Let Me Vote!
An experimental study of vote rotation in committees

R. Bosman[†], P. Maier[†′], V. Sadiraj[‡], F. van Winden[◇]
[†]VU University Amsterdam, [†′]Bank of America
[‡]Georgia State University[*], [◇]University of Amsterdam

Abstract

We conduct an experiment to investigate (i) whether rotation in voting improves a committee's performance, and (ii) the extent to which rotation critically influences collective and individual welfare. The experiment is based on the idea that voters have to trade-off between individual and common interests. Our findings indicate that the choice of rotation scheme has important consequences: it 'pays' to be allowed to vote, as voting committee members earn significantly more than non-voting members. Hence, rotation is not neutral. We also find that smaller committees decide faster and reach a deadlock less often. This reduces reported frustration among committee members.

Keywords: Decision making, committee, experiment, voting, rotation
JEL codes: D70, D78, E58

[*]Corresponding author: Vjollca Sadiraj, Georgia State University, Experimental Economics Center, PO Box 3992, Atlanta, GA 30302-3992, Email: vsadiraj@gsu.edu, Phone: 404-4130193, Fax: 404-4130205. The experimental research was conducted while Ronald Bosman and Philipp Maier were working for De Nederlandsche Bank. Vjollca Sadiraj received financial support from the National Science Foundation (grant number SES0849590). The authors thank Jos Theelen for programming the computer software and Karin Breen for research assistance. Helpful comments from Jonathan Baron, Henry Chappell Jr., James C. Cox, Gabriele Galati and Ragan Petrie are gratefully acknowledged.

1 Introduction

In many areas of economic policymaking, committees are used to arrive at decisions. Well-known examples are: international trade (WTO), international cooperation (UN Security Council), monetary policy (European Central Bank), and public governance (European Union).

At least since Condorcet began the formal study of decision making by committees in the 18th century, it has been known that committees can be an efficient means of aggregating information. At the same time, practical experience suggests that committees can lead to endless discussion.[1] Hence, ways have been sought to improve a committee's ability to reach an agreement in a satisfactory way with regard to the interests involved and the time required. One such way is the implementation of a rotation scheme, that is to restrict the right to vote to a rotating basis. However, remarkably little is known about what rotation precisely entails for actual policymaking.

To illustrate the potential consequences of rotation, consider U.S. monetary policy. Monetary decisions are made by the Federal Open Market Committee (FOMC) of the U.S. Federal Reserve System. The FOMC is comprised of seven Board members, the President of the Federal Reserve Bank of New York, and four out of the eleven regional Federal Reserve Bank Presidents. The latter serve one-year terms *on a rotating* basis. Chappell et al. (2004) argue that the non-voting FOMC members do not significantly influence FOMC decision making: 'The results indicate that non-voting alternates have no appreciable influence over policy outcomes... If policymaking in the FOMC is consensual, that consensus does not appear to encompass the views of non-voting members' (Chappell et al., 2004, p. 418). The FOMC case suggests that *rotating committees* run a risk that decisions may be biased towards the individual interests of the voting members currently permitted to vote. Rotation may speed up decision making (because it involves smaller committees), but potentially at higher social costs if conflicts exist between common and individual interests. Because of the wide application of committee decision making, an interesting question is the extent to which these findings can be generalized. To study this issue, and other aspects of committee decision making, laboratory experiments can be a useful tool because the environment can be controlled and the decision-making

[1] 'Had Newton served on more faculty committees at Cambridge, his first law of motion might have read: A decisionmaking body at rest or in motion tends to stay at rest or in motion in the same direction unless acted upon by an outside force' (Blinder, 1998).

process can be replicated.

In this paper we investigate the effects of rotation on committee decision making in an experiment using a simple perfect information framework, thereby removing the complexity that uncertainty may introduce into the analysis.[2] We are interested in the following research questions: Is rotation a useful tool to increase a committee's efficiency? Does the type of rotation scheme matter? Does rotation lead to frustration with negative behavioral consequences? Does a temporary lack of the right to vote result in non-voters 'being ripped off'? To explore these questions we design an experiment whereby committee members have to trade-off between private and committee payoffs. We examine three cases: (i) no rotation, where every group member is allowed to vote; (ii) equal rotation, where only some group members are allowed to vote but every member rotates at the same rate; (iii) unequal rotation, where one member has permanent voting rights, whereas the others rotate at the same rate. In addition, we explore several psychological factors, such as the players' emotions (see Thagard and Kroon, 2006).

