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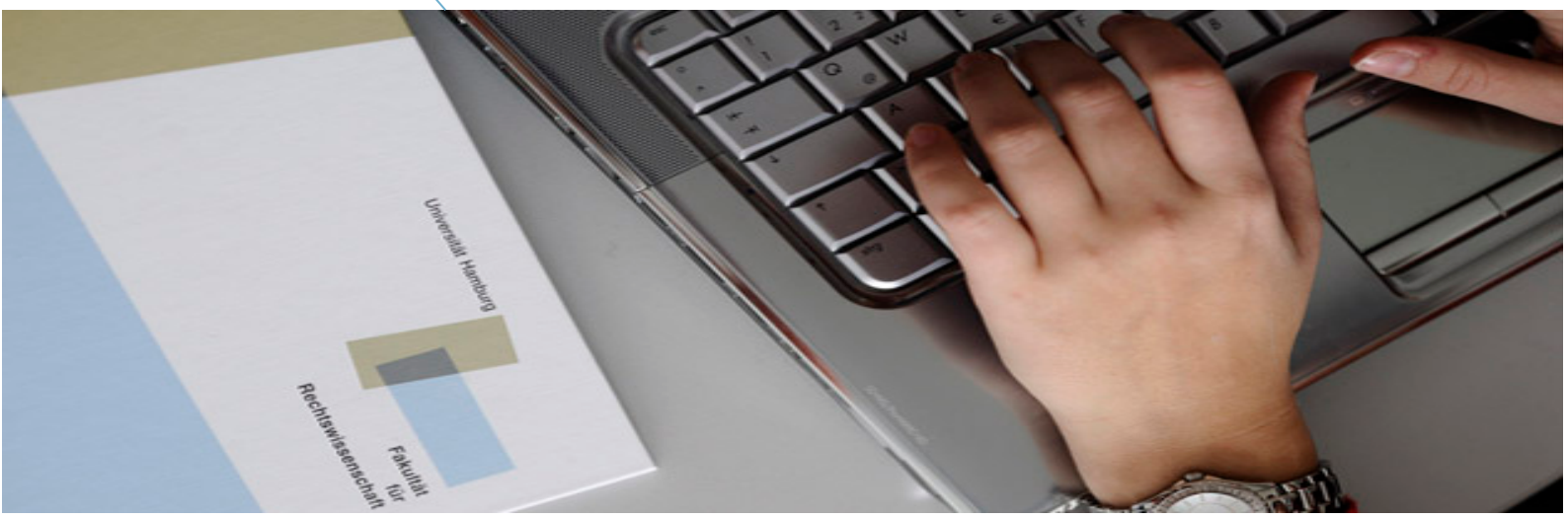

Institutional Choice and Cooperation in Representative Democracies: An Experimental Approach

Fanny E. Schories*

September 29, 2017

Abstract

This paper examines whether an institution has a differing impact on cooperation if it is introduced by a representative of the affected parties rather than exogenously imposed. The experimental design is able to control for selection effects arising from the democratic policy choice. I find evidence of a large *democracy premium* in the sense that endogenously implemented institutions lead to more cooperation than identical exogenous institutions. Especially the subjects who initially did not prefer the policy comply if it was brought about by an elected representative. The results have implications for the analysis of decision-making processes and policy recommendations in general.

Keywords: Laboratory Experiment, Representative Democracy, Collective Decision-Making, Social Dilemma, Legitimacy.

JEL Classification: C9, D02, D72.

1 Introduction

Does the way a law is implemented affect its effectiveness? This experimental paper studies the difference between compliance with exogenous institutions and those that are implemented through an indirect democratic procedure. Even when holding information and group composition constant, there is evidence of a large *democracy premium* in terms of an increased willingness to cooperate after an institution was introduced by a group representative.

The central argument for ceding authority from citizens to the state is to overcome the social dilemma that economists model as a prisoners' dilemma. It is characterized by the conflict between maximizing individual payoffs versus overall welfare. As a consequence societies are shaped by institutions that punish free-riding to attain a more efficient outcome for every citizen. Examples range from taxation authorities and court systems to international agreements against climate change and anticompetitive firm behavior.

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That such a central authority can effectively improve cooperation was shown in manifold economic experiments. Recently, additional interest in endogenous institutions which do not "fall from heaven" but are introduced by the affected parties themselves is growing. The process that leads to an institutional setting might well influence the extent to which it can fulfill its societal purpose. This study sheds light on the question how institution formation influences cooperation levels in a representative democracy. A payoff modification that potentially fosters cooperation is introduced into a prisoners' dilemma either by a representative of the subjects or by the experimental computer. It is then examined whether the policy's effectiveness differs if it was democratically (i.e. endogenously) chosen.

Dal Bó, Foster, and Putterman (2010) develop an experimental approach to quantify the impact that institution formation procedures have on cooperation levels in a direct democracy. I modify their experiment by including the election of a representative chosen by a plurality rule. Indirect democratic procedures are commonly used in various circumstances: nations, firms and clubs typically delegate at least parts of their decision-making processes to representatives.

The experiment has two stages with a vote in between. The first consists of a simple prisoners' dilemma. Subsequently, subjects form preferences about the introduction of a formal institution that penalizes unilateral free-riding. This institutional change is modeled by transforming the payoff structure to a coordination game that makes cooperation incentive-compatible. Subjects vote for a representative, whose preference about payoff modification becomes binding for the group, but is only considered with some probability. If it is not considered either the coordination game or prisoners' dilemma is randomly assigned to each group for the second stage. The exogenous intervention allows the comparison of groups with identical preferences and information available but a differing implementation of the policy. Cooperation rates before and after the vote are analyzed conditional on individual modification preferences and the outcome of the random intervention.

The research question is thus if a given policy that is introduced to a community through an indirect democratic process has a stronger effect on cooperation than an exogenous policy implemented by the computer. This *democracy premium* is isolated by controlling for the instrumental effect of the reform itself, potential selection biases, and information effects from the voting procedure. There are two central questions: Are subjects willing to introduce a policy that incentivises cooperative behavior in a social dilemma? And is cooperation influenced by the way the policy is implemented? On top of that the experiment sheds light on the relationship between the group members in the role of citizens and their representatives.

I find that many subjects – especially more pro-social ones – are willing to introduce the payoff modification. The institutional change significantly fosters cooperation and even more so when introduced by a group representative. In the first round after the vote there is a cooperation difference of almost 17 percentage points between the endogenously and exogenously implemented institution. A decomposition of cooperation rates by vote stage outcome and group composition gives evidence of a large endogeneity effect that goes

beyond the pure influence of the payoff modification. 78 percent of the total policy effect in case the representative was considered can neither be attributed to the institutional change itself nor to differences in group composition and thus remain as the *democracy premium*. This holds true after controlling for information and individual characteristics to eliminate self-selection biases. In contrast to Dal Bó, Foster, and Putterman (2010) I find that especially those subjects who initially did not prefer the coordination game respond strongly to a democratic payoff modification with an increased willingness to cooperate.

The relevance of the results is twofold. First, behavioral effects of endogenous institutions in general and in representative democracies in particular are of relevance for the evaluation of experimental treatment effects in which subjects are assigned to different institutions. If the way an institution is implemented has quantifiable consequences beyond the pure policy impact this has to be accounted for. More precisely, what specific aspects of a decision-making procedure are outcome-relevant? My paper zeros in on the impact of representation as one crucial aspect of democracy.

Second, the results have potential policy implications. For policy recommendations insights into the interdependence between institutions and behavior, not only for small Polis-style groups but also for communities that operate on a larger scale, are crucial. These societies typically use a representative democratic system. Should a law that was effective in one instance also be assigned in other situations? Consider for example the progressing European integration. Is a reform introduced in Greece as effective when it is de facto prescribed from an external authority such as the "Troika" as if it was introduced directly by the national government? These questions inform economic theory which is outcome-oriented and does usually not consider utility derived from processes and contextual phenomena.

The remainder of the paper is structured as follows. Section 2 reviews the most closely related literature with a focus on the effects of endogenous institutions in experiments. Section 3 presents the design of the experiment including testable hypotheses. Section 4 reports the analysis and results including the findings on the relation between indirect democracy and cooperation on the individual as well as on the group level. Section 5 discusses these results and concludes.

