heading).

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Table A.4: Comparison of average contribution in the groups across situations (Continued 1)

B. NFS, Phase 2 overall

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Fully Exogenous (Exo)	Vote Count (Endo)	Override, no feedback, All (vExo_nF)	Override, no feedback, For (vExo_nFgF)	Override, no feedback, Against (vExo_nFgA)	Override, with feedback, For (vExo_FgF)	Override, with feedback, Against (vExo_FgA)
observations	8	5	6	5	1	6	0
(1) Exo	—	0.6605	0.7963	0.6605	0.6985	0.8973	—
(2) Endo	0.0790 R > C	—	0.7150	0.7540	0.7697	0.4652	—
(3) vExo_nF	0.4009	0.4652	—	0.3798	0.3798	0.4233	—
(4) vExo_nFgF	0.7140	0.4647	0.3798	—	0.3798	0.4652	—
(5) vExo_nFgA	0.1213	0.7697	0.3798	0.3798	—	0.6171	—
(6) vExo_FgF	0.4386	0.2012	0.8728	1.0000	0.6171	—	—
(7) vExo_FgA	—	—	—	—	—	—	—

Note: Numbers to the right and above the diagonal are for tests of differences in average contribution in the groups in Phase 2 as a whole. Numbers to the left and below the diagonal are for tests of differences in average contribution for the same groups in Phase 1. A statistically significant test *p-value* is indicated by bold typeface, and the direction of the observed difference is reported below it (R indicates variable in row heading, C indicates variable in column heading).

C. NFS + IS, Period 7 only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Fully Exogenous (Exo)	Vote Count (Endo)	Override, no feedback, All (vExo_nF)	Override, no feedback, For (vExo_nFgF)	Override, no feedback, Against (vExo_nFgA)	Override, with feedback, For (vExo_FgF)	Override, with feedback, Against (vExo_FgA)
observations	8	3	6	1	5	3	3
(1) Exo	—	0.5394	0.0054 R > C	0.4367	0.0042 R > C	0.6824	0.1521
(2) Endo	0.1530	—	0.0201 R > C	0.1797	0.0253 R > C	0.8273	0.2752
(3) vExo_nF	0.0389 C > R	0.0201 C > R	—	0.1432	0.1432	0.1213	0.7963
(4) vExo_nFgF	1.0000	0.1797	0.1432	—	0.1432	0.6547	0.6547
(5) vExo_nFgA	0.0192 C > R	0.0253 C > R	0.1432	0.1432	—	0.1011	0.6547
(6) vExo_FgF	0.3074	0.0495 C > R	0.4386	0.1797	0.1797	—	0.2752
(7) vExo_FgA	0.3074	0.5127	1.0000	0.6547	0.8815	0.5127	—

Note: Numbers to the right and above the diagonal are for tests of differences in average contribution in the groups in the first period of Phase 2. Numbers to the left and below the diagonal are for tests of differences in average contribution for the same groups in Phase 1. A statistically significant test *p-value* is indicated by bold typeface, and the direction of the observed difference is reported below it (R indicates variable in row heading, C indicates variable in column heading).

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Table A.4: Comparison of average contribution in the groups across situations (Continued 2)

D. NFS + IS, Phase 2 overall

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Fully Exogenous (Exo)	Vote Count (Endo)	Override, no feedback, All (vExo_nF)	Override, no feedback, For (vExo_nFgF)	Override, no feedback, Against (vExo_nFgA)	Override, with feedback, For (vExo_FgF)	Override, with feedback, Against (vExo_FgA)
observations	8	3	6	1	5	3	3
(1) Exo	—	1.0000	0.0389 R > C	0.4386	0.0404 R > C	0.6831	0.2207
(2) Endo	0.1530	—	0.1213	0.6547	0.1011	0.8273	0.8273
(3) vExo_nF	0.0389 C > R	0.0201 C > R	—	0.3798	0.3798	0.1213	0.1213
(4) vExo_nFgF	1.0000	0.1797	0.1432	—	0.3798	0.6547	0.6547
(5) vExo_nFgA	0.0192 C > R	0.0253 C > R	0.1432	0.1432	—	0.1011	0.1011
(6) vExo_FgF	0.3074	0.0495 C > R	0.4386	0.1797	0.1797	—	0.8222
(7) vExo_FgA	0.3074	0.5127	1.0000	0.6547	0.8815	0.5127	—

Note: Numbers to the right and above the diagonal are for tests of differences in average contribution in the groups in Phase 2 as a whole. Numbers to the left and below the diagonal are for tests of differences in average contribution for the same groups in Phase 1. A statistically significant test *p-value* is indicated by bold typeface, and the direction of the observed difference is reported below it (R indicates variable in row heading, C indicates variable in column heading).

