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Give Everybody a Voice!

The Power of Voting in a Public Goods Experiment with Externalities*

Christoph Engel# / Bettina Rockenbach**

Abstract

We study the effect of voting when insiders' public goods provision may affect passive outsiders. Without voting insiders' contributions do not differ, regardless of whether outsiders are positively or negatively affected or even unaffected. Voting on the recommended contribution level enhances contributions if outsiders are unaffected and internalizes the negative externality by lowering contributions when outsiders are negatively affected. Remarkably, voting does not increase contributions when it would be most desirable, i.e. with a positive externality. Here, participants vote for high contributions, yet compliance is poor. Unfavorable payoff comparisons to the outsiders that gain a windfall profit drive contributions down.

Key Words: Public Good, Externality, Voting, Experiment

JEL Classifications: C91, C92, D03, D43, D62, H23, H41, L13

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"Democracy is the worst form of government, except for all those other forms that have been tried from time to time."
Winston Churchill in a House of Commons speech on Nov. 11, 1947

1. Introduction

In this paper, we focus on a situation that is pervasive in politics: when a community overcomes its internal dilemma it also affects outsiders, either by providing a windfall profit or by imposing harm on them. Equatorial countries preserving the rain forest do not only save their national ecosystems but also provide a positive externality on the world's climate and biodiversity along with it. A metropolitan area that subsidizes the opera house also benefits the visitors from further away who do not pay local taxes. On the other hand, the successful provision of a (local) public good may create negative external effects. A country close to the source of an international river, building a dam to secure irrigation water and energy for its population, deprives countries closer to the estuary of the river's benefits. A municipality constructing a landfill close to its borders to keep garbage off its streets puts the groundwater in the neighboring community at risk. The presence of such externalities is frequently brought forward as an argument for extending the boundaries of the polity. The neighboring municipalities are made part of a larger political entity. The neighboring countries become members of a supranational body, like the European Union. One way of explaining why this might be desirable is procedural: all members of the larger unit may vote on the desirable level of providing the (local) public good.

To study the power of voting in such situations, we set up an experiment where insiders' public goods provisions either positively or negatively affect passive outsiders. In the first phase of our experiment participants experience the public goods dilemma and the outsiders have no means to influence insiders' actions. This phase allows all participants to gain experience with the situation and at the same time creates a benchmark of what happens if outsiders have no voice. At the outset of the second phase, all participants are asked to vote on the desired contribution level for the future rounds of the same public goods provision game. The voting outcome is determined by majority vote, yet there are no means to enforce this outcome. This procedure reflects a higher order polity with only the power of recommendation, not of rule-making or rule enforcement. It provides a lower bound for the power of voting.

To a greater or lesser degree, in most democracies votes are cast under a veil of uncertainty. Parliament or the voters themselves vote on solutions for policy problems and quite frequently do not know how they will in the future be affected by the voting outcome. As an example take a statute that assigns the responsibility for the clean-up of environmental havoc to the municipality where it happens. Many environmental problems have negative repercussions on neighboring regions. If the municipality that has been hit by the accident is not allowed to ignore it, this not only helps its own citizens, but those in a broader neighborhood as well. Yet ex ante, it is unknown where environmental damage is to occur. Hence when the statute is passed, voters or their representatives have to decide under the veil of ignorance. This reflects a fundamental tenet of rule of law and of democracy: rules should not be ad hoc, but should be "general". Voting under the veil of uncertainty is also frequently observed in international relations. For instance Art. IX (1) of the Treaty Setting Up the World Trade Organization[1] gives the majority of the Ministerial Conference power to enunciate new rules for generic situations in international trade.[2] To reflect this reality, in our experiment participants vote on a desired contribution level before they know whether, in the continuation, they will have the active or the passive role.

Our experimental setting allows studying to which degree giving people a voice helps them overcome the normative conflict resulting from the fact that a local dilemma is embedded in a broader social context. We compare public good provisions in two dimensions: without and with voting, and conditional on the character of the externality. Our experimental data show that voting is effective when the externality is negative. Voting recommends reducing contributions to the (local) public good and insiders follow this non-binding recommendation. Thus voting helps outsiders. By contrast, voting is pointless if not counterproductive when internalization would socially be most desirable, i.e. when providing the public good entails a positive externality on outsiders. Although in this case voting recommends high contributions, compliance with the recommendation is poor, mostly due to unfavorable payoff comparisons to the outsiders that gain a windfall profit. This finding is all the more remarkable since voting strongly increases contributions when outsiders are allowed to vote, but are not affected by contributions to the public good.

2. Experimental Design

The public goods game with an externality

In our experiment we study a finitely repeated linear public goods game in which provision may cause an externality to non-actors. The stage game consists of 4 active players, the *actors*, and 3 passive players, the *bystanders*. Actors are endowed with 20 tokens and have to contribute an amount $g_i \in \{0, 10, 20\}$ to a public good, which benefits all actors. We constrain the action space to ease later voting. The sum of all actors' contributions $G = \sum_{k=1}^{4} g_k$ is augmented by 1.6 and then equally distributed among the actors. Thus, an actor's payoff is:

$$\pi_i^A = 20 - g_i + 0.4 \cdot G, \qquad i = 1,...,4 \tag{1}$$

1 http://www.wto.org/english/docs_e/legal_e/04-wto_e.htm

2 International relations are also a good illustration for the feature of our voting procedure that the voting outcome is promulgated, but cannot be enforced. International law essentially serves as a coordination device for sovereign powers and enforcement is notoriously deficient. Many acts of international bodies remain pure "recommendations", as most of the decisions taken by the General Assembly of the United Nations.

