Discussion Paper No. 17-038

Democracy and Compliance in Public Goods Games

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Abstract: I investigate if, how, and why the effect of a contribution rule in a public goods game depends on how it is implemented: endogenously chosen or externally imposed. The rule prescribes full contributions to the public good backed by a non-deterrent sanction for those who do not comply. My experimental design allows me to disentangle to what extent the effect of the contribution rule under democracy is driven by self-selection of treatments, information transmitted via the outcome of the referendum, and democracy per se. In case treatments are endogenously chosen via a democratic decision-making process, the contribution rule significantly increases contributions to the public good. However, democratic participation does not affect participants' contribution behavior directly, after controlling for self-selection of treatments and the information transmitted by voting.

Keywords: Laboratory experiment; public good; democracy; endogenous institutions; voting; contribution rule; compliance

JEL classification: C91; D02; D72; K42

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1 Introduction

In this paper, I investigate whether the effect of a rule on how to act in a social dilemma situation depends on how it is implemented: endogenously chosen or externally imposed. Most importantly, my experimental design allows me to determine the drivers of the effect of democratic participation: self-selection of treatments, information transmitted via voting, or democracy per se. Since many interactions in real life related to cooperation are subject to non-deterrent policies, I focus on a rule which prescribes full contributions to a public good and is backed by a weak sanction for those who do not comply. For instance, in international environmental treaties between sovereign nations, like the Kyoto protocol, no third-party mechanism exists to enforce the agreement (e.g., Barett 2010). Small scale common property goods, like fisheries, do have formal authorities in most cases, but authorities often lack the capacities to monitor, sanction and enforce (e.g., Ostrom 1990; Kroll et al. 2007). Therefore, this experiment is in general related to the vast literature on how to design policies in order to foster cooperation in social dilemma situations in the absence of strong enforcement mechanisms.[1]

However, not the policy itself but rather the process of how it is implemented is at the focus of my paper. Thus, I contribute to the growing economic literature which investigates whether the effect of a policy depends on how it is implemented. One of Elinor Ostrom's design principles characterising robust institutions for managing common-pool resources is that resource users affected by regulations should be authorized to participate in making and modifying the rules (Ostrom 1990). Initially this refers to the importance of local knowledge in devising effective rules. Further - and most of all - positive aspects of participation have been identified in several field studies. Participation is suggested to increase the willingness to follow rules or to avoid that externally imposed regulations crowd out voluntary cooperative behavior (e.g., Ostrom and Nagendra 2006). In this line, Bardhan (2000) shows that users of a common-pool resource tend to manage the resource more successfully when they are genuinely engaged in decisions on rules affecting their use. Further empirical findings by Pommerehne and Weck-Hannemann (1996) and Frey (1998), for example, suggest that income tax compliance in Switzerland increases with democratic participation. A central problem with the interpretation of theses studies is that unobservable confounding factors such as self-selection into policies could affect the results. A series of laboratory experiments aim at taking confounding factors into account in more controlled environments and suggest that the effect of democratic participation is rather nuanced. The majority of

[1] For overviews, see, e.g., Ledyard (1995), Chaudhuri (2011), and Zelmer (2003).

the experiments suggest a positive democracy premium, i.e., that institutions are more effective if they are endogenously chosen via a democratic decision-making process than externally imposed (e.g., Ertan et al. 2009, Sutter et al. 2010, Dal Bó et al. 2010). However, other experiments provide a more differentiated and mixed picture. Sutter and Weck-Hannemann (2003), for instance, find that democratic participation in determining minimum contributions to a public good does not necessarily raise overall cooperation levels. Especially participants with relatively high obligations reduce contributions, if these are democratically determined. In a related experiment, Sutter and Weck-Hannemann (2004) show that cooperation collapses if groups democratically reject imposing minimum contribution levels. Tyran and Feld (2006) find that the effect of democratic participation can cut both ways. Based on a public goods game, they find that a simple contribution rule which aims at fostering cooperation is more effective in case it is endogenously chosen than the same rule externally imposed. If the rule is endogenously rejected, in contrast, the effect of participation tends to be negative. Drawing on the experiment by Tyran and Feld (2006) and using samples of students and workers in China, Vollan et al. (2017) conclude that the effectiveness of democratic participation depends on its conformity with societal values, norms, and rules. They find that participants cooperate on average the most if the contribution rule is exogenously imposed, what can be explained with a long history and great importance of authoritarian norms in China. One reason that prevents us from identifying a coherent effect based on these studies is that potential drivers of the effect democratic participation are not equally considered, identified and quantified. Dal Bó et al. (2010) suggest a randomization technique to identify and quantify different drivers of the effect of democratic participation. Based on a prisoner's dilemma they introduce the opportunity to democratically impose a deterrent sanction on mutual defection which transforms their dilemma into a coordination problem. After taking potential confounding factors into account, they conclude that the deterrent policy is more likely to be respected if it is democratically chosen than externally imposed.

In this paper, I complement the existing literature by investigating whether democratic participation increases participants' compliance with a non-deterrent intervention. The democratic decision-making process is considerably simplified in my experiment. Following the experimental literature, participants have to vote for the introduction of an intervention. It is of fundamental importance to look at non-deterrent interventions since it provides the opportunity to study how participants follow rules although they face incentives not to do so and it remains unclear whether the findings by Dal Bó et al. (2010) can be extrapolated into a setting with a non-deterrent intervention. Based on the experimental design by Tyran and Feld (2006), the rule in my experiment prescribes

full contributions to the public good and a sanction for participants who do not comply with the obligation. The sanction is non-deterrent and zero contributions remain the unique Nash equilibrium in dominant strategies. Furthermore, my paper extends previous experiments by identifying and separating three potential drivers of the effect of democratic participation. Theory on procedural utility suggests that people do not only value outcomes but also the processes. It indicates that being aware of the fact that the group imposed the policy may directly affect agents' behavior (Frey and Stutzer 2005). A second hypothesis is that democratic decision making could also affect behavior because it reveals information to agents on their partners' likelihood to favor a specific policy or not, affecting both the agents' beliefs about the partners' future behavior and thus their own behavior (Tyran and Feld 2006). Finally, while groups are randomly formed, they are not necessarily identical. One cannot exclude the possibility that there are unobservable factors that explain both responses to policies and the policy selected (Dal Bó et al. 2010). Adopting an identification strategy suggested by Dal Bó et al. (2010), I control for self-selection and separate the total effect of a democratically chosen contribution rule into a selection, information and a democracy effect.

Using a laboratory experiment, I observe that a simple contribution rule in a public goods game backed by a mild and non-deterrent sanction improves contributions under democracy, but not in case treatments are externally given. In line with Tyran and Feld (2006), contributions to the public good are significantly higher if the contribution rule is endogenously chosen (through a democratic process) than if it is democratically rejected. However, after controlling for effects of self-selection of treatments and the information transmitted by revealing the outcome of the referendum, democratic participation does not directly affect participants' contribution behavior anymore. My findings thus suggest that the effect of democratic participation does not per se increase participants' willingness to comply with rules which are for the common good, but at odds with their individual free-riding incentives.

The remainder of this paper is organized as follows. Section 2 presents the experimental design of the study. Results are presented in Section 3. A concluding discussion is provided in Section 4.