Our main findings are the following: Rotation increases a committee's efficiency in terms of total earnings, but it also increases the inequality of earnings. The right to vote 'pays off' in the sense that voting members neglect the interests of the non-voting members. However, decisions made by committees without rotation are blocked with greater frequency, generating efficiency losses. Moreover, committee members blocking decisions are punished by other committee members, even though the punishment is only possible after the end of the vote rotation experiment. This points at behavioral spill-over effects, which appear to be related to experienced negative emotions. Lastly, all committee members could increase their earnings by voting for the option with the highest total payoff for the group as a whole. By voting for their own (short-term) interests, the voting members end up in a 'prisoner's dilemma'-like situation where each committee member earns less.

Our analysis is related to experimental 'design' studies, involving the economist as 'engineer' (Roth, 2002). In these studies, experiments are used as tools to fill the gap between theory and design. Consider EU enlargement: As more and more countries become EU members, European committees risk becoming too large, and ways should be sought to increase their efficiency. Our results indi-

[2]For an experimental study that explores the effect of uncertainty on committee decision making see, for e.g., Blinder and Morgan (2005) who find that groups make better decisions than individuals in such settings; Lombardelli et al. (2005) report similar findings.

cate that rotation reduces the likelihood of a deadlock. However, these benefits come at a cost, namely distributional effects. Given our results it may not be a surprise why smaller EU countries are worried about losing power under a rotation scheme.

There are a few experimental studies that look at the impact of rotation on committee decision making. Studies closest to ours are Waldner et al. (2003), Montero et al. (2008), Kagel et al. (2010) and Drouvelis et al. (2010).[3] Each of these studies offers scattered empirical evidence shedding light on separate questions addressed in our study, such as the impact of : (i) the size of the committees, (ii) weighted majority rule on aggregation of preferences and (iii) veto players on committee performance in a public good provision or distributional settings. Waldner et al. (2003) examine the effect of rotation on the voluntary provision of an excludable public good. They find evidence of a temptation to exclude outsiders from the benefits of the good. Montero et al. (2008) study the paradox of new members, namely committee enlargement may increase the power of some existing voters. The framework is distribution of a given budget and a weighted majority rule is used to aggregate votes. They conclude that data in their experiment are consistent with the paradox of new members. Kagel et al. (2010) examine the role of a veto player on committee decision making in a bargaining game with no limit on the number of stages but delayed agreements are costly; the rule of aggregation of votes of non-veto players is the majority rule. They find that veto players have a negative effect on the committee performance and that the power of veto players is negatively correlated with delay costs. The non-experimental literature focuses on various aspects of committee decision making. For example, several authors examine the ability of committees to pool and process information (e.g., Bulkley et al., 2001; Blinder, 2004).[4] Mueller (2003) offers an excellent source for theoretical properties of different decision rules and procedures, particularly in situations where conflicting preferences promote manipulation (see also, Li et al., 2001 and Bernheim et al., 2006). Another strand of the literature focuses on private versus public information, which enables strategic interaction among committee members. Gerling et al. (2003) provides an overview of studies in this area.

We proceed as follows. Section 2 discusses the experimental design. Results

[3] For a review of (classical) experimental studies on legislative bargaining and spatial voting see Kagel et al. (2010, p.170-171).

[4] A committee '...is superfluous if it possesses no special expertise and informational inefficiency is increasing in the uncertainty associated with the policy.' (Gilligan and Krehbiel, 1990).

are presented in section 3. The final section 4 concludes.