Bystanders are also endowed with 20 tokens but cannot contribute to the public good. But – dependent on the parameter *b* – they either benefit from ($b = 0.2$, in treatment *PE*), suffer from ($b = -0.2$, in treatment *NE*), or are unaffected by ($b = 0$, in treatment *NX*) the contributions of the actors. Accordingly, for a given *b* all bystanders earn an identical payoff which is solely determined by the actors' contributions and is out of the bystanders' control:

$$\pi^B = 20 + b \cdot G \tag{2}$$

Thus, the joint payoff of all actors is $\Pi^A = 80 + 0.6 \cdot G$, the joint payoff of all bystanders is $\Pi^B = 60 + 3b \cdot G$ and the joint payoff of all participants (actors and bystanders) is:

$$\Pi = \Pi^A + \Pi^B = 140 + 3 \cdot (0.2 + b) \cdot G = \begin{cases} 140 + 1.2G & PE\ (b = 0.2) \\ 140 + 0.6G & NX\ (b = 0) \\ 140 & NE\ (b = -0.2) \end{cases} \tag{3}$$

Both in the positive and the no externality case the joint payoff of actors Π^A and joint payoff of all participants Π increase in contributions. With a negative externality, in principle, there would be potential for a motivational conflict between augmenting actors' joint payoff Π^A and reducing the joint payoff of all participants Π. To rule out that conflict we chose the parameter *b* such that the net gain of actors exactly equals the net loss of bystanders. As can be seen from equation (3) the joint payoff is independent of actors' contributions (at 140). This ensures that contributing actors cannot be motivated by a concern for overall efficiency.

Voting and Phase Structure

We are interested in the effect of voting on informed voters, i.e. voters who have experienced the public goods dilemma. We therefore study two phases of ten periods each. While there is no voting possibility in phase 1, voting takes place in phase 2. Prior to phase 1 subjects receive the instructions for phase 1and are informed that, after completion of this part of the experiment, another part will follow. They are told that they will receive new instructions for the continuation and that their phase-1-behavior has no consequences for their strategic position in the continuation. After the termination of phase 1, subjects receive the instructions for phase 2. The instructions are provided in the Appendix.

At the beginning of phase 1, the seven subjects of a group are randomly allocated to the roles of actors and bystanders, and play the public goods game with fixed roles without any voting possibilities for ten announced periods. At the end of each period actors are informed about the sum of contributions G, their individual payoff π_i^A and the bystander payoff π^B. Bystanders are informed about the sum of contributions G and the bystander payoff π^B.

The second phase takes place in the same group of seven subjects. It starts with all subjects voting on the recommended contribution for the second phase. Voting is anonymous and takes place under the veil of ignorance, i.e. before subjects are allocated to the roles of actors and bystanders for the second phase of the experiment. Specifically all subjects vote on one of the three possible contribution levels 0, 10, or 20 as a recommendation for the later actors. The contribution recommendation is determined by absolute majority vote. If no contribution level receives an absolute majority in the first voting round, a run-off ballot between the two contribution levels with the highest number of votes is conducted. If votes are split 3:2:2, one of the contribution levels that received two votes is randomly selected as the second option in the run-off ballot. The voting outcome is communicated to all subjects of the group. It is a non-binding, non-enforceable recommendation for the actors. After the communication of the voting result, the phase 2 roles are allocated, randomly and independent from the phase 1 allocation.

The separation of the experimental task into two phases induces a restart effect, which has been argued to be cooperation enhancing (Andreoni 1988). To disentangle the voting effect from a mere restart effect, we conduct a control treatment for the case in which we find a significant contribution enhancing effect, the no externality case. The only difference between the control treatment ReNX and NX is that ReNX has no voting stage at the beginning of phase 2, just a restart. Table 1 provides an overview over all treatments.

Treatments	# Actors	# Bystander	Voting	Externality
NE	4	3	yes	negative
PE	4	3	yes	positive
NX	4	3	yes	no
ReNX	4	3	no	no

Table 1
Experimental Treatments

The experiment was run at the University of Erfurt (elab) with a computerized interaction using z-Tree (Fischbacher 2007). Subjects that had never played a public goods experiment before were invited using ORSEE (Greiner 2004). No subject played in more than one treatment. We collected nine independent observations in each treatment, adding up to 36 independent observations with subjects of various majors. Each session lasted about one hour. Average earnings were 11.20 € in *PE*, 10.79 € in *NX*, 10 € in *NE*, and 10.52 € in *ReNX*.