2 Experimental design

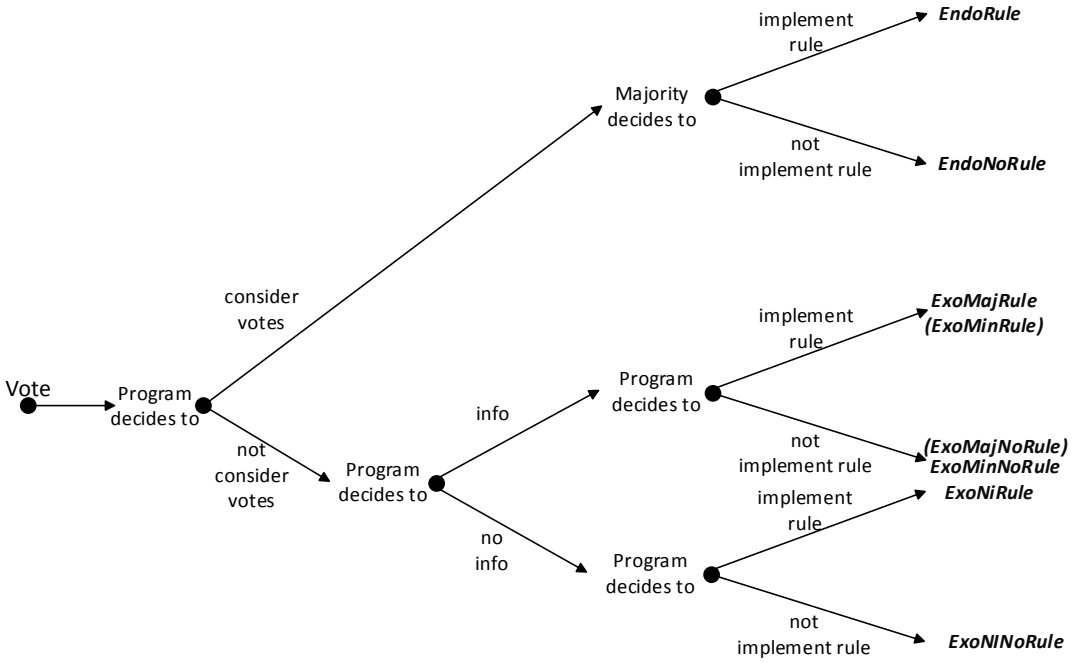
The experimental design is based on a linear public goods game with subjects randomly and anonymously matched into groups of three for the entire experiment. The experiment consists of two parts. In Part I, subjects participate in ten rounds of a stand-

ard public goods game. Each subject i receives an initial endowment of $e = 20$ Lab-Dollar (LD) in each round which has to be allocated to either a public good (q_i) or a private good ($e - q_i$). Subject i's payoff (π_i) is given by the private good plus the benefit from the group's contributions to the public good multiplied by the marginal per capita return of $\beta = 0.5$, i.e., $\pi_i = e - q_i + 0.5 \sum_{j=1}^{3} q_j$. Since $\beta < 1 < n\beta$, complete free-riding ($q_i = 0$) is the unique dominant strategy for all subjects, according to the standard game theoretic prediction of purely selfish subjects. Full contributions to the public good ($q_i = 20$) are, in contrast, socially optimal. After ten rounds of this standard public goods game, Part II of the experiment starts. In Part II, subjects play ten rounds as in Part I but they can impose a rule at the beginning of this part. The main focus of my experiment is to investigate whether and, if so, how the effect of the rule depends on the procedure of implementation. Therefore, I decided to keep the rule as simple and non-strategic as possible and abstain from introducing rather complex centralized (e.g., Cardenas et al. 2000) or decentralized sanctioning mechanisms (e.g., Carpenter 2007). Following Tyran and Feld (2006) the rule aims at fostering cooperation by prescribing full contributions to the public good backed by a fixed and automatically imposed sanction of $s = 4$ for subjects who do not comply, i.e., $q_i < 20$. In case the rule is imposed, subject i's payoff is given by:

$$\pi_i = \begin{cases} 20 - q_i + 0.5 \sum_{j=1}^{3} q_j - 4 & if\ q_i < 20 \\ 20 - q_i + 0.5 \sum_{j=1}^{3} q_j & if\ q_i = 20. \end{cases}$$

With $s = 4$ the penalty for violating the proposed contribution is rather low and zero contributions to the public good remain the unique Nash equilibrium in dominant strategies. Since $\beta = 0.5$, partial contribution is never optimal. Complete free-riding yields a payoff of $\pi_i(q_i = 0|q_{-i}) = 20 + 0.5 \sum_{j \neq i} q_j - 4$. Compliance, in contrast, yields $\pi_i(q_i = 20|q_{-i}) = 10 + 0.5 \sum_{j \neq i} q_j$. Compliance is rational if and only if $\pi_i(q_i = 0|q_{-i}) < \pi_i(q_i = 20|q_{-i})$. This would require a sanction of $s > 10$. However, $s = 4$ and, therefore, full free-riding is the unique Nash equilibrium in dominant strategies, i.e., $\pi_i(q_i = 0|q_{-i}) > \pi_i(q_i = 20|q_{-i})\ \forall i$. Participants in Tyran and Feld (2006) vote in a referendum on whether or not to enact the rule. However, Tyran and Feld (2006) do not explicitly control for confounding factors like self-selection and information transmitted by voting. Using a within-subject design, Tyran and Feld (2006) rely on the strategy method, in which subjects make contingent decisions for all possible outcomes of the referendum. According to standard game theoretic predictions, the strategy method should yield the same decisions as the direct-response method. However, the literature suggests that subjects make different decisions in contingent

Figure 1: Randomization technique adpoted by Dal Bó et al. 2010



Note: After all participants have voted the program decides randomly whether to consider the votes. In case the votes are not considered, it randomly decides whether to reveal the information about the outcome of the voting stage and thereafter whether to implement the rule. Consequently, participants could be assigned randomly to eight different treatments. However, only six out of all the treatments are of primary interest, i.e., *EndoRule*, *EndoNoRule*, *ExoMajRule*, *ExoMinNoRule*, *ExoNiRule*, and *ExoNiNoRule*. The two remaining treatments, i.e., *ExoMinRule* and *ExoMajNoRule*, are not considered in the following analysis and, therefore, placed in parentheses.

responses relative to situations where they face given and known decisions (e.g., Falk et al. 2005; Brandts and Charness 2011; Jordan et al. 2016).

In this experiment, I rely on a direct-response design and adopt a randomization technique suggested by Dal Bó et al. (2010) to control for self-selection of treatments and to disentangle the effect of a democratically chosen contribution rule. Dal Bó et al. (2010) use a prisoner's dilemma with mutual defection as unique Nash equilibrium and introduce the opportunity to impose a sanction on unilateral defection. The sanction is comparatively strong and both mutual defection and cooperation are Nash equilibria. I investigate the effect of a rather weak and non-deterrent rule. This is of fundamental importance because strong and deterrent rules set strong incentives, thus cooperation and compliance seem easier anyway. Furthermore, many situations in real life, and especially in an environmental policy context, are subject to rather non-deterrent interventions. Either no supra authorities exist in order to monitor, enforce, and sanction any policy, or, in case authorities exist, they lack the resources to enforce policies. I

complement the existing literature by combining the experiments by Tyran and Feld (2006) and Dal Bó et al. (2010) in order to test whether the effect of a weak and non-deterrent contribution rule in a public goods game depends on how it has been implemented. The corresponding randomization strategy is summarized in Figure 1. First, all three participants per group vote simultaneously and anonymously in a referendum on whether to enact the rule or not. Second, the computer randomly chooses whether to consider the votes in each group. If the computer considers the votes, the majority wins. If the computer does not consider the votes, it randomly chooses whether or not to reveal the information regarding the outcome of the referendum and, in a second step, whether or not to impose the rule exogenously. After the voting stage, subjects are informed whether the computer randomly chose to consider votes and whether the rule is implemented.[2] In case participants do receive the information about the outcome of the voting stage, they do not learn the exact distribution of votes. They learn whether at least two subjects or at the most one subject per group voted for the rule.