2 Design and behavioral considerations

2.1 Experimental design

The experiment was set up such that each committee member faces a trade-off between 'own' and 'common' interests.[5] This reflects the idea that committees as a whole often have a stake in the decision taken while individual committee members may have their own (private) interests as opposed to the common interest when these interests are in conflict. Each committee is comprised of five members and decides among four options.[6] Depending on the decision made by the committee each player receives:

- a *private payoff* (see example below) and, in addition,
- a *common payoff*. The common payoff is a weighted average of the private payoffs capturing a collective welfare. In calculating the weighted average three players' payoffs are weighted 10% each, and the other two players' payoffs are weighted 35% each; this can be interpreted as players representing 'small' and 'large' regions. The common payoff ensures that an 'appropriate' policy choice results in welfare gains for the committee as a whole.

The *total payoff* for each player is the sum of the private and the common payoffs. The incentive structure, according to total payoffs is characterized by a single-peaked, symmetric distribution to ensure a unique voting equilibrium. In each round, the peak of the distribution varies by region. However, the peaks of the distributions are chosen in such a way that over all rounds, every player experiences a peak at option 1, option 2, etc. equally often.[7]

Table 1 provides an example (with payoffs in eurocents). For each option the private payoffs for each region are shown in the top five rows. The sixth row (labeled Common payoff) shows the common payoff; it is the weighted sum

[5] All experimental sessions were run at the Creed Laboratory of the University of Amsterdam. Subjects were recruited online and through announcements on bulletin boards. Each experimental session lasted about 2.5 hours and average earnings per subject were 44.4 euros.

[6] We use the terms 'players', 'committee members' and 'regions' interchangeably. Note that this interpretation was not given to subjects during the experiment. The instructions given to the participants (and read aloud by the experimenter) and descriptions of the rotation schemes are available from the authors upon request.

[7] An overview of the distribution of the peaks over the rounds is available upon request.

Table 1: Example of the distribution of payoffs (in eurocents)

		Option 1	Option 2	Option 3	Option 4
	Player 1	350	200	100	25
	Player 2	200	350	200	100
Private payoff	Player 3	25	100	200	350
	Player 4	350	200	100	25
	Player 5	350	200	100	25
Common payoff		265	242.5	145	83.75
	Player 1	615	442.5	245	108.75
Total payoff	Player 2	465	592.5	345	183.75
(=private +	Player 3	290	342.5	345	433.75
common payoffs)	Player 4	615	442.5	245	108.75
	Player 5	615	442.5	245	108.75

Large players (members, regions) are in bold print; weights of small and large countries are 10% and 35% respectively.

of the private payoffs (note that players 2 and 5 are given the weight of 'large' regions, i.e., 35% each). Finally, the total payoffs, shown in the bottom five rows, correspond to the sum of private and common payoffs. For example, if option 1 is chosen, the total payoff for player 3 is 25+265=290 eurocents. To isolate the effects of rotation and avoid distortions due to imperfect information, we have implemented a full information setting, whereby every player has full information about the other player's incentive structure (i.e., every player receives the information contained in table 1).

In this example player 3, say, faces the following situation: he maximizes the committee payoff by voting for option 1, which in this example is also the option with the largest common payoff. However, option 1 also yields the lowest private (and total) payoff of all the options for player 3. On the other hand, option 4 would maximize player 3's total payoff, but would imply the smallest common and total committee payoff. Because experimental evidence suggests that (some) people care about efficiency in terms of total group payoffs (Engelmann and Strobel, 2004) it is not obvious for which option player 3 will eventually vote.[8]

[8]Note also that option 3 is the most fair one (in terms of payoff inequality) whereas option 2 maximizes the lowest payoff of the committee members. Experimental evidence on efficiency, equity, and/or maximin as defining characteristics of other-regarding preferences is mixed; For direct tests of these properties see Cox and Sadiraj (2012).