3. Related Literature

To the best of our knowledge we are the first to study the effects of voting in public goods provision with externalities. However, voting has been introduced into experiments on public goods provision without externality. Kroll, Cherry et al. (2007) find that voting as such does not increase contributions, provided it is not backed up by (decentral) punishment. Marchese and Montefiori (2011) have subjects generate a binding rule by bidding and study the conditions under which a mean rule outperforms a median rule. Cinyabuguma, Page et al. (2005)

allow participants to expel free-riders by majority vote, which leads to near complete cooperation in a linear public good. Likewise, Charness and Yang (2014) find that allowing groups to increase size and efficiency by vote is an effective device. Huber, Shubik et al. (2011) show that taxation is not only superior to mere voluntary provision, but also overwhelmingly chosen by vote. Wahl, Muehlbacher et al. (2010) have participants play a linear public good game in groups of three where the marginal per capita rate is drawn from one of two known distributions. If participants are allowed to themselves pick the distribution by vote, contributions are slightly higher. Hewett, Holt et al. (2005) give members of experimental communities with induced heterogeneous preferences two channels of influence on the level of providing public goods: through voting within their community, and through exit to another community. The alternative channel is shown to improve welfare. Innocenti and Rapallini (2011) have a similar finding. Putterman, Tyran et al. (2011) give groups a chance to vote on binding sanctions. Groups quickly learn to adopt efficient sanctioning schemes, which improves welfare. Güth and Sausgruber (2008) give groups a choice between a commodity tax and an income tax to finance a public good. Groups predominantly vote for the income tax, although the commodity tax would have been efficient.

Other experiments introduce voting into common pool resource experiments. Walker, Gardner et al. (2000) allow each member of a group of seven to propose a binding vector of take rates. The whole group votes on all proposals. A proposal is adopted only if a majority of members votes for it. If no proposal reaches a majority, members decide individually. Otherwise the chosen rule is enforced. This procedure significantly improves welfare. Vyrastekova and van Soest (2003) allow users to vote on an incentive scheme. Provided the group chooses an appropriate scheme, this increases welfare. Yet this only happens in about half of the groups. Rauchdobler, Sausgruber et al. (2010) introduce voting into a threshold public good, but do not find significant welfare improvements, while Feige, Ehrhart et al. (2014) do. Finally Vanberg (2010) has dictators vote on a non-binding sharing rule. This does not induce more giving.

4. How should voting affect behavior?

If it is common knowledge that all actors hold standard preferences, they do not have any incentives to contribute to the public good. This even holds true for inequity averse actors, unless their disutility from advantageous inequity is very high. Allowing players to vote on a non-binding recommendation, as in phase 2, does not change this result. The non-binding nature of the recommendation makes actors indifferent with respect to its contents. Hence, being asked to cast a vote a group of rational agents may create any voting result and continue free-riding.

In their seminal paper Kreps, Milgrom et al. (1982) show that, when abandoning common knowledge of rationality and assuming incomplete information about the other player's type, cooperation may occur in a sequential equilibrium of the finitely repeated prisoners' dilemma game. Narrowly self-interested players conditionally cooperate in equilibrium if both of them believe that there is a small chance that the opponent cooperates. This 'rational cooperation' already yields incentives for (conditional) cooperation in phase 1. In this logic, the voting mechanism in phase 2 may further support conditional cooperation by being used as a vehicle to signal the level on which players conditionally cooperate.

The signal gains additional strength if players believe that others comply with the voted recommendation although it is non-binding. Players vote under the veil of uncertainty of their role in phase 2. Risk neutral players may vote for the contribution that yields the highest expected payoff, i.e. maximize $\pi^{VU} = \frac{1}{7} \cdot \Pi = 20 + \frac{3}{7}(0.2 + b)G$. Because with a positive externality both actors and bystanders profit from high contributions, we should expect a high proportion of votes for 20 in *PE*. In *NE* actors benefit from high contributions, while bystanders dislike contributions to the public good. However, all three possible contribution recommendations yield the same expected payoff of 20. Absent any externality, in *NX*, actors profit from high contributions, while bystanders are unaffected. The expected payoff under the veil of uncertainty increases in contributions, which is why we expect a high proportion of votes for 20. Thus, we expect votes for 20 in *PE* and *NX* and no clear voting patterns in *NE*.

If we assume that subjects are inequity averse (Fehr and Schmidt 1999), their voting decision is not solely based on the expected payoff, but on the expected utility, which incorporates potential disutility out of advantageous and disadvantageous inequity. Thus, under the veil of uncertainty a player has to evaluate $U(\pi^{VU}) = \frac{4}{7}u_A + \frac{3}{7}u_B$. The identical endowments of actors and bystanders in all our three treatments ensure that all actors and all bystanders achieve identical payoffs if all actors free-ride. If actors choose identical positive contributions there is no inequity among the actors, but inequity with respect to the bystanders in each of the three treatments. Under the usual assumptions on the inequity aversion parameters α and β, full contribution of all actors yields the highest expected utility in *PE* and *NX*, whereas free-riding of all actors yields the highest expected utility in the *NE*. Thus, we expect votes for 20 in *PE* and *NX* and votes for 0 in *NE*.

Hypothesis 1 Votes: *We expect high votes in PE and NX. In contrast we expect rather low votes in NE.*

Voting outcomes serving as a coordination device for active players' 'rational cooperation' may be followed until an end effect kicks in, independent of the treatment. A treatment difference in compliance, however, may appear when one considers that votes are influenced by role uncertainty. Since in PE insiders' and outsiders' interest for high contribution levels are aligned, compliance should be expected to be high. In NE, however, the active players may be reluctant to dampen their contributions based on a low voting result originally motivated by the fear of becoming an outsider. Thus, compliance may be low in NE. Thus, although recommendations are non-binding, we expect voting to be effective and different across treatments.