The eight possible treatments are denoted as *EndoRule, EndoNoRule, ExoMajRule, ExoMinRule, ExoMajNoRule, ExoMinNoRule, ExoNiRule, and ExoNiNoRule. Endo* denotes that the votes of the group were considered and *Exo* denotes that the computer overrode the votes. *Rule* denotes that the rule is implemented versus *NoRule*. In case the information regarding the outcome of the referendum is available, *Maj* denotes that the majority of the group supported the rule, *Min* denotes that only a minority supported the rule. *Ni* denotes that this information is not available.[3]

After Part II has been completed, agents fill in a final questionnaire on socio demographic characteristics as well as attitudes and values adapted from established value surveys (World Value Survey 2014). I included questions to measure participants' trust

[2]Subjects were informed that the computer will randomly decide. However, following Dal Bó et al. (2010) they were not informed about the exact probabilities. The instructions said that "the computer will randomly choose whether to consider the votes or not in your group", "it will randomly choose whether to reveal the outcome of the voting stage or not" and "it will randomly choose whether to implement the contribution rule or not". A translated version of the instructions is provided in the appendix.

[3]Only six out all eight possible treatments are of central importance for the following analysis, i.e., *EndoRule*, *EndoNoRule*, *ExoMajRule*, *ExoMinNoRule*, *ExoNiRule*, *ExoNiNoRule*. The program, however, decides randomly whether to consider votes, and in case the votes are not considered, whether to reveal the information of the voting stage and thereafter to implement the rule. It is thus possible that the votes are not considered, the rule exogenously implemented (not implemented) and participants informed that a majority of their group members are against (in favor of) the rule, i.e., *ExoMinRule*, *ExoMajNoRule*. The function of the information treatments is to provide the necessary intermediate steps between the exogenously imposed and democratically chosen treatments. This is done by comparing participants with the same information of the outcome of the referendum across treatments, i.e., *EndoRule* vs. *ExoMajRule* and *EndoNoRule* vs. *ExoMinNoRule*. Following this logic, there is no equivalent for *ExoMinRule* and *ExoMajNoRule* under democracy. Therefore, both treatments are not considered in my analysis.

level, locus of control, political preferences and political commitments as well as their acceptance of authorities.

3 Results

The experiment was conducted at the mLab of the University of Mannheim, Germany. I used the experimental software z-Tree developed by Fischbacher (2007) for programming, and participants were recruited via ORSEE (Greiner 2015). I conducted 17 sessions between October 2016 and June 2017 with a total of 270 participants.[4] A session lasted on average slightly more than 60 minutes and participants earned on average 11.60 euros, with a maximum of 18.00 euros and a minimum of 5.00 euros.

Average contributions to the public good over rounds and across treatments in both parts of the experiment are summarized in Figure 2. In the first part of the experiment, both the level of contributions to the public good as well as the pattern are comparable to other voluntary contribution mechanisms (e.g., Ledyard 1995; Zelmer 2003; Chaudhuri 2011). In Part I, participants contribute on average 6.99 LD to the public good and contributions decrease over rounds with an average of 10.40 LD in round 1 and 3.63 LD in round 10. Although all participants played a standard voluntary contribution mechanism without any interventions in the first ten rounds, there are differences across treatments in terms of participants' contributions, especially at the end of Part I. According to a Kruskal-Wallis test, contributions cannot be considered as equal across treatments in the last five (p-value 0.066) and three (p-value 0.040) rounds of the first part of the experiment. More precisely, in round 10 participants in *ExoNiNoRule* contribute on average 1.25 LD to the public good and therefore significantly less than participants in the other treatments.[5] Therefore, even before the voting stage and the assignment to treatments, participants can not be considered statistically identical in terms of contribution levels.

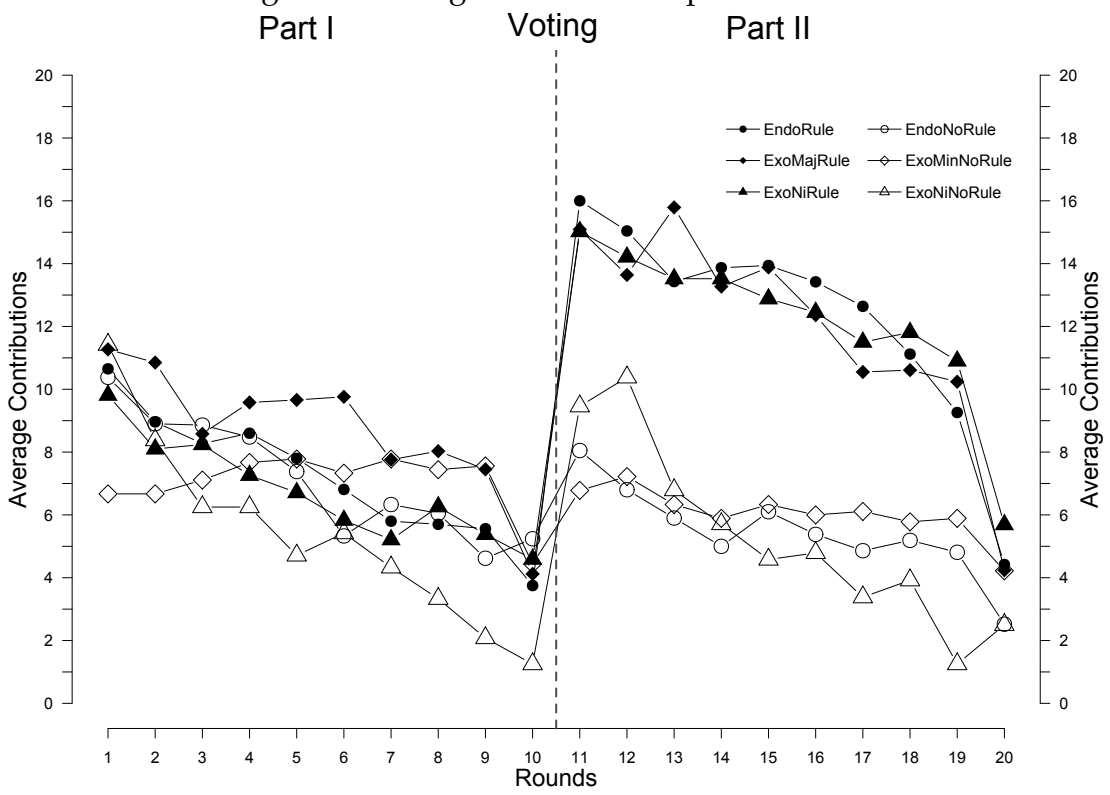
In line with previous evidence on the restart effect in prisoner's dilemma games (e.g., Andreoni and Miller 1993) and public goods games (e.g., Andreoni 1988), contributions increase at the beginning of the second part of the experiment (see Figure 2). The increase is much larger in case the rule is implemented, which leads to substantial differences across treatments in Part II (p-value: 0.000, Kruskal-Wallis test) and especially in round 11 (p-value: 0.000, Kruskal-Wallis test).[6] In order to estimate and disentangle

[4] Panel A of Table 2 summarizes the number of participants by treatment and vote. The two treatments *ExoMinRule* and *ExoMajNoRule* are irrelevant for my analysis, therefore the results are based on the 213 participants in the treatments of primary interest, i.e., *EndoRule*, *EndoNoRule*, *ExoMajRule*, *ExoMinNoRule*, *ExoNiRule*, and *ExoNiNoRule*.

[5] Differences are also robust to corrections for multiple hypothesis testing proposed by List et al. (2016).

[6] In Part II of the experiment, the differences are also robust to corrections for multiple hypothesis

Figure 2: Average contributions per treatment



Note: Average contributions to the public good in LabDollar (LD) by round and vote stage results. In Part I, all participants play a voluntary contribution mechanism. After Part I participants vote in a referendum on whether or not to enact the contribution rule. Depending on individual votes and the randomization strategy described in Section 2 participants are assigned to treatments in Part II. *EndoRule* (*EndoNoRule*): contribution rule is democratically chosen (rejected). *ExoMajRule* (*ExoMinNoRule*): contribution rule is externally imposed (not imposed) and participants receive the information that the majority (minority) of their group supported the rule. *ExoRule* (*ExoNoRule*): contribution rule is externally imposed (not imposed).

the effect of democratic participation, I follow Dal Bó et al. (2010) and initially focus on behavior in the first round of Part II, i.e., round 11. Since participants can not be considered statistically identical in terms of cooperation levels in the first part of the experiment, I use individual differences in contribution levels between round 11 (i.e., the first round of Part II) and round 10 (i.e., the last round of Part I) as primary outcome variable.