2 Related Literature

There is a growing body of experimental literature exploring the key factors that influence cooperative behavior in societies. These studies suggest that the implementation of an institution matters in addition to the institutional design itself. A central result from previous lab experiments on such institutions is that direct democratic participation rights increase subjects' contributions to a public good, ceteris paribus.[1] These insights cannot

[1] Various authors have taken the search for effects of endogenous institutions in public goods games to the field. Cavalcanti, Schläpfer, and Schmid (2010) find that public deliberation increases the willingness of participants to contribute to projects for the management of common resources among Brazilian fishermen. Other studies such as Bonin, Jones, and Putterman (1993), Bardhan (2000), Black and Lynch (2001), and Fearon, Humphreys, and Weinstein (2011) find similar results in settings ranging from irrigation rules in rural India to workplace decisions of manufacturing businesses in the USA: participation rights increase

be explained with outcome-oriented utility concepts as used for example in rational choice theory (Becker, 1978). An endogeneity premium of democratic institutions should not exist if the institution that is implemented and the information provided remain the same.[2]

The evidence about the influence of participation rights on cooperation levels is mainly based on public goods experiments, where democratic structures are implemented into the policy selection process by allowing participants to directly vote on different proposals.

The Effects of Democratic Policy Selection Tyran and Feld (2006) produce evidence that an endogenously chosen non-deterrent law reduces free-riding behavior in public good provision. The experiment varies the severity and enaction of a monetary punishment on free-riding. In the endogeneity treatment subjects vote on whether to enact a given law, in the exogenous treatment the game is played with a given ordering of the institutions. Under exogenous law the mild version does not significantly increase compliance compared to the game without law. In the endogenous treatment, individuals mostly accept mild law and the contribution rate is significantly higher than without law (ibid.). Yes-voters comply highly under accepted mild law, but have low contribution rates if the mild law is rejected. This is evidence against a *pure* selection effect, because in this case unconditionally cooperative players contribute similarly under both circumstances (ibid., p.150). An experiment by Sutter, Haigner, and Kocher (2010) presents additional evidence that participation rights reinforce cooperation Subjects vote for a decentral punishment or reward mechanism. For any given institution, endogenous choice is associated with higher contributions compared to an identical mechanism implemented through an external authority (ibid.).

Markussen, Putterman, and Tyran (2014) contrast informal and formal sanctions in endogenous and exogenous regimes and show that the efficiency of non-deterrent formal sanctions is higher if they are chosen by subjects. Kamei, Putterman, and Tyran (2015) allow subjects to decide on the parameters of the formal sanctioning regime themselves. Endogenous sanctions are slightly more effective in inducing contributions to the public good than exogenous sanctions.

However, the experiments presented so far in this section cannot isolate a pure *democracy premium*. In each case the vote entails a signaling component and reveals information about the group composition and subjects' preferences. Conditionally cooperative players are likely to respond to this and adjust their behavior accordingly. Furthermore, because of the democratic policy selection the institution is not randomly assigned and the estimated differences between exogenous and endogenous assignment are potentially biased. Both self-selection and information as confounding factors are mitigated using the experimental design as presented in section 3.1.

The experimental mechanism employed in the present study was first introduced by

compliance, productivity, and satisfaction. Grossman and Baldassarri (2012) find that subjects electing leaders contribute more to public goods than subjects who were assigned leaders through a lottery.

[2]However, Frey, Benz, and Stutzer (2004) introduce *procedural utility* to incorporate preferences about the process that leads to an instrumental outcome. A related concept from political theory is input legitimacy: an institution is responsive to citizens' needs by allowing participation in the decision-making process (Schmidt, 2013).

Dal Bó, Foster, and Putterman (2010). It avoids a self-selection bias in investigating the effect of democracy. Subjects are allowed to vote on a fixed policy proposal but this democratic choice is overruled by a random computer decision in 50-percent of the cases. This strategy makes it possible to control for unobservable characteristics that influence both voting decisions and cooperative behavior. Dal Bó, Foster, and Putterman (ibid.) find that even when controlling for selection, endogenous and exogenous institutions have a differing impact on cooperation. The authors find evidence of a *democratic dividend*: an effect of democratic institutions beyond the instrumental effect of the policy choice. The knowledge that the policy was introduced by the subjects can reinforce cooperation norms or work as an equilibrium selection device. Sutter, Haigner, and Kocher (2010) obtain contradictory results using a similar randomization mechanism: whether the vote was considered has no significant influence. The authors conclude that the institutional design itself influences behavior and not its democratic nature.

Representative Democracies Hamman, Weber, and Woon (2011) find that repeated electoral delegation is a useful tool to overcome the free-rider problem in a social dilemma situation via selection. As groups largely choose pro-social representatives, delegation leads to a higher provision of a public good compared to decentralized decision-making. Other experiments find that leadership by example can reduce free-riding and thus improve overall welfare, but is seldom chosen endogenously (Rivas and Sutter, 2011).

Olken (2010) compares direct and indirect democratic decision-making processes and finds that when compared to a representative system, direct participation in political decision-making increases the satisfaction of participants even when the outcome is not changed. Mechtenberg and Tyran (2016) show that subjects' willingness to acquire costly information in a common interest setting is higher after the group actively demanded to make the decision by voting instead of delegating to an expert. In a similar vein, Towfigh et al. (2016)'s online vignette study finds that voters are more likely to accept decisions made by representatives if the issue at hand is of minor importance to them personally. The more someone cares about a topic, the more she favors direct democratic procedures.

3 The Experiment

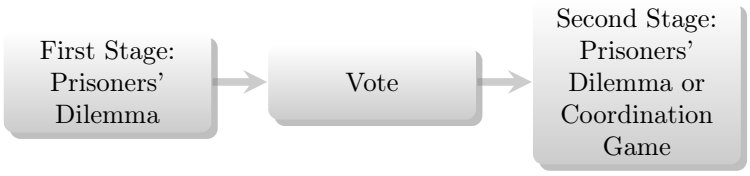
The chosen method to further investigate the impact of democratic decision-making is a laboratory experiment. Computerized economic experiments make it possible to measure the effect of a policy under conditions that tightly control the incentives and information structure. This section first explains the experimental setup – discussing aspects of the procedure, incentives and potential confounding factors – and then develops the hypotheses tested in section four.

3.1 Experimental Design

In the first stage, a prisoners' dilemma is played in small groups over ten periods. At the beginning of the following second stage, a vote takes place. Groups then play another ten

rounds of a game whose parameters are determined according to the outcome of the vote and a random intervention of the experimental computer. The design allows observations between and within subjects. Neutral framing is used as is common practice in experimental economics to minimize the psychological effect of the institution. The experiment was programmed with the software z-Tree (Fischbacher, 2007).

Figure 1: Sequence of the Experiment



The Games Played The design has two stages and is based on the prisoners' dilemma in table 1. This game has a strictly dominant strategy and hence a unique symmetric Nash equilibrium in which both players choose action B. Groups consist of four players and remain together over the entire session. In the first stage, ten rounds of the prisoners' dilemma are played with random rematching of pairs within each group.

		Player 2	
		A	B
Player 1	A	$50, 50$	$30, 60$
	B	$60, 30$	$40, 40$

Table 1: Initial Payoffs – Prisoners' Dilemma

When players decide on an action in each round they do not know against which group member they are playing. However, the opponent's player ID – a number which is randomly assigned and kept over the entire session – becomes known at the end of every round. Additionally, I show the actions of the other pair in the group. By doing so it is ensured that all group members have identical information about the behavior of the other players in the group. Direct reciprocity is excluded but it is possible to establish a reputation as a cooperator, which becomes relevant in the following election.

The second stage begins with a vote. Subjects decide whether they want to change the payoff matrix of their group into a coordination game that has an additional Pareto-superior Nash equilibrium: mutual cooperation. The modified payoff structure is shown in table 2 and can be understood as introducing a penalty on unilateral defection (Dal Bó, Foster, and Putterman, 2010, p.2207). Every individual privately announces her preference whether to implement the modification or not. This decision will only matter if she is elected as group representative (strategy method).