Hypothesis 2 Compliance with the voting result: *Compliance with the voting result is expected to be higher in NX and PE than in NE.*

Hypothesis 3 Contributions after voting: *Compared to the situation before voting we expect contributions to be higher in PE and NX. Due to the beneficial effect of the positive externality, the contribution enhancing effect may be expected to be even more pronounced in PE than in NX. In NE the internalization of the externality through voting is expected to lead to lower contributions as compared to the situation before voting.*

5. Results

Contributions

The development of contributions is displayed in Figure 1. In phase 1, absent any voting, contribution levels do not significantly differ between treatments (NX vs. NE p=0.1445, NX vs. PE p=0.8252, PE vs. NE p=0.2508)[3]. Also parametrically the main effects for treatments PE and NE are insignificant (see Table 2).

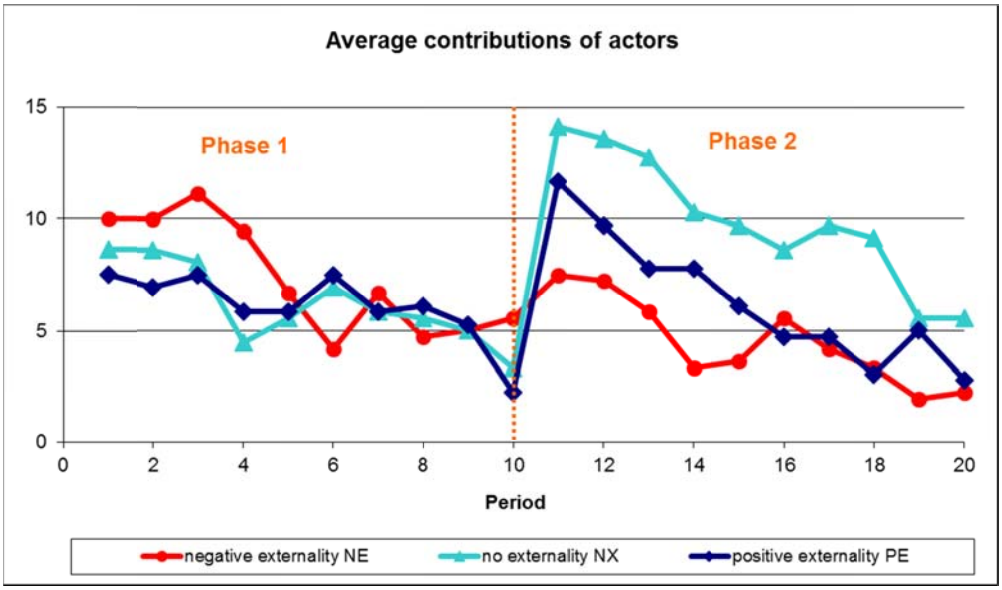

Figure 1
Contributions per Treatment

These observations leads to

Result 1: *Just knowing that contributions of actors impose a negative externality on bystanders does not prevent actors from cooperating. Knowing that bystanders would benefit as well does not induce actors to make higher contributions.*

3 All reported non-parametric pairwise treatment comparisons use two sided Mann Whitney U-tests with N = 18. The within treatment comparisons use the two sided Wilcoxon test with N=9.

	Linear		interval regression	
	coefficient	net effect of voting	coefficient	net effect of voting
Second phase	3.125***	3.125***	3.095***	3.095***
	(.545)	(.545)	(.544)	(.544)
PE	-.344	.468	-.325	.465
	(1.028)	(.530)	(1.021)	(.530)
PE*second phase	-2.657**	-2.708***	-2.630**	-2.717***
	(.760)	(.545)	(.760)	(.544)
NE	.802		.819	
	(1.027)		(1.019)	
NE*second phase	-5.833***		-5.812***	
	(.771)		(.769)	
round in phase	-.663***		-.661***	
	(.045)		(.045)	
Cons	10.080***		10.093***	
	(.767)		(.762)	
N obs	2160		2160	
N individuals	154		154	
N groups	27		27	

Table 2
Contributions per Treatment and Phase[4]

column 1: linear mixed effects, standard errors for choices nested in individuals nested in groups, Hausman test insignificant
column 2: average marginal effects (net effects) tested with Wald tests
column 3: mixed effects interval regression, standard errors for choices nested in individuals nested in groups
column 4: average marginal effect from previous model
standard errors in parenthesis
*** p < .001, ** p < .01, * p < .05

Voting leads to a significant increase in contributions if bystanders are unaffected (*NX*) (expressed in the significance of the main effect of the “second phase” in the regressions in Table 2). This, however, is not true when bystanders are either positively or negatively affected by contributions. If the externality is negative, contributions after voting are significantly lower than before votes are cast (significance of the net effect, i.e. adding up the treatment main effect and the interaction effect, and testing the combined effect with a Wald test, Table 2). In case of a positive externality, voting does not significantly change contributions.[5]

Although contributions did not show any significant treatment differences in phase 1, they do so in phase 2. After voting, the positive as well as the negative externality leads to a significantly lower contribution level than if bystanders are unaffected (periods 11-20: *NX* vs. *NE* p=0.0169, *NX* vs. *PE* p=0.0575, *PE* vs. *NE* p=0.1112). In the regression, both interactions between being in the second phase and the direction of the externality are significant (Table 2). So only for *NX* and *NE* do we support our hypothesis 3, while voting does not increase contributions in *PE*. This leads to

4 In principle, for our data structure, the interval regression is more appropriate than the linear model, as our dependent variable has only three expressions, and these expressions are equidistant (which is why we do not need ordered probit). Yet interaction terms do not have a straightforward interpretation in non-linear models (Ai and Norton 2003). Comparing this model with the linear random effects model, one sees that both models are very similar. For the ease of interpretation, we therefore rely on the linear model. Note that this choice works against us. As the much larger Chi2 value shows, the interval regression has even higher statistical power.