3.1 Results from the voting stage

Right after Part I of the experiment has been completed, participants vote in a referendum on whether to enact the rule or not. The vast majority of the 270 participants wanted the rule to be introduced. More precisely, significantly more participants vote

testing (List et al. 2016).

in favor of the rule than against it: 196 (72.59%) yes-voters versus 74 (27.41%) no-voters (p-value: 0.000, Binomial test).

Result 1: Participants vote for rule in the majority of all cases.

The approximately 73% of participants voting for the rule are clearly above the 50% obtained by Tyran and Feld (2006) and 53% by Dal Bó et al. (2010). However, the intervention of Dal Bó et al. (2010) differs substantially from the rule used by Tyran and Feld (2006) and in this experiment. The intervention by Dal Bó et al. (2010) is comparatively strong and affects the equilibrium of their game, this could explain the comparatively low level of support.[7] I use the same contribution rule as Tyran and Feld (2006), however, the experiments differ in their protocols. In the experiment by Tyran and Feld (2006) participants do not interact before they vote on whether or not to impose the contribution rule. In my experiment, in contrast, participants play ten rounds of a standard public goods game before they vote. The experience they have made in Part I and the enhanced understanding of the experiment could drive the differences in voting behavior.

I define the variable *Yes*, which is a binary variable for whether participants vote in favor of the rule or not, in order to analyze participants voting behavior in more detail via estimating a regression model (see Table 1). In line with Dal Bó et al. (2010) my results suggest that participants own contributions to the public good in Part I of the experiment (*Coop. Part I: Own*) are positively and significantly correlated with voting for the rule. More cooperative participants are more likely to vote for enacting the rule. In this line, voting for the rule is negatively correlated with the average contributions of the other group members in Part I (*Coop. Part I: Others*). However, the effect does not reach the conventional significant levels. In addition, my findings suggest that participants who are convinced to be able to control events that affect their lives (*Locus of control*) are more likely to vote for the rule. Furthermore, males are more likely to favor the rule compared to females (*Female*). Finally, I find that that participants' political commitment *(Pol. commitment)* affects participants' voting behavior significantly. Participants reporting a strong political commitment vote significantly less frequently for enacting the rule than participants with a weak commitment.

3.2 Endogenous vs. exogenous treatments effects: Aggregated analysis

The main results of Part II of the experiment are summarized in Table 2. Panel A summarizes the number of observations by vote and results of the voting stage. Treat-

[7] See Section 2 for a detailed discussion of the differences in interventions.

Table 1: Determinants of voting

	Dependent variable: *Yes*	
	Coefficients	Average marginal effects
Coop. Part I: Own	0.084**	0.024**
	(0.042)	(0.012)
Coop. Part I: Others	-0.032	-0.009
	(0.020)	(0.006)
Trust	-0.058	-0.017
	(0.123)	(0.036)
Locus of control	0.149**	0.043***
	(0.058)	(0.016)
Obey authority	0.136	0.039
	(0.179)	(0.052)
Democrat	-0.01	-0.003
	(0.069)	(0.020)
Pol. commitment	-0.449***	-0.130***
	(0.158)	(0.044)
Female	-0.412**	-0.120*
	(0.205)	(0.058)
Age	0.002	0.001
	(0.020)	(0.06)
Constant	-0.233	
	(0.900)	
Observations	216	216
Log likelihood	-112.031	

Note: Probit regression. Coefficients (average marginal effects) with robust standard errors in parentheses in column 1 (2). Dependent variable (*Yes*): 1 if participant votes for rule and 0 otherwise. *Coop. Part I: Own* (*Others*): average own contributions (contributions of others) in Part I. *Trust:* index for stated trust level between 0 (low) and 1 (high). *Locus of control* stated locus of control on a scale between 1 and 10: 1 high external locus of control, 10 high internal locus of control. *Obey authority:* index for stated respect for authorities between 0 (high) and 1 (low). *Democrat:* stated importance of living in a democratic system on a scale between 1 and 10: 1 not important at all, 10 very important. *Pol. commitment:* index for stated political commitment between 0 (low) and 1 (high). *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

ment effects shown in Panel B are estimated by the differences in individual contribution levels between round 11 (i.e., the first round of Part II) and 10 (i.e., the last round of Part II).[8] To start the aggregated analysis I derive the total treatment effect (*TotalTrE*) of the democratically chosen rule by comparing the treatment effect in case the rule is democratically chosen (*EndoRule*) with the effect if it is democratically rejected (*EndoNoRule*). By randomly assigning participants to treatments and conditioning on individual votes, I can decompose this *TotalTrE* into four components: the exogenous treatment effect ($ExoTrE$), the effect of revealing the information about the outcome of the referendum ($InfoE$), the effect of self-selection into treatments ($SelE$), and the effect of democratic participation ($DemoE$). Results of the decomposition are shown in Figure 3. In order to structure the analysis, I extend a framework by Dal Bó et al. (2010) by explicitly addressing the effect of information transmitted via the results of the referendum. In this sense, I denote as $g(v|M, I, R)$ the proportion of subjects who vote $v \in \{Y, N\}$ (in favor or against the rule) given the procedure of implementation $M \in \{Endo, Exo\}$ (democratically chosen or randomly by the computer), the information available of the outcome of the voting stage $I \in \{Maj, Min, Ni\}$ (majority or minority support the rule or no information available), structure of the experiment $R \in \{Rule, NoRule\}$ (rule imposed or not), and let $q(v|M, I, R)$ be the difference between contributions in round 11 and round 10 of participants who voted v given the structure of the experiment, the amount of information available, and the procedure of implementation.

Total Treatment Effect - The first two columns in Panel B of Table 2 show that the increase in individual contributions at the beginning of Part II is substantially stronger if the rule is democratically chosen than democratically rejected: 12.25 vs. 2.81 (p-value: 0.000, Table 3 - column 1).[9] Following Dal Bó et al. (2010), I can calculate the *TotalTrE* as weighted average of individual contributions by participants' voting behavior if I use the proportion of participants who vote for and against the rule as weights.

$$\begin{aligned} TotalTrE \;=\; & \textstyle\sum_{v\in\{Y,N\}}[g(v|Endo, Maj, Rule)q(v|Endo, Maj, Rule) \\ & -g(v|Endo, Min, NoRule)q(v|Endo, Min, NoRule)]. \end{aligned}$$

This shows that participants contribute on average 9.44 LD more to the public good in case the rule is democratically chosen than democratically rejected.[10] This first obser-

[8] The two treatments *ExoMinRule* and *ExoMajNoRule* are not required to estimate and disentangle the effect of democracy and therefore not considered in Table 2. A summary of all individual contributions in Part I and Part II of the experiment is given in Table 4 in the appendix.

[9] If not mentioned otherwise, p-values in this section correspond to Wald tests based on regression results in Table 3.

[10] $TotalTrE = (\frac{14}{84} * 10.14 + \frac{70}{84} * 12.67) - (\frac{14}{21} * 1.50 + \frac{7}{21} * 5.43) = 9.44$.

Table 2: Individual level data

	Considering votes		Not considering votes			
			Information available		Information not available	
Vote	EndoRule	EndoNoRule	ExoMajRule	ExoMinNoRule	ExoNiRule	ExoNiNoRule
Panel A. Votes						
No	14	14	4	6	13	6
Yes	70	7	29	3	29	18
Total	84	21	33	9	42	24
Panel B. Treatment effects (Differences in individual contributions between round 11 and 10)						
No	10.14	1.5	-0.5	1.67	5.54	6.17
Yes	12.67	5.43	12.55	3.67	12.62	8.88
Total	12.25	2.81	10.97	2.33	10.43	8.21

Note: Panel A summarizes the number of observations by vote and result of the voting state across treatments. Treatment effects are summarized in Panel B. Treatment effects are measured by differences in individual contribution levels between round 11 (i.e., the first round of Part II) and round 10 (i.e., the last round of Part I).