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Table A.5: The effect of democracy (Individual level data)

A. no-IS treatments

	contribution		avgc_p2	
Dependent Variable	(1)	(2)	(3)	(4)
EndoNFS	10.74***	10.99***	8.429***	6.472***
	(1.83)	(2.87)	(2.32)	(2.35)
EndoNoNFS	1.19	0.97	−1.40	−3.652*
	(2.07)	(3.08)	(1.57)	(1.81)
vExoNFS_nF	10.04***	10.66***	8.667***	6.815***
	(1.73)	(2.88)	(1.52)	(2.13)
vExoNoNFS_nF	4.973*	5.23	1.82	−0.17
	(2.68)	(3.40)	(2.49)	(2.56)
vExoNFS_FgF	12.13***	12.54***	10.17***	8.329***
	(1.61)	(2.78)	(2.04)	(2.45)
vExoNoNFS_FgF	5.686**	5.596*	2.66	0.57
	(2.38)	(3.18)	(1.93)	(2.10)
vExoNFS_FgA	—	—	—	—
vExoNoNFS_FgA	—	—	—	—
ExoNFS	11.13***	10.64***	9.747***	7.442***
	(1.41)	(2.58)	(2.03)	(2.50)
ExoNoNFS	3.790**	3.77	1.48	−0.41
	(1.64)	(2.78)	(1.38)	(1.73)
Own Period 1 contribution	0.323***	0.305***	0.234***	0.227***
	(0.06)	(0.06)	(0.06)	(0.06)
Others' Phase 1 contribution	0.22	0.19	0.247*	0.234*
	(0.15)	(0.14)	(0.13)	(0.13)
female		1.35		2.073***
		(0.93)		(0.63)
Major in Econ or Business		−1.33		0.03
		(0.97)		(0.74)
Year of study		0.506*		0.18
		(0.30)		(0.23)
Political View		−0.33		0.09
		(0.37)		(0.25)
clustered by group	no	no	yes	yes
Observations	195	195	195	195
R-squared	0.834	0.841	0.847	0.854

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Table A.5: The effect of democracy (Individual level data) (Continued 1)

	contribution		avgc_p2	
Dependent Variable	(1)	(2)	(3)	(4)
p-values of tests of differences of contribution rate by situation				
EndoNFS = vExoNFS_nF	0.6873	0.8508	0.8994	0.8548
EndoNFS = vExoNFS_FgF	0.4256	0.3708	0.4594	0.3958
EndoNFS = vExoNFS_FgA	n.a.	n.a.	n.a.	n.a.
EndoNFS = ExoNFS	0.8156	0.8363	0.5585	0.6502
vExoNFS_nF = vExoNFS_FgF	0.2078	0.2547	0.4013	0.3764
vExoNFS_nF = vExoNFS_FgA	n.a.	n.a.	n.a.	n.a.
vExoNFS_nF = ExoNFS	0.4889	0.9900	0.5131	0.7205
vExoNFS_FgF = vExoNFS_FgA	n.a.	n.a.	n.a.	n.a.
vExoNFS_FgF = ExoNFS	0.5165	0.2289	0.8464	0.6682
vExoNFS_FgA = ExoNFS	n.a.	n.a.	n.a.	n.a.
EndoNoNFS = vExoNoNFS_nF	0.1554	0.1104	0.1317	0.0473
EndoNoNFS = vExoNoNFS_FgF	0.0858	0.0782	0.0241	0.0034
EndoNoNFS = vExoNoNFS_FgA	n.a.	n.a.	n.a.	n.a.
EndoNoNFS = ExoNoNFS	0.1881	0.1649	0.0169	0.0012
vExoNoNFS_nF = vExoNoNFS_FgF	0.8059	0.8993	0.7139	0.7068
vExoNoNFS_nF = vExoNoNFS_FgA	n.a.	n.a.	n.a.	n.a.
vExoNoNFS_nF = ExoNoNFS	0.6147	0.5543	0.8618	0.8875
vExoNoNFS_FgF = vExoNoNFS_FgA	n.a.	n.a.	n.a.	n.a.
vExoNoNFS_FgF = ExoNoNFS	0.4078	0.4229	0.4454	0.4577
vExoNoNFS_FgA = ExoNoNFS	n.a.	n.a.	n.a.	n.a.