5 Non-parametric Wilcoxon tests of mean contributions in the first vs. the second phases per group exhibit a significant difference for NX and NE (p = .0502), but not for PE (p = .3726).

Result 2: *If actors' cooperation has a negative externality on bystanders, voting reduces contributions. If bystanders are unaffected, voting has a strong positive effect. In case of a positive effect voting has no significant effect on contributions.*

Voting Outcomes and Votes

In order to shed some more light on the surprising result for *PE*, we study voting outcomes (see Figure 2). As we have expected in hypothesis 1, voting outcomes are more cautious in the negative externality treatment. Only in one group the recommended contribution level is 20. Voting outcomes in *NE* are lower than both in *PE* and *NX* (*NE* vs. *NX* p=0.0128; *NE* vs. *PE* p=0.0128). Again in accord with hypothesis 1, in both *PE* and *NX* six out of nine groups vote for a recommended contribution level of 20.

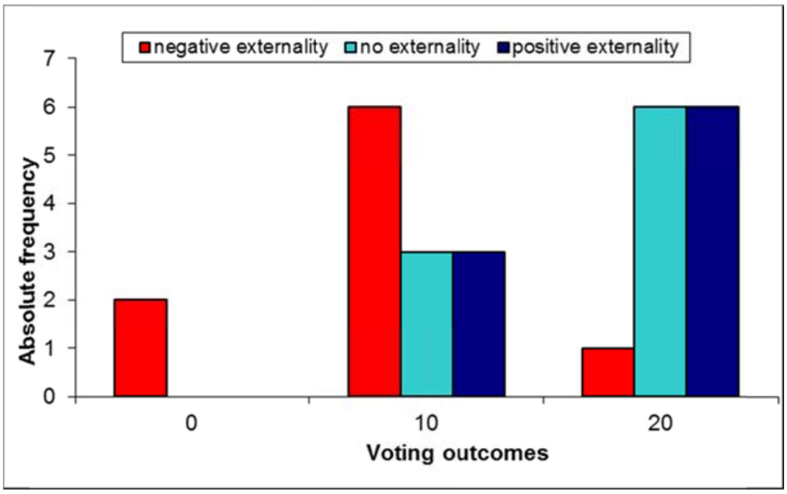

Figure 2
Voting Outcomes

Individual votes are more dispersed, but in line with voting outcomes (see Figure 3). Only in *NE* does the role in the phase before the vote significantly influence votes (Fisher's exact test, p = .001). As one would expect, former bystanders are much more likely to vote for a recommendation of zero contributions than former actors.

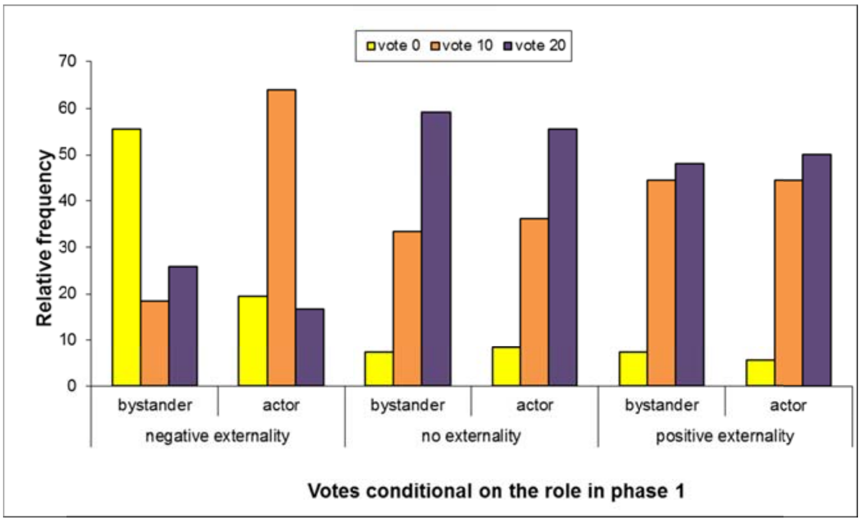

Figure 3
Votes Conditional on the Role in Phase 1

Result 3: The lower contributions in PE as compared to NX cannot be explained by differences in voting outcomes. Voting results are not different and encourage high contributions. The voting behavior in NE mirrors the internalization of the negative externality.

Compliance

If recommendations do not cause the difference between PE and NX, the reason may be a difference in compliance, which we operationalize as the difference between a subject's contribution and her group's voted recommendation. This dependent variable also allows us to address our Hypothesis 2. Groups that voted for 10 are displayed in the left panel and groups that voted for 20 are displayed in the right panel of Figure 4. If the recommended contribution is 10, in all treatments mean contributions come close to the recommendation. By contrast, the recommendation of 20 is poorly respected, however better in NX (left panel of Figure 4).