When designing the decision-making procedure, we aimed to mimic the functioning of political committees or international organizations, such as the WTO, the EU Commission or the UN Security Council. Suppose that the committee is negotiating the text of an international treaty. In practice this entails making different proposals, voting on these proposals, and accepting or rejecting them. This continues until a decision has been reached. In the end, every committee member has to agree upon a common text. We try to capture the most important elements of this procedure in the following stylized way. In each round a sequence of players is chosen to make a proposal and this is common knowledge.[9] A proposal that is unanimously supported is implemented. If the proposal is vetoed by any player, the next proposer in the sequence makes a proposal. In our experiment, an option can only be proposed once and each voting committee member has the power to veto any given proposal (except one's own).[10]

Reaching an agreement requires that no one blocks the proposal. In the experiment, if four options are vetoed, the committee is declared 'deadlocked' and each participant is paid 10 eurocents. The payoff from a deadlocked committee is considerably less than the payoff from 'the worst alternative option'. This captures the idea that if, say, the WTO cannot agree on a reduction of tariffs, every participant is worse off. In the experiment – as arguably in real life – every subject knows this in advance.

We investigate three decision-making procedures (experimental treatments):

- *No rotation (NR):* In each round all five committee members vote; three members can make proposals (if three proposals are rejected, the remaining option is automatically voted upon).

- *Equal rotation (ER):* In each round only three members who can make proposals (in the round) are permitted to vote. Regardless of the size of the region, all committee members rotate equally often; each player votes and can make a proposal in 60% of the rounds.

- *Unequal rotation (UR):* In each round only three members who can make proposals are permitted to vote. One large region votes in every round whereas the other large region rotates with the same frequency as the

[9] The experiment is set up so that over all rounds, every player gets to make the first, second, or third proposal equally often. Subjects were informed about this.

[10] A similar procedure is used in Fréchette et al. (2003), where bargaining in legislatures is studied.

small regions; each rotating player can make a proposal and vote in 50% of the rounds.

The rationale behind granting permanent representation to one large region is to investigate whether permanent representation (i.e., knowing that one player will *always* vote and can make a proposal) leads to differences in outcomes: As the two large regions differ only in that respect, differences in voting patterns or earnings between these two (otherwise identical) regions can be attributed to permanent representation. It should be noted that all players have full access to all information in every round (including voting patterns), regardless of whether or not they are allowed to vote in a particular round. It will be useful (to follow the data analysis) to keep in mind that non-voting players (who lack the right to vote and/or make a proposal) in ER and UR are disadvantaged in the NR treatment because, although they can vote, they never get to make a proposal.

There were 225 subjects in this experiment; each subject participated in only one treatment. Subjects were randomly assigned to groups of five at the beginning of the experiment and remained with their group for all rounds. Each group played 50 rounds under the scheme 'no rotation' and 'equal rotation' and 48 rounds under 'unequal rotation'.[11] To counter income effects, subjects were paid only for 10 rounds randomly chosen at the end of the experiment. It is important to note that committee members are provided conflicting incentives, as the option yielding the highest individual payoff differs among the members. However, over all rounds, subjects face similar possibilities to 'earn and exploit', in the sense that: (i) each member experiences equally often the maximal payoff at option 1, option 2, etc., (ii) each player has similar positions in the voting procedure (i.e., every player has equal opportunities to make the first, second or third proposal), and (iii) each member votes an equal number of times.[12] These features of the experiment were public information.

To investigate affective responses towards other group members, we use the following methods:

- During the experiment participants were asked to rate their mood on a scale of 1 (very happy) to 9 (very unhappy) after every 10th round

[11] The total number of rounds in a treatment is determined by the number of rounds required to make possible that each subject experiences the same number of times being first, second and third to make a proposal (and therefore also vote in rotation treatments). The difference between 50 and 48 rounds in ER and UR follows from having one player never rotate in UR.

[12] The only exception is, of course, one large country in the unequal rotation treatment.