To elect this representative players privately announce another group member's ID without knowing her preference for modification explicitly. The idea is that players gained some experience in the first stage and infer the other group members' preferences for cooperation from their behavior in the prisoners' dilemma game. This noisy signal about someone's willingness to introduce the institution models the free mandate of an office-

		Player 2	
		A	B
Player 1	A	50, 50	30, 48
	B	48, 30	40, 40

Table 2: Modified Payoffs – Coordination Game

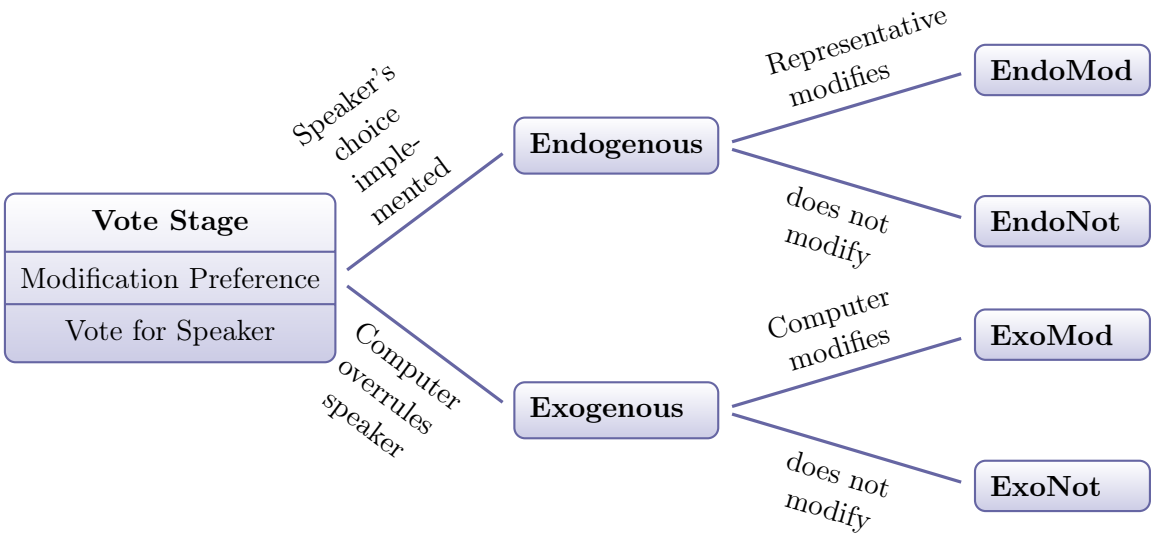
holder in a representative democracy. The player who is named most often in a group is elected as speaker – the computer randomly breaks a tie when it arises – and the speaker's choice of payoff matrix from now on constitutes the whole groups' decision about modification. Analogous to Dal Bó, Foster, and Putterman (2010) the speaker's choice is considered with probability $\frac{1}{2}$. If it is not considered the computer chooses the prisoners' dilemma or coordination game for the group with equal probability (see figure 2). The random intervention makes it possible to compare groups that voted in the same way but end up under different regimes. Once the analysis conditions on an individual's original preference and the payoff structure, correlated unobservable characteristics are assumed to be controlled for.[3]

Subjects are informed about the outcome of the election (the player ID of the representative), the preference of the speaker (modify payoffs or not), whether this preference was considered (endogenous or exogenous choice) and the game their group faces in the second stage (prisoners' dilemma or coordination game). Otherwise, certain types of information about group composition and the speakers' preferences would only become known in the endogenous case where the vote is considered. My design ensures that there are in principle no informational differences between the endogenous and exogenous vote stage outcomes that subjects could condition their behavior on in the following rounds. The respective game is played for another ten rounds, analogous to the first stage with random matching within groups and information on the opponent's identity at the end of each round. To summarize, there are four potential outcomes: payoff modification to coordination game by the group (EndoMod) or the computer (ExoMod), and an unmodified prisoners' dilemma either chosen endogenously (EndoNot) or exogenously (ExoNot).

Self-Selection and Information Effects The main confounding factor of experiments investigating democratic institutions is self-selection: whenever a policy is endogenously introduced participants select into the treatment by definition. It is only natural that players vote for the policy that is aligned with their preferences, making it difficult to compare the impact of different institutional designs since the assignment is not random. Cooperative subjects are also more likely to prefer the policy that fosters cooperation. Dal Bó, Foster, and Putterman (ibid.) claim that selection leads to an overestimation of the effect of endogenous policy selection since the voting decision and behavior are positively correlated. In order to eliminate the effect randomization and control for underlying characteristics are introduced into the experiment. This design holds the advantage that the results of groups that voted in the same way and ended up with the same game, but through a different mechanism, can be compared. Dal Bó, Foster, and Putterman (ibid.)'s

[3] See Dal Bó, Foster, and Putterman (2010) for a more formal discussion of this assumption.

Figure 2: Four Possible Vote Stage Outcomes in Stage Two



idea is that groups with an identical distribution of votes for and against modification also have identical preferences about modification and thus cooperation, and if their behavior differs this is attributed to the way the modification was implemented.

The second confounding factor which I control for in the presented design is information. Sutter, Haigner, and Kocher (2010)'s as well as Dal Bó, Foster, and Putterman (2010)'s main experiment involve instructing subjects about their group's choice only in the endogenous case, thereby straining the ceteris paribus assumption: not only the implementation of the institution differs between endogenous and exogenous outcomes but also the information provided. One can argue that this information is an essential part of a democratic institution and the asymmetry between the outcomes should not be erased. However, in my experiment subjects are told about the representative's choice in the endogenous as well as in the exogenous case. This choice is not perfectly informative about the group's composition but hints at the preferences of the majority. Furthermore, the choice of game of the representative is a credible signal. This holds the available information constant across outcomes and means that observed differences can be attributed to the intrinsic difference between democratically and exogenously introduced policies. I consider this a conservative estimate of the lower bound of a *democratic dividend* because many factors that are inherent to democratic processes are controlled for.

3.2 Hypotheses

The payoff modification introduces another Nash equilibrium in pure strategies. Now both (A,A) and (B,B) are equilibrium outcomes, with the former being the social optimum. Dal Bó, Foster, and Putterman (ibid.) note that the optimal choice of payoffs depends on the players' expectations about what the others will do in the coordination game. If subjects expect to achieve mutual cooperation under the modification, they should vote in its favor; whereas they are indifferent between the two games if they expect mutual defection in the coordination game. Dal Bó, Foster, and Putterman (ibid.) discuss off-equilibrium

reasoning as well: A player whose strategy is to always defect could oppose modification as it decreases the deviation profit she obtains every time she faces a cooperating partner. But she could hope to increase others' willingness to cooperate through the modification thereby making it more likely to harvest the (albeit lower) deviation profit. Of course in this case it would be even better for her to cooperate herself.

As the modification of payoffs makes the Pareto-superior cooperation equilibrium more attainable I expect both unconditionally as well as conditionally cooperative players to favor modification. Dal Bó, Foster, and Putterman (2010) find that only slightly more than half the sample wants to modify. This is a phenomenon worth investigating. One explanation is that it takes some amount of logical reasoning to grasp the influence of the modification on the (equilibrium) behavior of one's group members such that players with a higher cognitive ability are more likely to vote for modification.

Hypothesis 1 *A subject who is more cooperative in part one is more likely to have a preference for payoff modification.*

Since subjects only learn about the vote after the first stage is completed, and the election is held without further interaction possibilities, I do not consider electoral competition. I expect subjects with a preference for cooperation to vote for a group member that cooperated as well. Conditionally cooperative individuals are likely to be in the majority in the sample (Fischbacher, Gächter, and Fehr, 2001). These would anticipate another player with a preference for cooperation to want to modify as well and consequently vote for this player. Hamman, Weber, and Woon (2011) find that groups typically elect the most cooperative subject as representative.

Hypothesis 2 *Cooperative players are more likely to be elected as representatives.*

The coordination game has (A,A) and (B,B) as equilibria in pure strategies and one equilibrium in mixed strategies where each player cooperates with probability $\frac{5}{6}$ and defects with probability $\frac{1}{6}$. I expect more players to cooperate under the modified payoffs compared to the prisoners' dilemma. Since there is no unique best response after modification, coordination between players is crucial to realize one of the symmetric equilibria. Following Harsanyi and Selten (1988) mutual cooperation can be classified as payoff-dominant as it is Pareto-superior to all other Nash equilibria. On the other hand, defection risk-dominates cooperation as the opportunity cost of unilateral deviation are higher.