Note: All results are from OLS regressions. The dependent variable is contribution (contribution in period) in column (1) and (2), and is avgc_p2 (average contribution in Phase 2) in column (3) and (4). All the regressions control for the individual's contribution in period 1 and their group members' average contribution in Phase 1. Regressions in column 2 and 4 control for the individual's contribution in period 1 and their group members' average contribution in Phase 1. Numbers in parenthesis are standard errors. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

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Table A.5: The effect of democracy (Individual level data) (Continued 2)

B. IS treatments

	contribution			avgc_p2		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
EndoNFS	11.70***	11.70***	10.39***	10.75***	11.41***	9.246***
	(2.15)	(2.21)	(2.85)	(2.44)	(2.47)	(2.83)
EndoNoNFS	4.464***	5.089***	3.65	2.880*	4.213**	1.94
	(1.51)	(1.66)	(2.42)	(1.69)	(2.04)	(2.46)
vExoNFS_nF	8.624***	10.08***	8.621***	9.250***	9.844***	7.629***
	(1.33)	(1.49)	(2.38)	(1.14)	(0.90)	(1.77)
vExoNoNFS_nF	8.290***	5.412*	4.00	7.440**	4.692***	2.29
	(2.28)	(2.83)	(3.45)	(2.91)	(1.49)	(2.21)
vExoNFS_FgF	11.83***	11.85***	10.24***	12.17***	12.62***	10.21***
	(1.77)	(1.81)	(2.64)	(1.93)	(1.95)	(2.63)
vExoNoNFS_FgF	—	—	—	—	—	—
vExoNFS_FgA	9.775***	9.784***	8.362***	11.65***	12.08***	9.936***
	(1.75)	(1.79)	(2.56)	(1.31)	(1.31)	(1.96)
vExoNoNFS_FgA	4.928**	4.977**	3.72	10.04***	10.63***	8.642***
	(2.21)	(2.26)	(2.92)	(1.72)	(1.78)	(2.21)
ExoNFS	11.84***	11.87***	10.20***	11.89***	12.46***	10.06***
	(1.61)	(1.67)	(2.50)	(2.05)	(2.08)	(2.45)
ExoNoNFS	5.131***	5.112***	3.46	6.628***	6.970***	4.453*
	(1.28)	(1.31)	(2.29)	(1.93)	(1.99)	(2.44)
Own Period 1 contribution	0.362***	0.381***	0.384***	0.222***	0.225***	0.230***
	(0.06)	(0.06)	(0.06)	(0.04)	(0.04)	(0.05)
Others' Phase 1 contribution	−0.03	−0.05	−0.01	0.268*	0.20	0.23
	(0.15)	(0.15)	(0.16)	(0.14)	(0.15)	(0.15)
Female			−1.03			−1.140*
			(0.86)			(0.66)
Major in Econ or Business			−0.28			0.85
			(0.98)			(0.84)
Year of study			0.34			0.25
			(0.27)			(0.19)
Political View			0.12			0.30
			(0.34)			(0.30)
Clustered by group	no	no	no	yes	yes	yes
Observations	195	175	175	195	175	175
R-squared	0.844	0.85	0.853	0.906	0.908	0.912

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Table A.5: The effect of democracy (Individual level data) (Continued 3)