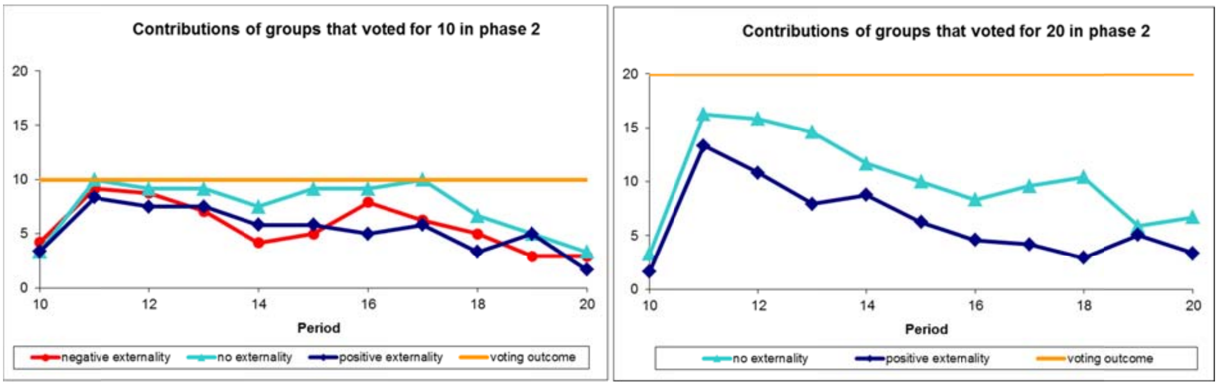

Figure 4
Compliance with Voting Outcome

Note, that we refrain from displaying the single group that voted for 20 in *NE*, since this is only one observation

Due to a ceiling effect participants may only downwards deviate from a voting outcome of 20, but deviate in both directions from a voting outcome of 10. Therefore, the statistical analysis of Table 3 looks at absolute deviations between voting outcome and contribution. Model 1 directly tests hypothesis 2. The reference category is deviations from the voting outcome in *NX* and *PE*. The constant informs us that, in these treatments, deviations are pronounced. The negative coefficient of NE shows that, in contradiction with our expectation, in *NE* we find smaller, not larger deviations from the voting outcome (p = .060). If we separately compare *NE* with *NX*, we do not find a significant difference (model 2), while the difference is significant and negative if we compare *NE* with *PE* (model 3). This is remarkable since, from the perspective of the actors, compliance with low voting outcomes in *NE* is a sacrifice, while (full) compliance with high voting outcomes in *PE* would also give actors a higher payoff. Model 4 splits the analysis by treatment and voting outcome. In this model, voting outcome 10 in *NX* is the reference category. Conditional on voting outcome, deviations from the voting outcome are least pronounced in *NX*. The more demanding the voting outcome, the less well it is obeyed.

	model 1	model 2	model 3	model 4
PE				2.972*
				(1.277)
NE	-3.431^{+}	-1.944	-4.917*	3.104*
	(1.821)	(2.067)	(2.053)	(1.509)
voting outcome 0				-5.100*
				(2.179)
voting outcome 20				7.047***
				(1.229)
cons	9.181***	7.694***	10.667***	2.997*
	(1.052)	(1.461)	(1.452)	(1.219)
N	1080	720	720	1080
p model	.0596	.3468	.0166	<.001

Table 3
Compliance with Voting Outcome

depvar: |contribution – voting outcome|, phase 2 only,
linear mixed effects, standard errors for choices nested in individuals nested in groups
reference categories: model 1: *NX* and *PE*, model 2: *NX*, model 3: *PE*, model 4: *NX* voting outcome 10
standard errors in parenthesis
*** p < .001, ** p < .01, * p < .05, $^{+}$ p < .1

The Critical Effect of Comparative Performance

Why are actors less inclined to follow the recommendation if contributions also increase bystander payoff? The regression in table 4 shows that actors conditionally cooperate and are independently affected by payoff comparisons to the other actors as well as to the bystanders. Most importantly, the regression shows that actors reduce contributions if bystanders have had a higher payoff and increase their contribution if they have outperformed bystanders in the previous period. While payoff comparisons to the other actors are not affected by the treatment variation, payoff comparisons to the bystanders are. The risk of falling behind the bystanders strongly differs between treatments and is most severe in PE. Consider for example three actors who contribute 20 and one actor who free-rides (contributes 0). In all treatments the full contributors achieve a payoff of 24 and fall behind the free-rider whose payoff is 44. In PE, however, the contributors also fall behind the three passive bystanders, who earn 32 each. By contrast, in the same situation bystanders' payoff is 20 in NX, and hence below the payoff of active players who have fully contributed. More generally, in PE the contributing actors already fall behind the bystanders if there is a single free-rider in a group of full contributors, while in NX one needs at least two free-riders to make the full contributors fall behind the bystanders.

PE	-2.806
	(2.217)
NE	4.115^{+}
	(2.273)
lagged profit	.481***
	(.097)
lagged difference between own and average profit	-.517**
of other active players	(.150)
lagged difference between own and bystander profit	.237*
	(.098)
round in phase	-.519***
	(.056)
Cons	-16.587***
	(2.966)
N obs	972
N individuals	108
N groups	27
p model	<.001

Table 4
Explaining Compliance with Voting Outcome[6]

depvar: contr – voting outcome, phase 2 only,
Hausman Taylor, bootstrapped with draws of entire groups, 50 reps,
*** p < .001, ** p < .01, * p < .05

Result 4: *The desire not to fall behind bystanders reduces cooperation in PE and explains lower compliance in PE after voting.*

6. Robustness

When bystanders are unaffected, in treatment *NX*, contributions significantly increase after voting, while in the other treatments this is not the case (see Table 2 and footnote 5). In particular, in *NX* the contributions in round 11 (after voting) are significantly higher than the contributions in round 10 (immediately before voting) (p=.0087). To assess how much of this significant increase may be attributed to the mere restart effect (Andreoni 1988) and how strong the additional effect of voting is, we compare the control treatment *ReNX* to *NX*. Figure 5 provides the impression that voting does indeed have an independent effect.