The vote stage can deliver cues towards one of the equilibria. For example, a representative choosing the coordination game may make cooperation more salient (Schelling, 1960). Markussen, Putterman, and Tyran (2014) claim that a *democratic dividend* of cooperation is rationalisable with the model of inequality aversion by Fehr and Schmidt (1999).[4] Voting can then serve as an equilibrium selection device in the coordination game

[4]The model by Fehr and Schmidt (1999) incorporates fairness concerns into a self-interested individual utility function, such that inequalities in a subject's own payoff relative to others' payoffs are penalized. Formally, in the two-player case with payoffs $x = x_i, x_j$, the utility function of player i is given by $U_i(x) = x_i - \alpha_i max\{x_j - x_i, 0\} - \beta_i max\{x_i - x_j, 0\}, i \neq j$; where the second term represents a utility loss from disadvantageous inequality and the third term a utility loss from advantageous inequality.

because it is a credible signal of an intention to cooperate that prompts inequality-averse subjects to cooperate as well (Markussen, Putterman, and Tyran, 2014, p.307).

However, in my setting, two things are known to subjects: The actions of all players in the group in the prisoners' dilemma in part one, and the policy choice of the representative. This becomes known in the exogenous as well as in the endogenous case, thereby erasing potential information differences between the conditions. Rational choice would predict subjects to be indifferent between decision-making procedures as long as the outcome (in a broad sense, i.e. including information) remains constant (Towfigh et al., 2016, p.4). I nevertheless expect to replicate the findings of Dal Bó, Foster, and Putterman (2010): Endogenous policy selection leads to more cooperation than exogenously imposed institutions. This is evaluated with a between-subjects comparison.

Hypothesis 3 *Cooperation rates in the coordination game are higher under endogenous modification compared to exogenous modification after controlling for voting behavior.*

Furthermore, the function of the representative as leader of the group is considered. The effect of the representative's decision and that of the institution's implementation have to be separated. Analogous to Markussen, Putterman, and Tyran (2014) I investigate whether the choice of the representative works as a recommending signal also in the exogenous case, e.g. for groups whose speaker wants to modify but is not considered. This is done by a within-subjects analysis. If the information and coordination aspect of the vote stage is dominant over the effect of democracy, cooperation rates are expected to be higher.

Hypothesis 4 *Cooperation rates of subjects in exogenous non-modification are higher in stage two compared to stage one if the representative chose the coordination game but was overruled.*

4 Analysis

This section presents the analysis and results of the study in light of the discussed hypotheses. For the first part of the experiment I study the determinants of individual cooperation in the prisoners' dilemma. Next, subjects' preferences about the payoff modification as well as the representatives' election are analyzed. With regard to the second stage I compare and decompose cooperation rates conditional on the four vote stage outcomes and individual preferences. This is done on the subject- as well as on the group-level.[5]

The results show that – while the institutional change itself is effective in increasing cooperation in both the endogenous and exogenous outcome – the way the payoff modification is implemented has strong consequences for behavior: there is significant evidence of a democracy premium. Subjects seem to strongly respond to their representative's choice even when it contradicts their own original preference.

[5]If not indicated otherwise, the reported p-values are obtained from Mann-Whitney U tests for independent and Wilcoxon signed-rank tests for dependent observations.

4.1 Protocol and Summary Statistics

Six sessions took place at Hamburg University in January and October 2016 with a total of 164 participants. Subjects were recruited using the software hroot (Bock, Baetge, and Nicklisch, 2014) and no one participated in more than one session. Upon arrival to the lab, subjects were randomly assigned to a computer cubicle and received the instructions in written form.[6] At the end of the session, participants filled out a socio-economic questionnaire along with three unpaid questions from a cognitive reflection test to elicit strategic sophistication (Frederick, 2005). Payment was made according to the outcome of two randomly chosen rounds from the first and second part respectively with an exchange rate of 10 points = €1. Subjects earned €9 on average which is in line with the mean hourly wage of €10 that the lab promises since all sessions lasted less than an hour.

Table 3 presents the summary statistics. 60 subjects identified themselves as male, 99 as female and 5 chose the option "other or prefer not to say". The age of the participants ranged from 17 to 48 with a mean of 25 years. The binary variable *econ* indicates if someone's subject is broadly related to economics, which is the case for 43 percent of the sample. The mean reported net monthly income is €610. A little less than one third of the subjects answered all three of the aforementioned logic questions correctly.[7]

Table 3: Summary Statistics

	Min	Max	Mean	Standard Deviation
Age	17	48	25.0	4.8
Monthly Income (€)	0	2000	609.5	354.7
Semester	0	26	5.7	4.4
Logic	0	3	1.5	1.2
Payout (€)	7	12	8.8	1.1

	Share
Female	60 %
Economics Student	43 %
Game Theory Knowledge	26 %

Note: Sample size is n = 164. Logic gives number of questions correctly answered.

4.2 The First Stage

Figure 3 gives the cooperation rates of stage one where all groups played the regular prisoners' dilemma. Average cooperation in these rounds amounts to 33 percent. Overall

[6] A translation of the original instructions can be found in the appendix. Instructions for the second stage were handed out after the end of the first stage in order not to influence behavior prior to the vote. Every subject correctly answered a set of control questions to ensure the instructions were well understood.

[7] On average female subjects gave correct answers to 1.2 questions while males answered 2.1 questions correctly (p-value < 0.01). An OLS estimate obtains that

$$\widehat{logic} = \underset{(0.607)}{1.757} + \underset{(0.022)}{0.003}\,\text{age} + \underset{(0.000)}{0.000}\,\text{income} - \underset{(0.195)}{0.793}\,\text{female} - \underset{(0.191)}{0.013}\,\text{econ}$$

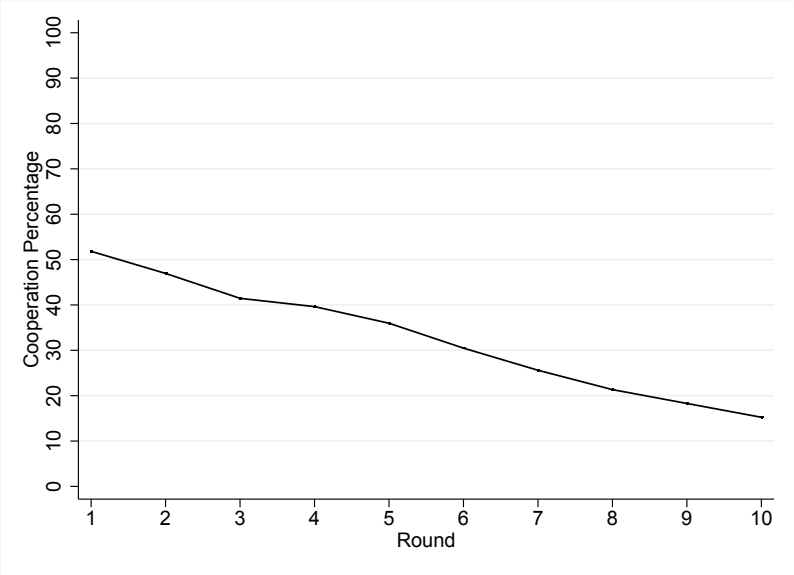
n = 157, R^2=0.121, Standard errors in parentheses;

indicating that gender is the only included variable significantly correlated with the proxy for cognitive ability. This pattern of gender differences is curious but consistent with previous studies using the cognitive reflection test (Frederick, 2005, p.37).

cooperation was highest in the first round with 52 percent. Defection increased over time until only 15 percent cooperated in the last round of stage one. The difference between cooperation rates in rounds 1 and 10 is highly significant ($p < 0.01$, two-sided t-test).

In a linear probability model (LPM) of individual cooperation in the first round regressed on personal characteristics reported in columns (1) and (2) of table 4, gender appears as the most important factor.[8] Being female is associated with an increased probability of cooperation of more than 30 percentage points and highly significant. The influence of logic is significant at the 10-percent level and has an effect of an increase of six percentage points for each correctly answered question. The age of a subject is of low economic and statistical significance and neither the income nor the subject of study seem to be relevant as explanatory variables. Probit estimates in columns (3) and (4) yield consistent results.