	contribution			avgc_p2		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
p-values of tests of differences of contribution rate by situation						
EndoNFS = vExoNFS_nF	0.1014	0.4284	0.3933	0.4596	0.4281	0.3727
EndoNFS = vExoNFS_FgF	0.9480	0.9418	0.9426	0.5635	0.6166	0.6825
EndoNFS = vExoNFS_FgA	0.3524	0.3588	0.3354	0.6834	0.7493	0.7098
EndoNFS = ExoNFS	0.9335	0.9181	0.9151	0.6047	0.6272	0.6791
vExoNFS_nF = vExoNFS_FgF	0.0647	0.3475	0.3966	0.0909	0.0866	0.1343
vExoNFS_nF = vExoNFS_FgA	0.5045	0.8763	0.8927	0.0425	0.0136	0.0040***
vExoNFS_nF = ExoNFS	0.0225	0.2627	0.3336	0.0965	0.0839	0.1023
vExoNFS_FgF = vExoNFS_FgA	0.3000	0.3010	0.3521	0.7827	0.7626	0.8820
vExoNFS_FgF = ExoNFS	0.9976	0.9898	0.9855	0.8955	0.9415	0.9470
vExoNFS_FgA = ExoNFS	0.2189	0.2168	0.2786	0.8898	0.8147	0.9362
EndoNoNFS = vExoNoNFS_nF	0.0678	0.9066	0.8994	0.1264	0.7730	0.8550
EndoNoNFS = vExoNoNFS_FgF	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EndoNoNFS = vExoNoNFS_FgA	0.8223	0.9581	0.9732	0.0003	0.0017	0.0016
EndoNoNFS = ExoNoNFS	0.6404	0.9883	0.9039	0.0787	0.2220	0.2903
vExoNoNFS_nF = vExoNoNFS_FgF	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
vExoNoNFS_nF = vExoNoNFS_FgA	0.1671	0.8845	0.9267	0.3241	0.0000	0.0000
vExoNoNFS_nF = ExoNoNFS	0.1235	0.9103	0.8409	0.7781	0.1350	0.1488
vExoNoNFS_FgF = vExoNoNFS_FgA	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
vExoNoNFS_FgF = ExoNoNFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
vExoNoNFS_FgA = ExoNoNFS	0.9171	0.9470	0.8995	0.0574	0.0449	0.0162

Note: All results are from OLS regressions. The dependent variable is contribution (contribution in period) in column (1), (2) and (3), and is avgc_p2 (average contribution in Phase 2) in column (4), (5) and (6). All the regressions control for the individual's contribution in period 1 and their group members' average contribution in Phase 1. Regression 3 and 6 control for individual's characteristics. Regression 2, 3, 5 and 6 exclude 5 observations in IS + EndoNoNFS, 10 observations in IS + vExoNFS_nF, and 5 observations in IS + vExoNoNFS_nF because of accidental loss of post-experiment survey observations for those groups due to a computer error. Numbers in parenthesis are standard errors. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

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Table A.6: the organization of the effects

i. without IS

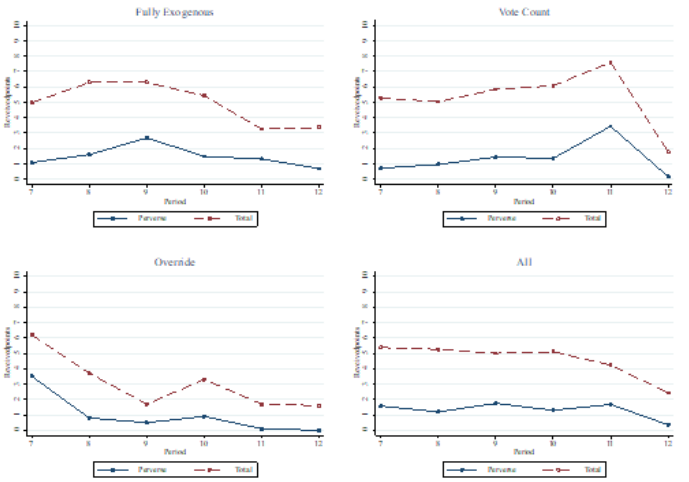
	Period 7				Phase 2			
		Reg. w/vote	Regs. without vote control			Reg. w/vote	Regs. Without vote control	
	M-W test	control	2 char's	4 char's	M-W test	control	2 char's	4 char's
Democracy effect, DFP	Not	Not	Not	Not	Not	Not	Not	Not
(Endo vs. Exo_nF)	signif.	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Info. Effect, DFP	Not	Not	Not	Not	Not	Not	Not	Not
(Exo_FgF vs. Exo_nF)	signif.	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Info. Effect v2								
(Exo_FgF vs. Exo_nFgF	Not	Not	Not	Not	Not	Not	Not	Not
(FOR groups only))	signif.	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Pure Demo Effect	Not	Not	Not	Not	Not	Not	Not	Not
(Endo vs. vExo_FgF)	signif.	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Demo Effect	Not		Not	Not	Not		Not	Not
(Endo vs. ExoNFS)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect	Not		Not	Not	Not		Not	Not
(vExo vs. Exo)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect								
for no feedback only	Not		Not	Not	Not		Not	Not
(vExo_nF vs. Exo)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect								
for Feedback for only	Not		Not	Not	Not		Not	Not
(vExo_FgF vs. Exo)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect								
for Feedback against only								
(vExo_FgA vs. Exo)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