(beginning with round 5).[13]

- At the end of the experiment, the earnings of all subjects were calculated and reported individually. Following the end of the experiment, subjects were invited to participate in a debriefing procedure. Any subject was free to decline participation in the debriefing procedure and leave the lab with his or her earnings from the experiment. Subjects who accepted the invitation to participate were asked to fill out a questionnaire and were given the opportunity to reward or penalize other subjects who stayed for the debriefing procedure.[14] Each subject received an initial payment of 600 eurocents for filling out the questionnaire. This payment could be pocketed, or used to reward or punish other players in one's group by up to 75 eurocents per player. Since each eurocent spent for rewards or punishment costs one eurocent, each player could use up to 300 eurocents in total to reward or punish four other players. Similarly, each player could be rewarded or punished by others with the maximum of 300 eurocents. This behavioral option was added to the experiment to investigate emotional spill-over effects of committee decision making. Such spill-over effects may be an important feature of real life committees (Thagard and Kroon, 2006), and an improved understanding may facilitate the design of better committee decision-making policies.[15]

- During the debriefing procedure, but before the reward or punishment option, subjects were also asked to report their emotions by rating the experienced intensity of thirteen different emotions on 7-point scales (ranging from 'no emotion at all' to 'high intensity of the emotion'). The list includes the following emotions: irritation, anger, contempt, envy, jealousy, sadness, joy, happiness, shame, fear, surprise, pride, and relief.[16]

[13] 'Self-report is the most common and potentially the best way to measure a person's emotional experiences': Robinson and Clore (2002, p.934). We use the Self-Assessment Manikin, a figure with a face changing from a very happy to a very sad expression (Lang, 1980).

[14] As it turned out, no subject declined participation.

[15] The only way to study such emotional spill-over effects in a clean way is after the experiment itself – without giving subjects information about it. If subjects would know in advance they can punish or reward, this could change their behavior in the committee decision-making experiment. To avoid effects on future experiments, we decoupled the punishment/reward procedure completely from the experiment and made it part of the (optional) debriefing questionnaire.

[16] Apart from the negative emotions that are expected to be particularly relevant for reciprocity (anger, irritation) some other negative as well as positive emotions were included as filler items, to avoid pushing participants in a particular direction (see Bosman and van Winden, 2002).

2.2 Behavioral considerations

Based on economic theory, there are a variety of hypotheses concerning subject behavior and outcomes of the experiment; we look at the following five behavioral modes:

- *Strategic voting:* Subjects behave strategically in proposing options and vetoing others' proposals (as is normally assumed in the game theory literature);[17]

- *Quasi-naive voting:* Subjects lack sophisticated strategic behavior: they propose and accept the option that gives them the highest total payoff, and always accept the last proposal to prevent a 'deadlocked' committee and the resulting inferior payoff;

- *Maximum committee payoff ('efficiency'):* Subjects propose and accept options that maximize the sum of the total payoffs over all members. This behavioral mode provides a benchmark for how much the group as a whole could have earned; it can be viewed as the socially efficient behavior.

- *Maximum common payoff:* Subjects propose and accept options that maximize common payoffs.[18] The option that maximizes common payoff may be perceived as a good compromise by players and therefore it may serve as a focal point for coordinating voting behavior because it offers a common payoff that is equally shared by everyone.

- *Median voter decisive:* Although the voting procedure in our experiment is 'voting by veto', the median voter preferences might still be a good predictor of the voting outcome.[19] The median voter corresponds to the median of the voting members for the ER and UR treatments whereas in case of the NR treatment it is the median committee member (since every member has the right to vote in this treatment).

[17] Because players have perfect information in each round, there exists a subgame perfect equilibrium for each round. Although the (round) SPE outcome may be attainable via different paths, the outcome is unique. We focus in the SPE outcome in each round in the analysis of the empirical performance of this mode.

[18] A quick inspection of tables 5/6 (Appendix A) reveals that in only 7 (out of 50) rounds in NR and ER, options that maximize total committee payoffs and common payoffs are different; different predictions also occur in only 7 (out of 48) rounds in the UR treatment.

[19] Blinder and Morgan (2005) find no differences between group decisions made by majority rule and unanimity.

Overall in the experiment voting for the maximum committee payoff also maximizes *each* player's total payoff. This follows from the fact that procedures in our experiment are fair: each player finds himself in an advantageous situation equally often.[20] It should be noted, however, that in many rounds players have an incentive to deviate from maximizing the committee payoff by choosing options that maximize their (round) individual payoffs.