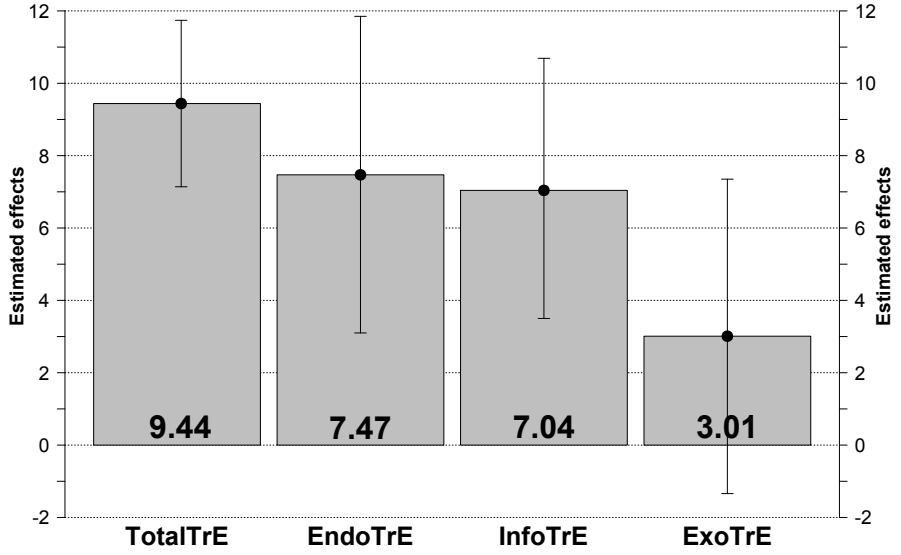
vation can be summarized by establishing the following result:

Result 2: Contributions are higher if the rule is democratically chosen than if it is democratically rejected.

In case both treatments are exogenously imposed and participants do not receive the information about the outcome of the referendum, the rule does not significantly increase contribution levels (*ExoNiRule*: 10.43 vs. *ExoNiNoRule*: 8.21, p-value: 0.357, Table 3 - column 1). Moreover, by simply comparing these two effects I can replicate the finding by Tyran and Feld (2006) that the effect of the rule is stronger under democracy than if treatments are exogenously given (9.44 vs. 2.22, p-value: 0.024).[11] However, the *TotalTrE* captures at least two changes. A change in treatments (*EndoRule* vs. *EndoNoRule*) and, by design, a change in the proportion of yes- and no-voters across treatments. Furthermore, under democracy participants do know the outcome of the referendum. This is not the case if treatments are exogenously given and could also affect their behavior. Before we take potential effects of self-selection into treatments and the information transmitted via voting into account the naive comparison

[11] Under democracy, a comparison of average contributions in *EndoRule* (12.25) and *EndoNoRule* (2.81) reveals a treatment effect of 9.44 LD. Following this logic and simply comparing average contribution in *ExoNiRule* (10.43) and *ExoNiNoRule* (8.21) leads to a treatment effect of 2.22 LD.

Figure 3: Decomposition



Note: Estimated total treatment effect (*TotalTrE*), endogenous treatment effect (*EndoTr*E), information treatment effect ($InfoTrE$), and exogenous treatment effect (*ExoTrE*). Confidence intervals at the 90%-level. The information effect ($InfoE$) is given by the difference between $InfoTrE$ and *ExoTrE*. The selection effect (*SelE*) is given by the *TotalTrE* and the difference between *EndoTrE*. The democracy effect (*DemoE*) is given by the difference between *EndoTrE* and $InfoTrE$.

between endogenously and exogenously implemented treatments could be biased. By conditioning on the proportion of yes- and no-voters or the contributions per treatment, I can separate the *TotalTrE* into an endogenous treatment effect (*EndoTrE*) and a selection effect (*SelE*).

Endogenous Treatment Effect - The *EndoTrE* leaves the proportion of yes- and no-voters constant and captures only the endogenous change in the structure of the experiment.

$$\begin{aligned} EndoTrE &= \sum_{v\in\{Y,N\}} g(v|Endo,Maj,Rule)[q(v|Endo,Maj,Rule) \\ &\quad -q(v|Endo,Min,NoRule)]. \end{aligned}$$

In other words, it measures the effect of changing treatments democratically assuming that the proportion of yes- and no-voters is the same in both treatments. With 7.47 LD the effect loses some of its strength, but contributions are still significantly higher in case the rule is democratically chosen than if it is rejected (p-value: 0.006).[12] That the *EndoTrE* is de facto slightly below the *TotalTrE* indicates a weak and positive effect of self-selection into treatments under democracy.

Selection Effect - The *SelE* is given by the difference between the *TotalTrE* and the

[12] $EndoTrE = \frac{14}{84} * (10.14 - 1.50) + \frac{70}{84} * (12.67 - 5.43) = 7.47$.

EndoTrE. It captures the effect of the change in the proportion of yes- and no-voters in *EndoRule* and *EndoNoRule* leaving the contributions constant across treatments.

$$SelE = \sum_{v \in \{Y,N\}} [g(v|Endo, Maj, Rule) - g(v|Endo, Min, NoRule)]q(v|Endo, Min, NoRule).$$

The effect of self-selection is given by 1.97 LD.[13] In line with Dal Bó et al. (2010) this indicates that yes-voters show the tendency to contribute more to the public good than no-voters across treatments. However, the selection effect is statistically indistinguishable from zero (p-value: 0.282).

Exogenous Treatment Effect - The $ExoTrE$ captures the change in contributions to the public good due to an exogenous change in treatments in case participants do not receive any information about the outcome of the voting stage. As in the endogenous treatment effect, it leaves the proportion of yes- and no-voters constant across treatments in order to take the effect of self-selection into account.

$$\begin{aligned} ExoTrE \quad = \quad & \textstyle\sum_{v \in \{Y,N\}} g(v|Endo, Maj, Rule)[q(v|Exo, Ni, Rule) \\ & -q(v|Exo, Ni, NoRule)]. \end{aligned}$$

According to Table 2, the $ExoTrE$ is given by 3.01 LD and statistically indistinguishable from zero (p-value: 0.253).[14] In case treatments are exogenously given, the rule does not affect participants' contribution behavior. In line with Tyran and Feld (2006), this leads to the following result:

Result 3: In case treatments are exogenously imposed, the rule does not increase contributions.

Information Treatment Effect - Analogous to the $ExoTrE$ the information treatment effect ($InfoTrE$) captures the change in contributions due to an exogenous change in treatments and leaves the proportion of yes- and no-voters constant. In addition, the information about the outcome of the voting stage is revealed.

$$InfoTrE = \sum_{v \in \{Y,N\}} g(v|Endo, Maj, Rule)[q(v|Exo, Maj, Rule) - q(v|Exo, Min, NoRule)].$$

[13] $SelE = (\frac{14}{84} - \frac{14}{21}) * 1.5 + (\frac{70}{84} - \frac{7}{21}) * 5.43 = 1.97.$
[14] $ExoTrE = \frac{14}{84} * (5.54 - 6.17) + \frac{70}{84} * (12.62 - 8.88) = 3.01.$

According to Table 2, I can calculate this effect as 7.04 LD.[15] In case treatments are exogenously given and the information about the outcome of the referendum is revealed the rule does significantly affect participants' contribution behavior (p-value: 0.002).