Figure 3: Cooperation in Stage One



4.3 The Vote

In the beginning of the second stage subjects had to announce preferences about modification and elect the speaker of their group. Almost two-thirds (65 percent) of my sample would modify the payoffs in case they became group speaker. Dal Bó, Foster, and Putterman (2010, p.2212) find that 53 percent of their participants voted in favor of the modification and relate this to inefficiency preferences and delayed reforms. To further investigate the phenomenon I asked subjects to give a reason for their institutional preference in the questionnaire. Two types of players emerge here, representing the trade-off between payoff- and risk-dominance discussed in section 3.2 . Those who want to continue with the prisoners' dilemma mainly indicate that they expect to earn higher individual payoffs from this game. Almost all of those who want to modify mention fairness motives

[8] As no further information about the subjects' gender who chose the "other" option is available, I exclude them from the analyses of gender effects.

Table 4: Determinants of Initial Cooperation

Dependent variable: cooperation probability in round 1

	LPM		Probit	
	(1)	(2)	(3)	(4)
Logic	0.060*	0.061*	0.163*	0.180*
	(0.034)	(0.034)	(0.093)	(0.096)
Female	0.335***	0.331***	0.882***	0.921***
	(0.084)	(0.086)	(0.231)	(0.246)
Income		-0.000*		-0.000*
		(0.000)		(0.000)
Economics		-0.088		-0.242
		(0.079)		(0.218)
Age		0.016*		0.046*
		(0.009)		(0.026)
Constant	0.211**	-0.013	-0.774***	-1.489**
	(0.093)	(0.260)	(0.259)	(0.731)
N	159	157	159	157
R^2	0.093	0.137		
adj. R^2	0.082	0.109		
Pseudo R^2			0.069	0.106

Note: Logic is between 0 and 3. Standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

and the hope for increased earnings for all group members from cooperation as reasons for switching to the coordination game. The answers contribute to the knowledge gap insofar as it becomes clear that the reasons behind the inefficiency preference of some actors are mainly risk aversion and egoistic off-equilibrium reasoning, where subjects hope to harvest the highest possible deviation payoff from a cooperating partner.[9]

Table 5 shows Probit and linear probability models of voting for modification regressed on variables covering experiences from stage one and personal characteristics. Cooperation is positively related to a preference for the coordination game and significant in every specification. A player who cooperated in all of the first ten rounds has a probability to favor the coordination game that is ceteris paribus 42 percentage points higher than that of someone who did not cooperate at all. Cognitive ability is significantly positively correlated with a preference for modification. A subject who was able to answer all three logic questions has a probability of voting for modification that is 27 percentage points higher compared to one who gave no correct answer. Income, gender, age and studying economics are neither statistically nor economically significant. Overall, the data lends support to Hypothesis 1 implying that cooperative actors self-select into matching institutions.

Result 1 *Cooperative individuals and those with a higher cognitive ability have an increased preference for the coordination game.*

[9] Average earnings of subjects were higher under modified payoffs. The difference between a mean payout of €8.5 earned in two rounds of the prisoners' dilemma to €9 earned by those who switched to the coordination game is highly significant.

Table 5: Individual Determinants of Institutional Preferences

Dependent variable: preference for the coordination game

	LPM		Probit	
	(1)	(2)	(3)	(4)
Own cooperation	0.042**	0.048***	0.121**	0.142**
	(0.017)	(0.017)	(0.052)	(0.059)
Partners' cooperation	-0.028	-0.029	-0.078	-0.084
	(0.019)	(0.019)	(0.056)	(0.058)
Logic		0.091**		0.270**
		(0.038)		(0.113)
Income		-0.000		-0.000
		(0.000)		(0.000)
Female		-0.043		-0.156
		(0.094)		(0.281)
Age		-0.003		-0.009
		(0.011)		(0.030)
Economics		0.070		0.193
		(0.073)		(0.215)
Constant	0.605***	0.580*	0.272	0.227
	(0.064)	(0.300)	(0.176)	(0.850)
N	164	157	164	157
R^2	0.051	0.119		
Pseudo R^2			0.069	0.097

Note: Own and partners' cooperation range from 0 to 10. Logic lies between 0 and 3. Standard errors (in parentheses) clustered at group level. * $p < 0.10$ ** $p < 0.05$, *** $p < 0.01$.

Considering the reasons for the vote for the representative nearly half of the participants (43 percent) declared they had voted for a group member because it had appeared cooperative in the first stage. In contrast to this subjective impression of the players there is no significant difference in behavior in stage one between the speakers and their electorate. If anything the representatives cooperated *less* than the rest. Neither are there differences in modification preferences.

Result 2 *Players wish to elect pro-social speakers but in fact these are not more cooperative prior to the vote.*

Table 6 shows the outcome of the vote and computer intervention. The speakers' decision was considered for 18 groups and overruled for another 17.[10] In the endogenous cases 12 speakers introduced the payoff modification (EndoMod) and six did not (EndoNot). In the exogenous cases the computer modified eight groups' payoffs (ExoMod) whereas nine remained in the prisoners' dilemma (ExoNot). A total of 80 subjects therefore played the coordination game and 60 the prisoners' dilemma.

[10] A bug in the z-Tree code confronted subjects of the first session with a confusing screen output right after the vote and their payoffs were not modified. I exclude these observations from the analysis of the second stage in order not to corrupt the results. This diminishes the sample to 140 subjects.

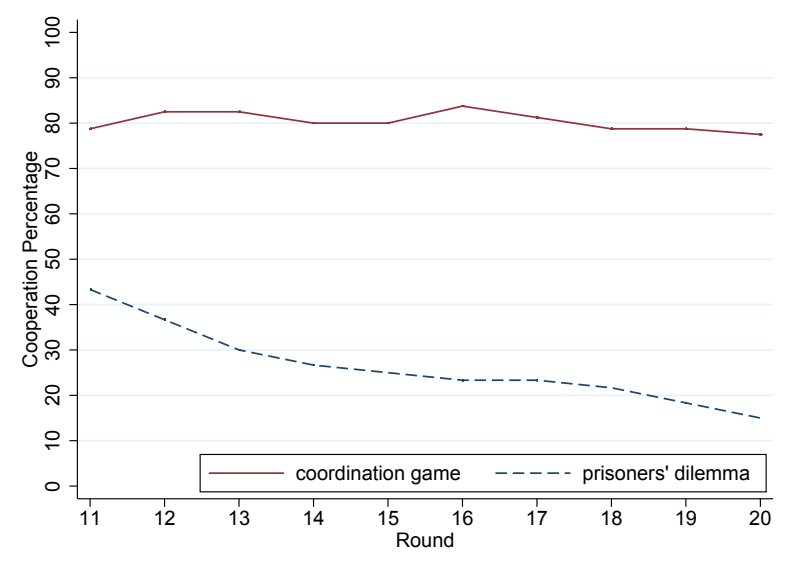
Table 6: Number of Subjects per Vote Stage Outcome

	Prisoners' Dilemma	Coordination Game	Total
Implementation:			
Endogenous	24	48	72
Exogenous	36	32	68
Total	60	80	140

4.4 The Second Stage

Stage two began with a cooperation rate above 40 percent in the prisoners' dilemma which over time declined to less than 20 percent (figure 4). Cooperation rates were both higher – over 75 percent in every round – and more stable under the modified payoffs. The difference between the two games is large and highly significant (p-value < 0.01, two-sided t-test). This shows that the institution is effective in fostering cooperative behavior as subjects respond to the incentives of the different games and coordinate on an efficient equilibrium. However, the difference between the two games is potentially biased by self-selection and obviously not informative about the effect of democratic policy selection.

Figure 4: Cooperation Rates in Stage Two



As discussed in section 4.3 subjects who play under endogenous modification are likely to have different preferences than those who are under exogenous modification. The most important tool to control for a selection bias is to condition the analysis of cooperation on a subject's institutional preference. Doing so endogenous modification is assumed not to be correlated with unobserved personal characteristics anymore (Dal Bó, Foster, and Putterman, 2010).