6 Since the Hausman test turns out significant in this model, we have to estimate a Hausman Taylor model, where we instrument the three variables for experiences from the previous period. A subsequent Hausman test shows that we have successfully removed the endogeneity (Baltagi, Bresson et al. 2003).

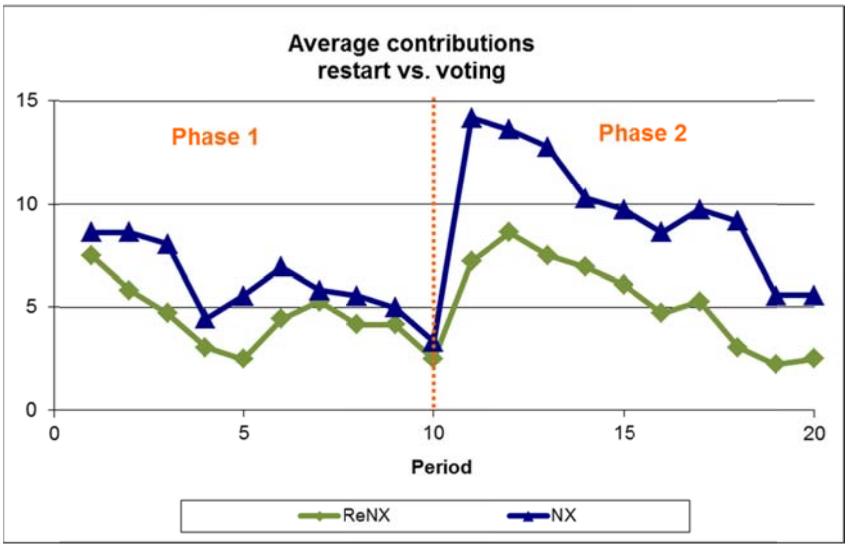

Figure 5
Robustness Check

	model 1 linear		model 2 interval regression	
	coefficient	net effect of voting	coefficient	net effect of voting
second phase	3.049***	3.049***	3.017***	3.017***
	(.538)	(.538)	(.537)	(.537)
ReNX	-1.568	.523	-1.566	.543
	(1.270)	(.548)	(1.259)	(.550)
ReNX*second phase	-2.526**		-2.475**	
	(.768)		(.768)	
round in phase	-.608***		-.608***	
	(.054)		(.054)	
cons	9.805***		9.828***	
	(.946)		(.938)	
N obs	1440		1440	
N individuals	105		105	
N groups	18		18	
p model	<.0001			

Table 5
Comparing *NX* with *ReNX*

column 1: linear mixed effects, standard errors for choices nested in individuals nested in groups, Hausman test insignificant
column 2: average marginal effects (net effects) tested with Wald tests
column 3: mixed effects interval regression, standard errors for choices nested in individuals nested in groups
column 4: average marginal effect from previous model
standard errors in parenthesis
*** p < .001, ** p < .01, * p < .05

Statistically, the two treatments are distinguishable only in phase 2. This result both holds non-parametrically (p = .2327 in phase 1 and p = .0378 in phase 2) and parametrically (Table 5). The interaction between phase 2 and *ReNX* is significant and almost entirely neutralizes the significant positive main effect of phase 2. Most importantly, this interaction effect gives us an estimate for the size of the additional effect of voting. It is as large as 2.526 and thus accounts for a 25.8 % (=100*2.526/9.805) increase in contributions.

7. Conclusions

We study the effect of voting when insiders' public goods provision may affect bystanders. Voting is weak as voting outcomes are just non-binding recommendations. Nonetheless, voting leads to significantly lower contributions when public goods provision causes negative effects on bystanders. Apparently, those who have the good fortune to assume the active role feel obliged to respect the wish of potential bystanders to reduce their contributions. It is even more remarkable how well voting works if there are no externalities. It seems that voting under the veil of ignorance serves as a powerful commitment device, despite the fact that there is no enforcement. It is quite plausible that, with negative externalities and when bystanders are unaffected, voting would work even better if groups had a chance to enforce their collective decision. By contrast, voting does not lead to increased contributions when it would be socially most desirable: when the contributions of insiders have a positive effect on bystanders. In this situation, compliance to high voting outcomes is poor and the negative effects of unfavorable payoff comparisons destroy the otherwise beneficial effects of voting.

Experiments identify causal effects and deliberately abstract from many factors that are very likely to matter for the conflicts of life that motivate the research. This experiment is no exception. We therefore do not venture immediate implications for policy making. Such caution is particularly advisable since most of our motivating examples are taken from large communities, even multiple countries. Such communities do not only have many more members than our experimental groups. Their decision making is also embedded into elaborate political institutions, and builds on an extended collective history. Yet all the necessary qualifications taken into account, our results may be turned into a hypothesis: could it be that decision making across the boundaries of constituencies most urgently needs explicit enforcement if decisions impose a distributional loss on their actors? This would be good news and bad. If there is no pronounced and visible distributional loss, simple joint decision making might already be instrumental. Yet if compliance requires accepting a distributional loss, our results suggest that policy makers must implement some form of enforcement to achieve the local goal.