Information Effect - In order to isolate the effect of the information transmitted by the voting stage, I use the difference between the information treatment effect ($InfoTrE$) and the exogenous treatment effect ($ExoTrE$). Therefore, the information effect ($InfoE$) leaves the proportion of yes- and no-voters, the treatments and how they have been imposed constant and only captures the effect of revealing the outcome of the voting stage.

$$\begin{aligned} InfoE \quad = \quad & \sum_{v\in\{Y,N\}} g(v|Endo, Maj, Rule) \\ & [(q(v|Exo, Maj, Rule) - q(v|Exo, Min, NoRule)) \\ & -(q(v|Exo, Ni, Rule) - q(v|Exo, Ni, NoRule))]. \end{aligned}$$

It is given by 4.03 LD, but the difference is statistically not different from zero (p-value: 0.239).[16]

Democracy Effect - Finally, the democracy effect ($DemoE$) captures the effect of choosing treatments democratically. It is measured by the difference between the endogenous treatment effect ($EndoTrE$) and the information treatment effect ($InfoTrE$). It leaves the proportion of yes- and no-voters, the information available and respective treatments constant. Only the procedure how treatments have been implemented changes.

$$\begin{aligned} DemoE \quad = \quad & \sum_{v\in\{Y,N\}} g(v|Endo, Maj, Rule) \\ & [(q(v|Exo, Maj, Rule) - q(v|Exo, Min, NoRule)) \\ & -(q(v|Endo, Maj, Rule) - q(v|Endo, Min, NoRule))]. \end{aligned}$$

The $DemoE$ is given by 0.43 LD and indicates that democratic participation does not affect contributions directly (p-value: 0.900).[17] This leads to the following result:

Result 4: After controlling for self-selection into treatments and information transmitted via voting, democratic participation does not affect contributions.

Decomposition - Having calculated all the different effects, I can decompose the total treatment effect of 9.44 LD into four components. It can be rewritten as $TotalTrE = ExoTrE + InfoE + SelE + DemoE$. The $TotalTrE$ is given by the effect of the rule if

[15] $InfoTrE = \frac{14}{84} * (-0.50 - 1.67) + \frac{70}{84} * (12.55 - 3.67) = 7.04$.
[16] $InfoE = \frac{14}{84} * (-0.50 - 1.67) + \frac{70}{84} * (12.55 - 3.67) - (\frac{14}{84} * (5.54 - 6.17) + \frac{70}{84} * (12.62 - 8.88) = 4.03$.
[17] $DemoE = \frac{14}{84} * (10.14 - 1.50) + \frac{70}{84} * (12.67 - 5.43) - (\frac{14}{84} * (-0.50 - 1.67) + \frac{70}{84} * (12.55 - 3.67)) = 0.43$.

treatments are exogenously imposed ($ExoTrE = 3.01$), the effect of revealing the outcome of the referendum ($InfoE = 4.03$), the effect of self-selection into treatments under democracy ($SelE = 1.97$), and, finally, the effect of democratic participation itself ($DemoE = 0.43$). The decomposition shows that the effect of democratic participation is not statistically significant and is also rather low in also rather low in magnitude. My results suggest that the democratic participation explains only 5% of the total treatment effect.

The absence of a direct effect of democratic participation is robust to restricting the analysis to contributions in the first round of Part II of the experiment (round 11) or expanding the analysis to average contributions in all ten rounds of the second part.[18] By considering only the average contributions in the first round of Part II, contributions to the public good are on average significantly higher in case the rule is democratically chosen than if it is democratically rejected (16.00 vs. 8.05, p-value: 0.000) and the $TotalTrE$ is given by 7.95 LD. The $TotalTrE$ consists of the effect of the exogenously imposed treatments ($ExoTrE = 6.47$, p-value: 0.007), the information effect ($InfoE = 0.997$, p-value: 0.818), the effect of self-selection into treatments ($SelE = 0.929$, p-value: 0.649), and the direct effect of democratic participation ($DemoE = -0.446$, p-value: 0.921). By expanding the analysis to all ten rounds of Part II of the experiment, the $TotalTrE$ amounts to 6.85 LD (p-value: 0.001). This effect can be decomposed into a $ExoTrE$ of 7.56 LD (p-value: 0.005), a $InfoE$ of -1.15 LD (p-value: 0.799), a $SelE$ of 0.33 LD (p-value: 0.040), and a $DemoE$ of 0.109 LD (p-value: 0.979). In case the analysis is restricted to contributions in round 11 or expanded to the average of contributions in all ten rounds of Part II, I find that the rule increases contributions significantly even in case treatments are exogenously given. Furthermore, when giving participants time to learn and coordinate, the effect of self-selection into treatments becomes more important and statistically significant.

3.3 Endogenous vs. exogenous treatments effects: Individual level analysis

When I control for self-selection into treatments and the information transmitted via the outcome of the election, the aggregated analysis in Section 3.2 shows that democratic participation does not affect participants' contribution behavior. However, the effect may vary across individual types of participants, especially yes- and no-voters. To take individual differences into account, I estimate a series of linear regression models for the complete sample as well as separately for yes- and no-voters. Table 3 con-

[18] Contributions in the in round 11 and all ten rounds of Part II are shown in Table 4 in the appendix.

tains the results. I use simple OLS regressions. Dependent variables are the individual differences in contributions between round 11 (i.e., the first round of Part II) and 10 (i.e., the last round of Part I) (first three columns of Table 3) and the average contributions in Part II of the experiment (last three columns of Table 3). All regressions are estimated without a constant and indicator variables for the different treatments to compare outcomes across the procedure of implementation (*Endo* vs. *Exo*), the information available (*Maj* vs. *Min* vs. *Ni*) and the structure of the experiment (*NoRule* vs. *Rule*). The difficulty is that participants in groups that choose or reject the rule democratically may be different from those participants in exogenously imposed treatments. I can derive unbiased estimates by conditioning on participants' votes. Furthermore, I can disentangle the effect of democratic participation by conditioning on the information available and the structure of the experiment.

More precisely, I can estimate the information effect by comparing contributions under externally imposed treatments with treatments under exogenously imposed treatments where the outcome of the election is revealed, i.e., *ExoNiRule* vs. *ExoMajRule* if the rule is implemented and *ExoNiNoRule* vs. *ExoMinNoRule* if it is not imposed. Following this logic, I estimate the democracy effect by comparing contributions in case the rule is democratically chosen or rejected with contributions in case treatments are externally imposed and the information about the referendum are available, i.e., *ExoMajRule* vs. *EndoRule* if the rule is implemented and *ExoMinNoRule* vs. *EndoNoRule* if it is not.

Among participants who voted in favor of the rule, i.e., yes-voters, there is no evidence that the information transmitted via voting affect participants' contribution levels. Yes-voters contribute 12.62 LD if the rule is exogenously given and 12.55 LD if it is exogenously imposed and, in addition, the information about the outcome of the election is revealed (p-value: 0.985, Table 3 - column 2). I also do not find evidence for an information effect in case the rule is not imposed (8.88 vs. 3.67, p-value: 0.310, Table 3 - column 2). Furthermore, I do not find an effect of democratic participation among yes-voters. Neither in case the rule is implemented (12.67 vs. 12.55, p-value: 0.962, Table 3 - column 2) nor in case it is not implemented (8.88 vs. 5.43, p-value: 0.560, Table 3 - column 2). This supports Result 4 that democracy does not affect contributions after controlling for self-selection and taking the information effect into account.