Table 7 allows this by giving the number of observations and cooperation rates directly before and after the vote stage separated by institutional preference and vote stage

outcome. The first message to take away from the topmost panel is that selection might not be as big a factor as expected. There is no statistical difference between the share of subjects preferring the institution in the endogenously and exogenously modified conditions (71 and 69 percent respectively). The share of yes-voters is however lower in the two unmodified conditions (46 and 58 percent respectively). The difference in modification preference between the two games is significant (p-value = 0.04).

We gather from the second panel that there are significant differences in behavior at the end of the first stage, especially that yes-voters cooperate more than no-voters (p-value = 0.03), meaning that self-selection could be a confounding factor if the types of voters were unequally distributed across groups. Group composition is therefore controlled for in order not to overestimate cooperation in the coordination game. In round ten, the players that will end up in ExoMod and EndoMod display on average virtually identical cooperation rates. Yet one round later, after the vote took place, average cooperation increases to 85 percent if the representative modified and to 69 percent if the computer modified (p-value = 0.08): directly after the vote stage, cooperation is higher if the policy is democratically introduced.

Table 7: Individual Behavior in Stage Two

	Endogenous Condition		*Exogenous Condition*		
Prefer to modify	EndoMod	EndoNot	ExoMod	ExoNot	Total
Number of subjects in each outcome by preference:					
No	14	13	10	15	52
Yes	34	11	22	21	88
Total	48	24	32	36	140
Cooperation rate in round 10 (in percent):					
No	7.1	0.0	10.0	13.3	
Yes	23.5	0.0	22.7	14.3	
Average	18.8	0.0	18.8	13.9	
Cooperation rate in round 11 (in percent):					
No	64.3	23.1	40.0	46.7	
Yes	94.1	27.3	81.8	61.9	
Average	85.4	25.0	68.8	55.6	

To investigate this further, table 8 reports a linear probability model of cooperation in the first round after the vote regressed on the different vote stage outcomes interacted with individual behavior as explanatory variables. Again, the endogenously modified payoffs are associated with the highest cooperation probability after controlling for modification preferences and cooperation in part one. This is especially true for the players that preferred the coordination game over the prisoners' dilemma. But also among those who were against modification the endogenous implementation leads to larger cooperation probability when compared to the exogenous policy. A player's own cooperation rate in the rounds 1 to 10 is again also a highly significant predictor of the cooperativeness in round 11.

Table 8: OLS-Regression – The Influence of Democracy on Cooperation

Dependent variable: cooperation probability in round 11

	(1)	(2)	(3)	(4)
EndoMody	0.941***	0.855***	0.720***	0.837***
	(0.073)	(0.251)	(0.077)	(0.224)
EndoNoty	0.273**	0.236	0.204*	0.293
	(0.128)	(0.252)	(0.119)	(0.226)
ExoMody	0.818***	0.758***	0.599***	0.691***
	(0.091)	(0.256)	(0.093)	(0.229)
ExoNoty	0.619***	0.520**	0.415***	0.513**
	(0.093)	(0.261)	(0.092)	(0.233)
EndoModn	0.643***	0.567**	0.565***	0.688***
	(0.114)	(0.267)	(0.112)	(0.240)
EndoNotn	0.231*	0.255	0.093	0.215
	(0.118)	(0.217)	(0.108)	(0.193)
ExoModn	0.400***	0.354	0.286**	0.400
	(0.135)	(0.274)	(0.124)	(0.244)
ExoNotn	0.467***	0.349	0.269**	0.371
	(0.110)	(0.268)	(0.110)	(0.239)
Own cooperation in part 1			0.075***	0.078***
			(0.015)	(0.015)
Partners' cooperation in part 1			-0.021	-0.016
			(0.016)	0.017
Session Dummies	No	Yes	No	Yes
N	140	140	140	140
R^2	0.731	0.743	0.790	0.799
adj. R^2	0.715	0.716	0.774	0.775

Note: Regressors are binary interaction terms of vote stage result and individual preference (suffix y pro and n against modification). Own and partners' cooperation range from 0 to 10. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Next, I estimate the size of the democracy premium: the increase in cooperation that cannot be explained by policy change or group composition. Dal Bó, Foster, and Putterman (2010) break down the total policy effect into a selection effect and the endogenous treatment effect. The latter can be further separated into an exogenous treatment effect and the democracy premium. This is done by using weighted averages of the individual cooperation rates and voter shares in round 11 that are provided in table 7. The total effect of the policy change is given by the difference between EndoMod and EndoNot and amounts to 60 percentage points.[11] The selection effect captures the increase in cooperation that is supposed to occur in the EndoNot condition if the share of yes-voters was the same as in the EndoMod groups. The difference in the proportion of player types that leads to changes in behavior beyond the differing treatment is small and accounts for one percentage point.[12]

The endogenous treatment effect then gives the increase in cooperation that is *not* due to the different composition of groups but caused by the (democratic) policy choice. It is estimated as the difference in cooperation rates between EndoNot and EndoMod weighted with the preference structure of EndoMod. Its magnitude is about 59 percentage points.[13] The change in cooperation caused by an exogenous payoff modification is given by the exogenous treatment effect which compares ExoNot and ExoMod. By keeping the proportion of yes- and no-voters as in the endogenous estimate and using the cooperation rates from the exogenous conditions, it is estimated at 12 percentage points.[14]

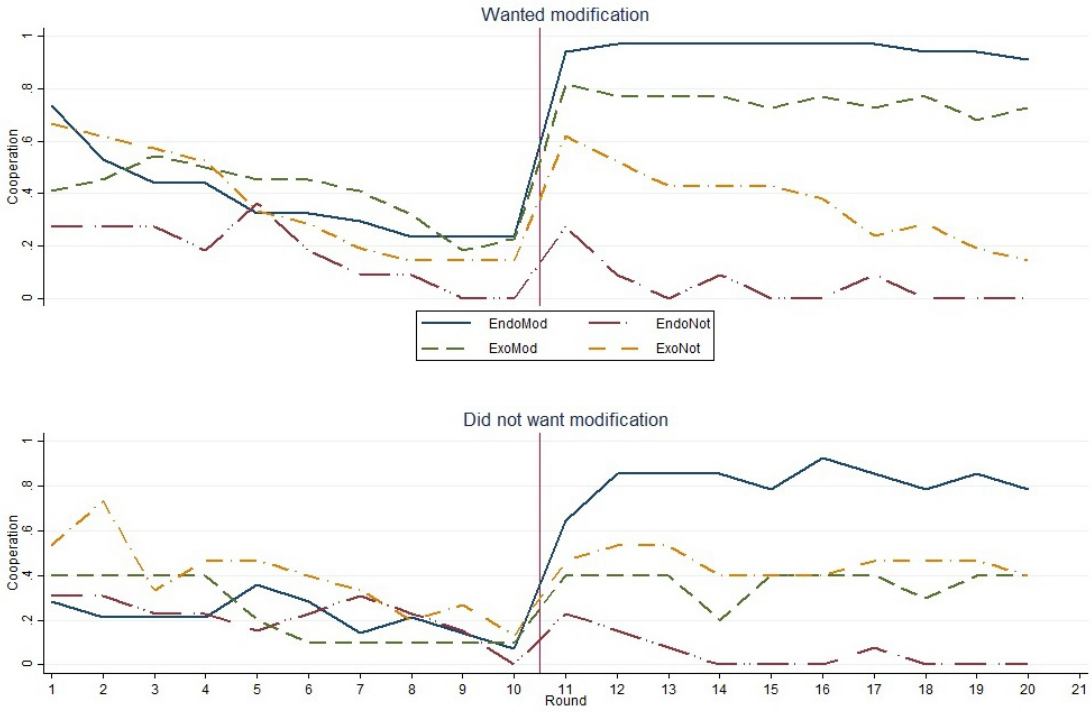
Lastly, the difference between the exogenous treatment effect and the endogenous treatment effect gives the democracy premium which accounts for 14 percentage points in Dal Bó, Foster, and Putterman (ibid.) and a stunning 47 in mine.[15] This *democratic dividend* is to a large extent driven by a pronounced reaction to modification from the no-voters, who comply much more with the endogenous policy. The recommendation towards cooperation from the group speaker appears to have a much stronger influence on behavior than modification through the computer. A more personal or more legitimate decision-making process might trigger a willingness to cooperate that was not present initially.