ii. with IS

Democracy effect, DFP	Supported,	Not	Not	Not	Not	Not	Not	Not
(Endo vs. Exo_nF)	$p = 0.0201$	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Info. Effect, DFP	Not	Supported,	Supported,	Not	Not	Supported,	Supported,	Not
(Exo_FgF vs. Exo_nF)	signif.	$p = 0.0560$	$p = 0.0787$	signif.	signif.	$p = 0.0022$	$p = 0.0785$	signif.
Info. Effect v2								
(Exo_FgF vs. Exo_nFgF	Not	Not	Not	Not	Not	Supported,	Not	Not
(FOR groups only))	signif.	signif.	signif.	signif.	signif.	$p = 0.0000$	signif.	signif.
Pure Demo Effect	Not	Not	Not	Not	Not	Not	Not	Not
(Endo vs. vExo_FgF)	signif.	signif.	signif.	signif.	signif.	signif.	signif.	signif.
Demo Effect	Not		Not	Not	Not		Not	Not
(Endo vs. ExoNFS)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect	Supported,		Not	Not	Supported,		Not	Not
(vExo vs. Exo)	$p = 0.0185$	n.a.	signif.	signif.	$p = 0.0639$	n.a.	signif.	signif.
Disappointment Effect								
for no feedback only	Supported,		Supported,	Not	Supported,		Supported,	Not
(vExo_nF vs. Exo)	$p = 0.0054$	n.a.	$p = 0.0377$	signif.	$p = 0.0389$	n.a.	$p = 0.0806$	signif.
Disappointment Effect								
for Feedback for only	Not		Not	Not	Not		Not	Not
(vExo_FgF vs. Exo)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.
Disappointment Effect								
for Feedback against only	Not		Not	Not	Not		Not	Not
(vExo_FgA vs. Exo)	signif.	n.a.	signif.	signif.	signif.	n.a.	signif.	signif.

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A. IS-only



B. NFS + IS

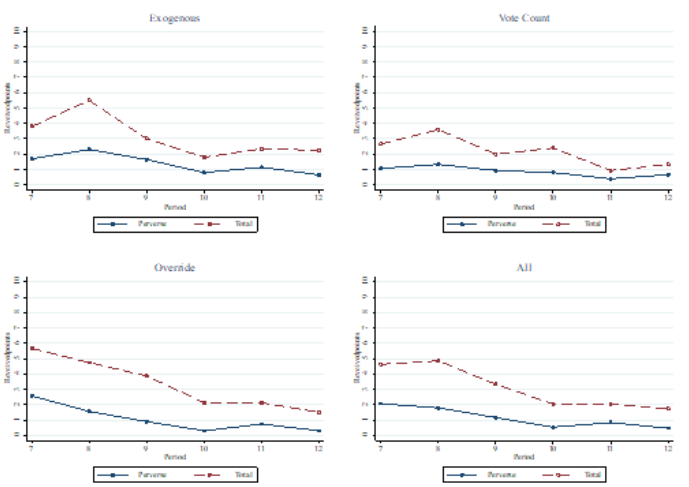


Figure A1: The trend of average amount of informal sanctions received

Note: average received sanctions per subject and period (double the number of sanction points given). Sanctions are defined as perverse when directed at a group member who contributes the average or more than the group average of the period to the group account.

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遵從非威懾性正式制裁: 同儕制裁效果和投票效果

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若要使經濟理性人遵從法令上的微弱制裁, 就需要有額外的輔助, 包括(1) 同儕間的非正式制裁力量以及(2) 通過投票實施這個非威懾性正式制裁。我在實驗室實驗中研究了非威懾性正式制裁對自願捐獻公共財的影響。我發現同儕間的非正式制裁會加強正式制裁的效果。具體來說, 在這個有限重複的博弈中, 當正式制裁和非正式制裁同時存在時, 受試者的捐獻額會隨著回合數不變或上升, 這可能是因爲, 貢獻額每低於小組平均一分, 就會受到同儕的懲罰。然而, 我發現通過投票實施這個非威懾性正式制裁, 相較於控制組, 對貢獻額沒有任何顯著的效果。

關鍵詞: 實驗, 自願捐獻, 正式制裁, 同儕懲罰, 投票
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