For no-voters, there is also no evidence for an information effect. Revealing the outcome of the election does not effect participants' contributions neither when the rule is externally imposed (5.54 vs. -0.5, p-value: 0.251, Table 3 - column 3) nor when it is not (6.17 vs. 1.67, p-value: 0.310, Table 3 - column 3). In case the rule is not imposed, there is no effect of participation (1.67 vs. 1.50, p-value: 0891, Table 3 - column 3). The

Table 3: Individual level analysis

	Dependent variable:					
	Treatment effects			Average contributions in Part II		
	All	Yes-voter	No-voter	All	Yes-voter	No-voter
EndoRule	12.25***	12.67***	10.14***	12.31***	12.60***	10.90***
	(1.144)	(1.259)	(2.454)	(1.092)	(1.109)	(1.845)
EndoNoRule	2.81***	5.43*	1.50	5.46***	5.90***	5.24***
	(0.738)	(2.917)	(0.964)	(1.557)	(1.557)	(1.634)
ExoMajRule	10.97***	12.55***	-0.50	11.97***	13.00***	4.45**
	(2.108)	(2.155)	(0.459)	(1.729)	(1.501)	(1.998)
ExoMinNoRule	2.33***	3.67**	1.67**	6.06**	4.87	6.65**
	(0.424)	(1.551)	(0.721)	(2.795)	(3.698)	(2.798)
ExoNiRule	10.43***	12.62***	5.54*	12.15***	13.90***	8.26***
	(1.617)	(2.426)	(3.105)	(1.905)	(1.765)	(2.580)
ExoNiNoRule	8.21***	8.88***	6.17**	5.28**	5.64***	4.17*
	(1.765)	(1.716)	(3.019)	(2.045)	(2.080)	(2.408)
Observations	213	156	57	213	156	57
Adj. R^2	0.581	0.644	0.403	0.758	0.803	0.594
Tests of differences of treatments effects						
			p-values			
EndoRule = EndoNoRule	0.000***	0.026**	0.002***	0.001***	0.008***	0.027**
ExoMajRule = ExoMinNoRule	0.000***	0.001***	0.015**	0.076*	0.045**	0.526
ExoNiRule = ExoNiNoRule	0.357	0.213	0.885	0.016**	0.004***	0.253
EndoRule = ExoMajRule	0.595	0.962	0.000**	0.866	0.828	0.022**
EndoRule = ExoNiRule	0.839	0.982	0.061*	0.943	0.701	0.249
ExoMajRule = ExoNiRule	0.361	0.985	0.251	0.942	0.535	0.410
EndoNoRule = ExoMinNoRule	0.578	0.560	0.891	0.853	0.798	0.666
EndoNoRule = ExoNiNoRule	0.002***	0.027**	0.155	0.822	0.855	0.505
ExoMinNoRule= ExoNiNoRule	0.006***	0.310	0.148	0.942	0.922	0.713

Note: OLS regressions. Differences in individual contributions between round 11 and 10 are the dependent variable in the first three columns. In the second three columns, average contributions in all ten rounds of Part II are the dependent variable. Standard errors, in parentheses, are clustered at the group level. All regressions are done for the complete sample (All) as well as for yes-voters (Yes-voters) and no-voters (no-voters) separately. The independent variables are indicator variables for the different treatments. p-values correspond to Wald tests on the regression results. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

effect of participation is, in contrast, positive and statistically significant if the rule is implemented. More precisely, the difference in contribution levels between round 11 (i.e., the first round of Part II) and 10 (i.e., the last round of Part I) is -0.5 LD if the rule is externally imposed and participants receive the information about the outcome of the referendum. In case the rule is democratically chosen, this difference amounts to 10.14 LD. This shows a positive democracy premium among no-voters if the rule is imposed (p-value: 0.000, Table 3 - column 3). However, this effect is not strong enough to drive aggregate results.

4 Summary and concluding remarks

This experiment contributes to the literature by investigating if, how, and why democratic participation increases participants' willingness to comply with a non-deterrent rule which aims at fostering cooperation. My experimental design enables me to identify and separate potential drivers of the effect of democratic participation. I can determine to what extent the effect is driven by self-selection into the rule, information transmitted by voting, and democracy per se. Tyran and Feld (2006) report that a non-deterrent contribution rule is more effective if it is endogenously chosen by voting than externally imposed. However, they do not explicitly take effects of self-selection and information transmitted via voting into account. Focusing on a deterrent intervention which transforms their prisoner's dilemma into a coordination problem, Dal Bó et al. (2010) suggest a randomization strategy to derive an unbiased estimate of the effect of democratic participation. I complement the existing literature by combining the key elements of Tyran and Feld (2006) and Dal Bó et al. (2010) experiments to test whether the effect of a non-deterrent contribution rule depends on whether is has been endogenously chosen via a democratic decision-making process or externally imposed and, if so, to what extent this is driven by self-selection into treatments, the information transmitted via voting, and democratic participation per se. Investigating a non-deterrent contribution rule enables me to investigate the willingness of participants to follow a rule which is for the common good, but at odds with their individual free-riding incentives. This is a central characteristic of many interactions in real life social dilemmas which are subject to non-deterrent policies which do not affect underlying incentive schemes. In an environmental policy context, for instance, either no supranational authorities exist in order to enforce international environmental policies (e.g., Barett 2010), or, in case authorities exist at the local level, they lack capacities and resources to actually enforce policies (e.g., Ostrom 1990; Kroll et al. 2007). Furthermore, deterrent rules set strong incentives and, thus, there is no conflict between cooperation

and compliance what increases participants' willingness to follow the rule.
In line with the existing literature, I find that contributions to the public good are significantly higher if the rule is democratically chosen than if it is democratically rejected. In case treatments are exogenously given, in contrast, the contribution rule does not affect participants' contribution behavior. A naive comparison would suggest that the contribution rule is more effective in fostering contributions to the public good in case treatments are endogenously chosen than in case treatments are externally given. However, this comparison neglects potential confounding factors and does not necessarily prove that democratic participation increases participants' willingness to comply with a non-deterrent contribution rule. More precisely, my decomposition reveals that the apparently different effects are not directly driven by democratic participation per se. Democratic participation does not affect participants' contribution behavior if I take self-selection into treatments and the information transmitted by revealing the outcome of the referendum into account. Of course, it is very difficult to make direct generalizations from my experiment, not at least because of the fact that I study students' behavior in an environment where they know they are being observed which might lead to higher willingness to follow the rule. Furthermore, due to my randomization strategy and the high amount of participants supporting the rule, participants are distributed unequally across treatments. It becomes thus more difficult to provide evidence for a statistically significant effect of democratic participation in my experiment. However, my findings not only indicate that democratic participation does not directly and significantly affect participants' compliance with a non-deterrent contribution rule, it is also shown that democratic participation explains only about 5% of the overall treatment effect. Therefore, the effect of participation appears to be neither of statistical nor economic significance.
This is not necessarily a contradiction to the postulate that democratic participation actually affects behavior. My findings rather show that the effect of choosing a non-deterrent intervention which aims at fostering cooperation in a social dilemma situation is a conglomerate of different sub-effects of participation. Differences with the existing literature suggest that the effect of participation depends on the type of the intervention. While Dal Bó et al. (2010) find a positive democracy premium in case of a deterrent contribution rule, my experiment does not provide evidence that people are more willing to follow a weak and non-deterrent rule if it is democratically chosen than externally given. This suggests that democratic participation can motivate people to comply with rules which are in their own interest, but not necessarily with rules which are at odds with their individual free-riding incentives. Finally, in order to decrease complexity, I follow the existing experimental literature and reduce the process

of democratic decision-making to voting. Thereby, the experimental design obviously neglects further important aspects of democratic participation like, for instance, communication, deliberation, and different decision rules. It is not the purpose of this paper to capture democratic decision-making in all this facets, but this could be a an interesting and important route for further research.