We have derived theoretical predictions for the 'winning option' for each mode (see Appendix A for details). In addition, to be able to test performance of committees in terms of time efficiency we have also identified the (shortest) path to the winning option for strategic voting, i.e., the shortest path from the first proposal to the final decision required to implement (round) SPE outcomes. Furthermore, figures on several performance measures for each of the five benchmark modes described above can be found in the top rows of table 5 (Appendix A): The *foregone efficiency* corresponds to the (percentage rate) difference between the total committee payoff at the option predicted by a behavioral mode in a round and the highest possible total committee payoff in the respective round); The *foregone equity*, on the other hand, is calculated as the (rate) difference between the Gini Index at the option predicted by a behavioral mode in a round and the smallest Gini Index (in the respective round). We have also included figures on the range of payoffs (highest minus lowest payoff) as another measure of inequality. Closer inspection of the figures in these five rows of table 5 reveal that it depends on the weights one attaches to the different measures which behavioral mode is socially to be preferred. For example, taking a shortfall of less than 2% from maximal efficiency and a Gini Index of no more than 0.1 as a selection criterion, only the mode of 'median voter decisive' in the NR treatment passes the test. In both ER and UR it is not clear which mode is socially preferable as either foregone efficiency or the Gini Index violates the postulated criterion; 'Maximum committee payoff' mode (see the TP column in table 5) comes close to being the socially preferred mode in the presence of rotation.

[20] There is only one exception to this: the player that never rotates in the unequal rotation treatment.

3 Results

3.1 Does rotation affect earnings?

Arguably the most interesting question under the investigation here is whether vote rotation leads to differences in earnings. Theoretically, the outcomes of 'maximum committee payoff' and 'maximum common payoff' modes obviously are not affected by who has the right to vote and/or propose since the outcomes are determined by the payoffs of all committee members. However, differences in earnings are expected in case of behavioral modes with outcomes that favor voting members in rotation treatments; such modes include 'strategic voting' and 'median voter decisive'.[21] An indicator of the differences in earnings is a high rate of foregone equity (see table 5, Appendix A); the foregone equity for the 'strategic voting' mode (the SV column in table 5) is 44% when all five committee members have the right to vote (NR) but the figure jumps to 80% and 65% when two committee members lack the right to vote (ER and UR); similarly, for the 'median voter decisive' mode (the MV column in table 5) the foregone equity figures are 54% in NR and up to 78% and 65% in ER and UR. It is an empirical question then whether regions are correct in fearing that they will be 'ripped off' if they are not allowed to vote. We report on two pieces of evidence, within and between treatments, that support the conclusion that vote rotation affects the distribution of income among committee members.

Before discussing the data, it will help to recall that in the rotation treatments only three members have the right to make a proposal and vote, whereas in the no rotation treatment, although again only three members have the right to make proposals, all five members have the right to vote. As an example, let players 3, 2 and 4 be the ones who can successively make a proposal. Players 1 and 5 cannot make a proposal in any treatment, but they do have the right to vote in the NR treatment. In the rotation treatments, in the *same* situation player 3 would still propose first, player 2 second and player 4 last, but players 1 and 5 now have no right to vote and, of course, no right to propose any option for consideration.

[21] The outcomes of 'quasi-naive' voting mode are unlikely to favor proposers (who are also the only committee members with the right to vote in ER and UR) since according to that mode a proposer proposes his first-best (feasible) option and a voter rejects any option that is not her first-best (feasible) option; so, early proposals most likely will be rejected unless preferences of all voters are completely aligned, an event with a likelihood that is negatively correlated with a voting committee size.

Earnings of voting versus non-voting members

The experimental design is such that the setup of the NR and ER treatments is exactly the same except that in each round two committee members who are not proposers in NR are not allowed to vote in ER. Thus, we can directly compare earnings of committee members in ER in any round with the earnings of the corresponding committee members in NR in that round. We group committee members into two categories: those who have the right to vote when the rotation scheme is implemented, and those who lack the right to vote. For these two categories, Figure 1 shows the deviation from average earnings. We observe an increase in earnings for the voting members who retain voting power (i.e., proposers), whereas earnings of the non-voting committee members (i.e., non-proposers) fall. It is also noticeable that rotation leads to a higher 'polarization' of earnings for the difference in earnings between voting and non-voting committee members increases as a result of rotation.