So far I have only considered individual cooperation in the first round after the vote. Figure 5 shows individual cooperation for all vote stage results separated by individual voting behavior over the course of the entire experiment. It can be observed from the first panel that for those who preferred modification the endogenous institution has a considerable effect and leads to almost full cooperation. Exogenous modification results in the second highest average cooperation. For both conditions the change of payoff structure results in a striking increase in willingness to cooperate in stage two. The rates are much lower without modification. Cooperation is decreasing steeply among the yes-voters in ExoNot. The lower panel shows only individuals that were against the payoff modification.

Those who received the coordination game through their representative dramatically

[11] Following Dal Bó, Foster, and Putterman (2010) the total policy effect in round 11 can be calculated from table 7: [64.3(14/48) + 94.1(34/48)] - [23.1(13/24) + 27.3(11/24)] = 60.38.
[12] Selection effect: 23.1(14/48 - 13/24) + 27.3(34/48 - 11/24)] = 1.05.
[13] Endogenous treatment effect: (14/48)(64.3 - 23.1) + (34/48)(94.1 - 27.3) = 59.33.
[14] Exogenous treatment effect: (14/48)(40.0 - 46.7) + (34/48)(81.8 - 61.9) = 12.14.
[15] Endogeneity premium: 59.33 - 12.14 = 47.19.

Figure 5: Cooperation by Vote Stage Result and Individual Vote



change their behavior and display quite stable cooperation rates in stage two. In the exogenous condition both games induce remarkably similar behavior suggesting that the democratic procedure has a strong behavioral impact independent of its outcome.

Result 3 *Cooperation is higher if the policy is introduced by a representative and the size of this democracy premium is substantial.*

It was already found that the elected speakers were not especially pro-social in stage one. Within- and between-subjects tests show further that neither do the representatives cooperate more in stage two compared to stage one if they remain in the prisoners' dilemma, nor do they cooperate more than the rest of their group in stage two in the coordination game.[16]

An interesting question in the light of signalling effects is whether recommendation works. Hypothesis 4 states that a speaker who is willing to modify is able to induce her group towards increased cooperation even in the exogenously installed prisoners' dilemma. There are indeed small differences in the cooperation rates of the groups in question between part one and two; but the effect is rather the opposite of what was hypothesized: average cooperation is higher in part one (28 versus 22 percent). A Wilcoxon signed-rank test does not allow rejection of the hypothesis that there is no difference. (p-value = 0.143).

Result 4 *The signal of a speaker who wants to modify does not increase cooperation rates under exogenously unmodified payoffs.*

[16] A Wilcoxon signed-rank test of the first statement gives a p-value of 0.13 and a Mann-Whitney-U test of the second claim a p-value of 0.36.

To control for information, Dal Bó, Foster, and Putterman (2010) ran further sessions with a design that slightly modifies their original experiment. Now subjects in the exogenous condition are informed whether there was a majority for or against modification in their group, which was also done in my experiment. Even though a part of the endogeneity premium is not explained by informational effects, Dal Bó, Foster, and Putterman (ibid., p.2224) "cannot reject statistically the hypothesis that information plays no role". But as the authors find no difference between yes-voters in the ExoMod groups with a majority for and against modification in round 11; and a significant difference between cooperation in ExoMod and EndoMod, they conclude that there is "no evidence that information differences between endogenous and exogenous modification explain the observed difference in behaviour" (ibid., p.2225).

Analogous to Dal Bó, Foster, and Putterman (ibid., p.2224), table 9 is a variant of table 7 and shows that the information hypothesis should not be rejected too readily. It contains only subjects who played the coordination game in part two. I disentangle what choice the representative made for the groups who received modification. This is straightforward for endogenous modification; but in the exogenously modified condition both preferences in favour and against are present. We see that of these ExoMod speakers one chose the prisoners' dilemma (centre column) and seven the coordination game (right column). The ExoMod groups whose representatives wanted to modify start stage two with a cooperation rate below the groups whose speaker was against modification, and are only partially able to coordinate on the socially optimal equilibrium over the course of the second stage.

In period 11, the average cooperation rate between EndoMod and ExoMod with a representative willing to modify is significantly different at the 10-percent level (p-value = 0.072). When also controlling for individual modification preferences the difference is only significant for those who did not want to modify (p-value = 0.083 and p-value = 0.269).

Table 9: Individual Cooperation – Speaker's Choice under Modified Payoffs

	Endogenous Condition	*Exogenous Condition*	
Speaker's Choice	Modify	Not Modify	Modify
Number of subjects in each outcome by preference:			
No	14	2	8
Yes	34	2	20
Total	48	4	28
Cooperation rate in round 11 (in percent):			
No	64.3	100.0	25.0
Yes	94.1	50.0	85.0
Average	85.4	75.0	67.9
Cooperation rate in part two (in percent):			
No	63.4	20.0	41.3
Yes	91.7	10.0	82.0
Average	93.6	15.0	70.4

4.5 Group Level Analysis

In the final part, results are derived at the group level. Therefore, only one observation per group is considered in the statistical tests.[17] Analogous to Dal Bó, Foster, and Putterman (2010, p.2212), I create the variable *voteshare* which indicates how many subjects per group wanted to modify the payoff matrix in case they were elected as speaker (see the topmost panel of table 10). This share ranges from 0 to 4 with a mean of 2.5. Note that in contrast to Dal Bó, Foster, and Putterman (ibid.)'s direct democracy the value of voteshare here does not give a clear indication of the chosen game if it lies between 1 and 3. A majority of subjects below unanimity preferring modification can still mean that the speaker would not want to modify in case she was considered.

The approach to obtaining unbiased estimates demands a comparison of groups for whom voteshare takes on the same value (ibid., p.2219). They are assumed to be of equal composition regarding cooperation preferences. The focus is on groups with two or three votes for modification respectively. For these values of voteshare all four possible outcomes were realised in my experiment making it possible to compare groups that had identical preferences but ended up under endogenous or exogenous modification.

Table 10: Overview of Group Level Data

	Endogenous Condition		*Exogenous Condition*		
Voteshare	EndoMod	EndoNot	ExoMod	ExoNot	Total
	Number of groups in each outcome:				
0	0	1	0	0	1
1	0	1	0	1	2
2	4	2	4	5	15
3	6	2	2	2	12
4	2	0	2	1	5
Total	12	6	8	9	35
	Cooperation rates in stage one (in percent):				
0		5.0			
1		2.5		95.0	
2	23.1	33.8	15.6	25.0	
3	46.3	21.3	70.0	46.3	
4	13.8		36.3	22.5	
Average	33.1	19.6	34.4	37.2	
	Cooperation rates in stage two (in percent):				
0		0.0			
1		2.8		100.0	
2	83.8	6.3	40.6	30.5	
3	95.0	8.8	75.0	36.3	
4	9.8		97.5	37.5	
Average	91.7	5.5	63.4	40.3	

Dal Bó, Foster, and Putterman (ibid.) find little difference after the voting between the prisoners' dilemma groups. In contrast, average cooperation under ExoNot after the vote is significantly higher in my sample when compared to EndoNot (35 percentage points difference; p-value $= 0.011$). In the modified outcomes in stage two subjects cooperated even more than in the unmodified ones (54 percentage points difference; p-value < 0.01).

[17] The p-values reported in this section are obtained from Wilcoxon signed-rank tests for all dependent observations and Mann-Whitney-U tests for all independent observations.

A within-subjects comparison of EndoMod and ExoMod between stage one and two gives additional support to the positive influence of modification on cooperation (p-value $<$ 0.01).

Between the two kinds of groups who play the modified game Dal Bó, Foster, and Putterman (2010) find a difference in cooperation of 8 percentage points in favour of endogenous modification in part two. But this result is not very robust: democracy is only significant at the 10 percent level if subjects who were not able to remember the vote stage result in the questionnaire are excluded from the analysis (ibid., p.2220). I find that EndoMod and ExoMod groups are very similar in stage one (p-value = 0.757), but in stage two the former display an average cooperation rate that is 28 percentage points higher (p-value = 0.077). The group level analysis therefore shows that the coordination game in general seems beneficial for cooperation and its democratic enaction even more so. These results fully support the findings from the individual analysis.