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Appendix

Table 4: Individual level data (all)

	Considering votes		Not considering votes					
			Information available				Information not available	
Vote	EndoRule	EndoNoRule	ExoMajRule	ExoMinRule	ExoMajNoRule	ExoMinNoRule	ExoNIRule	ExoNINoRule
Panel A. Votes								
No	14	14	4	9	8	6	13	6
Yes	70	7	29	3	37	3	29	18
Total	84	21	33	12	45	9	42	24
Panel B. Average contributions in Part I								
No	5.52	6.80	7.65	7.41	5.29	7.75	5.9	5.38
Yes	7.52	7.87	8.85	10.27	6.25	5.63	7.11	5.33
Total	7.19	7.16	8.71	8.13	6.08	7.04	6.74	5.34
Panel C. Contributions at the end of Part I (round 10)								
No	3.43	5.93	2.50	0.56	1.25	5.00	4.23	1.67
Yes	3.81	3.86	4.34	5.33	3.35	3.33	4.76	1.11
Total	3.75	5.24	4.12	1.75	2.98	4.44	4.60	1.25
Panel D. Treatment effects (Differences in individual contributions between round 11 and 10)								
No	10.14	1.5	-0.5	12.22	6.25	1.67	5.54	6.17
Yes	12.67	5.43	12.55	4.67	6.70	3.67	12.62	8.88
Total	12.25	2.81	10.97	10.33	6.62	2.33	10.43	8.21
Panel E. Contributions at the beginning of Part II (round 11)								
No	13.57	7.43	2.00	12.78	7.5	6.67	9.77	7.83
Yes	16.49	9.29	16.90	10.00	10.05	7.00	17.38	10.00
Total	16.00	8.05	15.09	12.08	9.60	6.78	15.02	9.46
Panel F. Average contributions in Part II								
No	10.90	5.24	4.45	8.92	5.84	6.25	8.26	4.17
Yes	12.60	5.90	13.00	12.23	6.53	4.87	13.00	4.87
Total	12.31	5.46	11.97	9.75	6.41	6.06	12.15	5.28

Note: Panel A summarizes the number of observations by vote and result of the voting state across treatments. Average contributions in Part I of the experiment are summarized in Panel B. Individual contributions at the end of Part I (i.e., the last round of Part I) and the first round of Part II (i.e., the first round of Part II) are summarized in Panel C and E, respectively. Differences in individual contribution levels between the first round of Part II and the last round of Part I are summarized in Panel D. Average contributions in Part II of the experiment are summarized in Panel E.

Instructions *[Translated from German]*†

Welcome!

Thank you for taking part in this experiment. Please do not talk to other participants and turn off all electronic devices such as phones for the whole course of this session. Please read the instructions carefully and raise your hand if you have any questions.
This experiment regards individual decision behaviour. At the end of the experiment, you will receive an individual payment anonymously and in cash. Your payment will be based on the decisions you and your fellow participants will have taken as well as a random component. During the experiment, your payment will be calculated in so-called LaborDollar (LD). After the experiment, the total sum of LD will be converted into euros. The exchange rate is:

2 LD = 1 euro.

During the experiment, you will take your decisions **anonymously**. Only the experimenter will know about your identity. Of course, all provided information will be treated in strict confidence.

Rules of the experiment
The experiment consists of **two parts** (**Part I** and **Part II**). For the whole course of the experiment, all participants are divided into groups of three. The group constellations do not change and every participant inside their respective group will face the same decision scenarios.

Part I
In Part I, we will ask you and your fellow participants to take decisions in ten separate rounds. At the beginning of each round, you and your fellow group members will be endowed with 20 LD, respectively. You (as well as your fellow group members) will then have to decide on the amount of LD that you wish to contribute to a joint project. Your contribution, q, can be between be 0 and 20 LD.
The individual payment (in LD) for all three participants is calculated as follows:

$$\text{Payment} = (20 - \text{Contribution of the participant}) + 0.5 \cdot (\text{Total sum of contributions})$$

As an example, if the other two group members contribute together 40 LD while your contribution is 10 LD, your individual payment will be calculated as follows:

$$\text{Payment} = (20 - 10) + 0.5 \cdot (40 + 10) = 35$$

If on the other hand, both group members contribute 40 LD in total and you refrain from paying by entering 0 LD, your individual payment will be calculated as follows:

$$\text{Payment} = (20 - 0) + 0.5 \cdot (40 + 0) = 40$$

†Explanatory notes are given in square brackets.

Part I consists of ten separate rounds. In each round, you will face the same decision task and interact with the same two group members. After each decision, you will be informed on the average values as well as the contributions and payments regarding the other two group members. At the beginning, there will be two test rounds. They are not relevant for disbursement.

Part II

As in Part I, we will ask you and your fellow participants to take decisions in ten separate rounds. You will be part of the same group, which remains unchanged in its constellation. Again, at the beginning of each round, you and your fellow group members will be endowed with 20 LD, respectively. The decision tasks are the same as in Part I. You (as well as your fellow group members) will have to decide on the amount of LD that you wish to contribute to a joint project. Your contribution, q, can be between be 0 and 20 LD.

Contrary to Part I, it is now possible to introduce a contribution rule. It stipulates that all group members shall contribute the total sum of LDs endowed at the beginning (q = 20) to the joint project. Participants who do not abide by this rule shall pay a fee of 4 LD.

If a participant adheres to the rule (q = 20), their individual payment will be calculated as follows:

$$\text{Payment} = (20 - 20) + 0.5 \cdot (20 + \text{Total sum of contributions made by all the other group members.})$$

If a participant refrains from adhering to the rule (q < 20), their individual payment will be calculated as follows:

$$\text{Payment} = (20 - \text{Contribution of the participant}) + 0.5 \cdot (20 + \text{Total sum of contributions made by all the other group members}) - 4$$

As an example, if the other two group members contribute a total sum to the tune of 40 LD while your contribution is 10 LD, your individual payment will be calculated as follows:

$$\text{Payment} = (20 - 10) + 0.5 \cdot (40 + 10) - 4 = 31$$

If on the other hand, both group members contribute 40 LD in total and you refrain from paying by entering 0 LD, your individual payment will be calculated as follows:

$$\text{Payment} = (20 - 0) + 0.5 \cdot (40 + 0) - 4 = 36$$

Whether the rule is introduced or not depends on the following: Firstly, the group decides on introduction of the rule by majority vote. Secondly, it is decided at random, whether the group's decision will be taken into account. After the voting, you will be informed on whether the group's decision will be taken into consideration.

- If the group's decision is taken into account, you will be informed on the voting results. The decision will be taken based on the group's majority. For example, if two out of the three group members vote in favour of the rule, it will be introduced. If only one group member is in favour, the rule will not be introduced.
- If the group's decision is not taken into account, the decision on introducing the contribution rule will be taken at random. Furthermore, it is decided at random, whether you will be informed about the voting results.

In total, the experiment is made up of 20 separate rounds (10 rounds for Part I and 10 rounds for Part II). At the end of the experiment, you will receive the payment of one of the 20 rounds in euros. The round which will serve as the basis of your payment will be selected at random. For this reason, we recommend you to decide for each round as if it was the basis of your payment.

Control Questions (please fill in)

1. Suppose that in Part I, your contribution to the joint project amounted to 15 LD. The other two group members payed 15 LD in total. What is your individual payment?
   My payment is _____
2. Suppose that in Part I, your contribution to the joint project amounted to 5 LD. The other two group members payed 15 LD in total. What is your individual payment?
   My payment is _____
3. Suppose that in Part I, the two other group members contributed their total initial sum to the joint project. Which contribution would produce the maximum individual payment (please tick)?
   O 0 LD O 5 LD O 10 LD O 15 LD O 20 LD
4. Suppose that in Part I, the two other group members contributed their total initial sum to the joint project. Which contribution would produce the maximum payment for your group (please tick)?
   O 0 LD O 5 LD O 10 LD O 15 LD O 20 LD
5. Suppose that in Part II, the contribution rule was implemented and your contribution to the joint project amounted to 20 LD. The other two group members payed 20 LD in total. What is your individual payment? My payment is: _____
6. Suppose that in Part II, the contribution rule was implemented and your contribution to the joint project amounted to 10 LD. The other two group members payed 20 LD in total. What is your individual payment?
   My payment is: _____
7. Suppose that in Part II, the contribution rule was implemented and the two other group members contributed their total initial sum to the joint project, respectively. Which contribution would produce the maximum individual payment (please tick)?
   O 0 LD O 5 LD O 10 LD O 15 LD O 20 LD
8. Suppose that in Part II, the contribution rule was implemented and the two other group members contributed their total initial sum to the joint project, respectively. Which contribution would produce the maximum payment for your group (please tick)?
   O 0 LD O 5 LD O 10 LD O 15 LD O 20 LD

Please raise your hand after you finished answering all questions. We will then check your answers. The experiment will start once all participants have successfully completed this test.

Good luck!