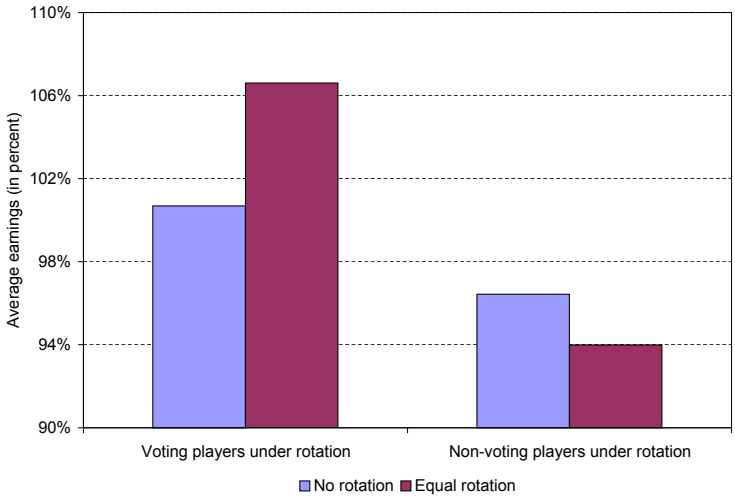
We find that proposers in ER earn about 6% more than proposers in NR, whereas non-proposers (who have the right to vote in NR but lack this right in ER) earn about 2.5% less in ER than in NR.[22] These differences in earnings of the two types of committee members between the NR and the ER treatments are statistically significant at conventional levels (t-test; for proposers, $p = 0.00$; for non-proposers, $p = 0.02$). Next, we look at earnings of voting and non-voting members within a rotation treatment. ER and UR data both reject the null hypothesis of earnings being drawn from the same distribution in favor of the alternative hypothesis of higher earnings for voting members: a voting member (i.e., a proposer) earns 11% more than a non-voting member in ER and 12% more in UR (t-test: $p < 0.01$ in both ER and UR). This difference in earnings (around 23 euros overall) is due to two factors:

- the right to propose, and
- the right to vote.

To disentangle the effects of the right to propose and the right to vote on higher earnings we use data from the NR treatment. We find that proposers in NR earn only 2% (or 4.5 euros overall) more than non-proposers (t-test, $p = 0.07$). As all committee members have the right to vote in NR, this modest difference in earnings is *only* due to having the right to propose.

[22] See Appendix B for statistical tests and detailed earnings of proposers (i.e., voting members in ER) and non-proposers (i.e., non-voting members in ER) in NR, ER and UR.

Figure 1: Deviation from average earnings of voting vs. non-voting committee members.



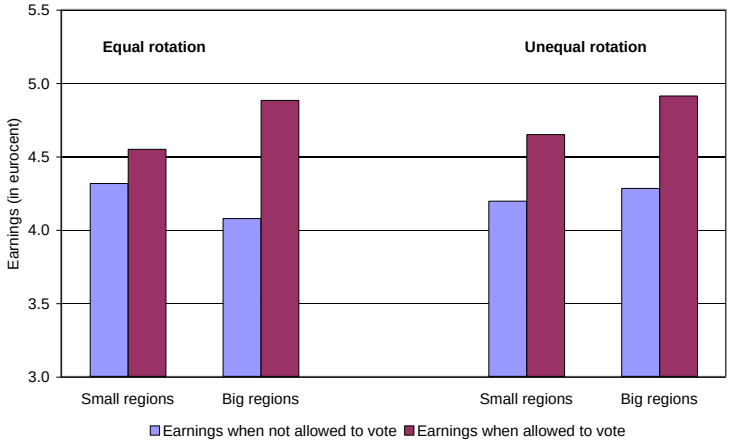
We conclude that data in our experiment are consistent with the hypotheses that: (i) committee members who lack the right to vote earn significantly less and (ii) having the right to make a proposal *in addition* to having the right to vote further boosts earnings in the rotation treatments but less so in the no rotation treatment. Committee members are correct in fearing that they will be 'ripped off' when they are not allowed to vote.