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Appendix: Instructions to the Experiment

In Section A we list the instructions for the positive externality treatment *PE*. The instructions for treatments *NE* and *NX* are analogous and may be requested from the authors. In Section B we list the instructions for phase 2 of the treatment without voting *ReNX*. The instructions for phase 1 of *ReNX* are identical to the phase 1 instructions of *NX*. Please notice that in all treatments we played a third phase, which is not in the focus of this paper. All provided instructions are translations from the original German instructions. The originals may be requested from the authors.

A. Instructions to *PE*

Instructions

General Information

- At the beginning of the experiment you will be randomly split into **3 groups of 7 members**. During the whole experiment you will only interact with members of your group.
- The experiment consists of **3 phases**. First you will be informed about phase 1. You will learn about the rules of the next phase as soon as the previous phase has been terminated. **Please note**: The decisions you make in one phase **do not affect** the range of possibilities you have at your disposal in any later phases.

Information for phase 1:

- There are **two types** of players: **active** and **passive players**. There are **4 active players** and **3 passive players**. At the beginning of phase 1 it will be randomly determined whether you are an active or a passive player. Your type will remain unchanged for the whole duration of phase 1.
- You play **10 rounds**, each round will have the same structure.
- Each **active** and each **passive** player receives an **endowment of 20 points in each round.**
- **Active players**: Each active player has to decide how many of the 20 points he/she wants to **contribute** to the public good. All points contributed to the public good will be **multiplied by 1.6** and **equally** split among all 4 active players, i.e. for every point contributed to the public good by an active player, every **active player receives 0.4 (=1.6/4).** Points not contributed to the public good will stay with the player. More precisely, each active player has to select one of the following three options:
  - **Contribute** 0 points and keep 20 points,
  - **Contribute** 10 points and keep 10 points or
  - **Contribute** 20 points and keep 0 points
- **Passive players**: Passive players cannot contribute to the public good. The payoff of the passive players depends on the contributions of the active players. For each point contributed to the public good by an active player, each passive player receives **0.2 points**.

- **Payoff per round:**

for **active players:**	**20** – points contributed **+ 0.4** x sum of the contribution of all active players
for **passive players:**	**20 + 0.2** x sum of the contribution of all active players

Example

If the four active players contribute 0, 10, 10 und 20 (arranged by amount), the sum of contributions by all active players is 40 and each active player receives 0.4x40=16 from the joint project. The individual payoffs per round of the **active players** depend on the amounts contributed and are:

- for the player who contributed 0: 20 – 0 + 16 = 36
- for the player who contributed 10: 20 – 10 + 16 = 26 and
- for the player who contributed 20: 20 – 20 + 16 = 16.

The payoff per round for each **passive player** is 20 + 0.2x40 = 28.

Payoff

Each player receives a flat fee of **€ 4** once. At the end of the experiment the points will be paid in Euro with the exchange rate: **10 points** are **0.15 €**.

Instruction for phase 2:

General Information

- In the second phase you will continue to play in your group of 7 participants.
- You will again play 10 rounds of the game described in phase 1. Before round 1 and before the determination of the active and passive players, all participants will vote on how many points the active players should contribute to the public good.
- After the voting and before the start of the first round the 4 active und the 3 passive players will be **drawn anew**. Your type will be drawn **randomly** and **independently of your previous** type.

Voting on the amount of the contribution

- Before the determination of active and passive players, all 7 players of the group vote on the **amount of the contribution** in the following 10 rounds. **Please note:** At the time of the voting you do not know yet whether you will be an active or a passive player in phase 2. You do know, however, that the payoff of the passive players in phase 2 depends on the contributions of the active players.
- Each player can vote for one of the three possible amounts (0, 10 or 20).
- After everybody's vote has been cast you will be informed about the result of the voting.
- If one of the amounts obtains the absolute majority, i.e. received 4 or more votes, it is selected (see example 1).
- If there is no amount with an absolute majority, a run-off vote between the two amounts with

the highest numbers of votes will be conducted (see example 2). If there are two amounts not with the highest but with an equal number of votes, the amount that will be part of the run-off vote will be randomly drawn from these two (see example 3). The amount of contribution that wins the absolute majority in the run-off vote will be selected as the voting result.

		Example 1	**Example 2**	**Example 3**
Vote no. 1	**0** **10** **20**	2 votes 4 votes 1 vote	3 votes 3 votes 1 vote	3 votes 2 votes 2 votes
Result vote no. 1		contribution 10 selected	Run-off vote between contributions 0 and 10	Run-off vote between contributions 0 and 20 (result of random draw between 10 and 20)
Run-off vote	**0** **10** **20**	not necessary	5 2 -	1 - 6
Final result of vote		**contribution 10 selected**	**contribution 0 selected**	**contribution 20 selected**

Decision about the contribution of the active players

As in phase 1 only active players can contribute to the public good. They individually decide whether they want to contribute 0, 10 or 20 points. **Please note**, that neither the experimenter nor active nor passive players can enforce that the active players stick to the voting result decided by the group.

Payoff

The exchange rate in phase 2 is the same as in phase 1: **10 points** are **0.15 €**.

B. Instructions to *ReNX* Phase 2

<u>Instruction for phase 2:</u>

<u>General Information</u>

- In the second phase you will continue to play in your group of 7 participants.
- You will again play 10 rounds of the game described in phase 1. <u>Before</u> round 1 the 4 active und the 3 passive players will be **drawn anew**. Your type will be drawn **randomly** and **independently of your previous** type.

Payoff

The exchange rate in phase 2 is the same as in phase 1: **10 points** are **0.15 €**.