Result 5 *Democratic modification has a significantly positive effect on cooperation at the group level.*

5 Concluding Remarks

The paper aims to quantify the influence that democratic decision-making processes have on the effectiveness of a policy. It extends a study by Dal Bó, Foster, and Putterman (ibid.) who investigate how cooperation is influenced by an endogenous institutional choice via a referendum. The present experiment models a representative democracy by including the election of a group speaker who determines the policy implementation. Standard economic theory would not predict a quantifiable impact of the decision-making process on behavior and consequently efficiency.

Small groups are presented with the possibility of changing their payoff structure from a prisoners' dilemma into a coordination game that makes cooperation incentive-compatible. This modification preference of each player is used as a proxy for unobservable personal characteristics that influence cooperative behaviour. It is tested whether the institutional change has the same influence if it is implemented by a group speaker compared to an external authority. This speaker is elected in each small group to simulate a representative democracy. Her choice of game is considered and implemented for the group with a 50-percent probability. If it is not considered the computer chooses one of the two games with equal probability. The randomization allows for a comparison of subjects with the same preferences, information, and institution who only differ in the way the institution was implemented: by the representative or by the computer. Standard economic theory would not predict a quantifiable impact of the decision-making process on behavior and consequently efficiency. The main advantage of this design is that potentially biasing self-selection is controlled for (ibid.). Information effects cannot be excluded to drive results in previous studies by Tyran and Feld (2006) and Sutter, Haigner, and Kocher (2010). In these, the group's institutional choice was only revealed in the endogenous cases. My design controls for this by presenting the speaker's choice also in the exogenous outcomes.

To summarize my results, the first stage confirms the well-known phenomenon that subjects cooperate in prisoners' dilemma experiments despite defection being the best response. When presented with the opportunity of payoff modification, a higher cognitive ability is associated with an increased preference for the cooperation-fostering policy. Unsurprisingly, cooperative players favor the modification more, suggesting that self-selection is an issue to be concerned with as it can lead to an overestimation of the policy's effect. However, the distribution of voters in the groups with endogenously and exogenously modified payoffs is similar in the present study. Subjects try to elect pro-social representatives, but factually these do not behave significantly different compared to the rest of the sample in both stages. Furthermore, a cooperative speaker is not sufficient as a cue towards cooperation when payoffs are not modified.

The coordination game itself has a positive influence on cooperation meaning that the institution itself is effective, which is in line with theoretical considerations and previous empirical findings. Dal Bó, Foster, and Putterman (2010) find that endogenous modification increases cooperation more than exogenous modification, especially for players who preferred the modified over the unmodified game. Directly after the vote, subjects in my experiment also cooperate more if the payoff modification is democratically introduced. Over the course of the rounds, differences between endogenous and exogenous modification become more pronounced. In contrast to Dal Bó, Foster, and Putterman (ibid.) the impact of the democratic policy is even larger for those subjects who initially did not want to introduce it. Using an estimation strategy of Dal Bó, Foster, and Putterman (ibid.), which controls for different shares of player types in the outcomes, the *democratic dividend* is calculated to account for a substantial increase in cooperation. With almost 50 percentage points it is of more than triple the size of the premium that Dal Bó, Foster, and Putterman (ibid.) find. Not enough is known about the contextual factors besides the computer intervention that cause these radical differences. It certainly does not seem to be the case that the indirect decision-making through a representative is perceived to be more exogenous per se. The strong reaction displayed by the no-voters after the endogenous modification rather points towards an exemplary function of the speaker who as an authoritative figure is able to establish cooperation as a focal point only when she is considered.

Limitations of the abstract experimental design are that many essential features of a representative democracy are excluded. There is no running for elections, neither pandering nor accountability, and no rent for the elected politician. While this simplified model is undoubtedly useful as an extension and robustness check of Dal Bó, Foster, and Putterman (ibid.), the external validity of the results can be further improved. Incorporating the randomization mechanism into more complex experiments promises to be a way of obtaining unbiased estimates of various kinds of endogenous treatment effects. Possible extensions to my study are giving more power to the representative, e.g. by letting her decide on the strategies of the citizens. Repeated elections, campaigning of candidates, and preference heterogeneity are further relevant factors in representative democracies to potentially include.

A Appendix

A.1 Instructions

Welcome to the experimental lab. Please keep in mind that from now on you are not allowed to communicate with anyone other than the lab personnel. If a question arises please show your hand and we will contact you. You must not use a phone, tablet or similar device throughout the entire session. Please note that any act of non-compliance with these rules may lead to your exclusion from all payments. Every decision you will make during the experiment will be treated anonymously and cannot be linked to your identity. Now, please read these instructions carefully and hand them back to the assistants at the end of the experiment.

The following experiment has two parts. You will receive instructions for the second part after the first is completed. Both parts consist of a game that is played for ten rounds. You will earn points in these games; the amount of points you earn depends on your own and on others' choices. At the end of the session one round from each of the two parts will be randomly selected and paid. Points will be converted at a rate of 10 points = 1€. First of all you are now randomly divided into groups of four. Simultaneously, every player receives a player ID between 1 and 4. Both the group composition as well as all player IDs remain unchanged throughout the entire experiment.
Example: You are player 2 and form a group with the players 1, 3, and 4.

Part 1

In this part you play ten rounds of a game (**Game 1**) together with one of your other three group members. This other player is randomly chosen in every round and you will be notified at the end of the round who your partner was. **In this game you can decide between the options A and B in each round.** Your partner simultaneously chooses one of the options. While you make your decision, you do not know what your partner chooses. Your income in each round of game 1 is calculated in the following way:

If both you and your partner choose option A you both earn 50 points.
If you choose option A and your partner chooses B, then you earn 30 points and your partner earns 60.
If you choose option B and your partner chooses A, then you earn 60 points and your partner earns 30.
If both you and your partner choose option B you both earn 40 points.

After each round you will see the chosen option of your partner and of the other group members on your computer screen. Table 1 gives an overview of your earnings per round in game 1.

Your Choice	Your Partner's Choice	
	A	B
A	50	30
B	60	40

Game 1

Part 2

Part 2 of the experiment starts with a vote. **Every group elects one of their members as their speaker in a secret ballot. This speaker can decide which game your group will play for ten more rounds.** The choice is between Game 1 (as known from Part 1) and Game 2. In Game 2 you can again choose between options A and B and your income is calculated in the following way:

If both you and your partner choose option A you both earn 50 points.
If you choose option A and your partner chooses B, then you earn 30 points and your partner earns 48.
If you choose option B and your partner chooses A, then you earn 48 points and your partner earns 30.
If both you and your partner choose option B you both earn 40 points.

Your Choice	Your Partner's Choice	
	A	B
A	50	30
B	48	40

Game 2

At first you must now indicate which game you would choose for your group in case you become speaker. This decision is secret until the election of the speaker is completed. For this you vote for one other group member. You cannot vote for yourself. In case of a tie one of the players with the highest amount of votes is randomly chosen as speaker. The speaker's choice of game becomes binding for the entire group. **However, this choice**

is only implemented with a probability of 50 percent. If the speaker's game is not implemented the computer randomly selects Game 1 or 2. **Both games are equally likely to be chosen in this case.**

You will be informed about who was elected as speaker, which game the speaker preferred, if this choice was considered and if not which game your group will play in part 2 and **you play this game for ten rounds.** Again, you are informed about your partner's and other group members' choices after each round.

Subsequently we are going to ask you to fill out a short questionnaire, which has no influence on your income, and determine the two rounds relevant for the payout.

A.2 Questionnaire

Subjects answered a socio-economic questionnaire (available on request) plus the following questions: 1) A water lily on a lake doubles in size every day. If the lake is completely covered by the plant after 48 days, how many days does it take for the pads to cover half the lake? 2) If five machines produce five units in five minutes, how many minutes does it take for one hundred machines to produce one hundred units? 3) A baseball and a bat together cost €1,10. If the bat's price is one euro higher than the ball's, how expensive is the ball? (Frederick, 2005, p.27).

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