The right to vote and earnings across regions of different sizes

The question we take up in this section is: Do big regions have to fear more than small ones by the lack of the right to vote? We find that in the ER treatment, earnings of small regions are 5.4% higher when they have the right to vote, while big regions receive even 20% extra. In the UR treatment, the right to vote increases earnings of small regions by almost 11% and the rotating large country earns almost 15% more (earnings in eurocents are displayed in figure 2.[23] Data on earnings are characterized by substantial distributional effects. Big regions gain more than small regions when they can vote. On the other hand, they have more to lose if they are not allowed to vote. In the unequal rotation treatment we see a similar pattern, although the differences in earnings between big and small regions are less pronounced. These effects do not stem

[23]This earnings pattern is also confirmed in panel regressions with subject fixed effects.

Figure 2: Influence of the right to vote on earnings



from big countries having better earning opportunities, as the payoffs for big and small countries are exactly the same by design. We think that this is due to the attractiveness of the total committee payoff in voting (see section 3.2), and the bigger weight of the larger regions in the determination of the common payoff.[24]

Lastly, similar results are found when examining differences in earnings between the two big regions. Recall that the two are identical, except that in the unequal rotation case one region was granted permanent voting rights. Comparing earnings within the UR treatment between the two big regions for rounds in which the rotating region lacked the right to vote (i.e., for 24 out of 48 rounds), we find the 'permanent in' region earns about 7% more than the 'rotating' region.

Rotation hardly changes total earnings

Summarizing, under rotation the voting committee members earn more than the non-voting committee members. Given these distributional effects, one might wonder whether rotation also influences the payoffs of the committee as a whole: Does rotation expand the 'pie' or is the 'pie' simply distributed in a different way? Figures on the foregone efficiency (see table 5, Appendix A) show that the answer depends on the behavioral mode: the 'strategic voting' mode predicts

[24] Recall that the maximum committee payoff is typically (but not always) obtained through voting for the maximum common payoff.

lower efficiency in NR than in ER, and lower in ER than in UR; on the contrary, the 'median voter decisive' mode predicts higher effiicency in NR than in UR, and higher efficiency in UR than in ER; and of course, 'maximum common payoff' and 'maximum committee payoff' both predict that rotation has no effect on efficiency. What do our data show?

The left part of table 2 shows realized earnings per player for all three treatments. On average, a committee member earns 438 eurocents per round in the no rotation treatment. Average earnings are about 3% higher under rotation (this difference is significant at the 5% and 10% level for ER and UR, respectively).[25] Hence, we conclude that rotation has primarily distributional effects. The effect of rotation on total earnings of the committee seems marginal. Further analysis reveals that the differences in earnings across treatments are driven by the fact that less decisions are blocked under rotation. That said, the maximum average earnings each player could have obtained per round was 492 eurocents.[26] The right part of table 2 indicates how much (on average) could have been gained, if all players had simply voted for the option that maximizes committee payoff. In the rotation treatments, committee members could have earned 9% and 8% more; without rotation earnings could have been around 11% higher. Additional tests indicate that voting for the option that maximizes the committee payoff would have increased earnings of *all* committee members, irrespective of the size. In other words, players do not (all) simply vote for the option that maximizes the total payoff of the committee. In our experiment players may not have been aware that a cooperative strategy would have yielded the highest payoffs – but the same may hold, for e.g., in international negotiations. As committee members vote for their own (stage-game) interests, the committee ends up in a prisoner's dilemma-like situation with each member earning less.

3.2 Behavioral modes

To be able to better describe the conditions under which the choice of a decision-making institution may affect the outcome we turn our attention to empirical performance of different behavioral modes. Suppose, for instance, that all players aim to maximize the committee's total payoff. In that case, the winning option will not be affected by the composition of the committee. If, however,

[25] For detailed figures on average earnings and statistical tests see Appendix B.

[26] Maximum possible committee payoff is 2459 eurocents(see the second row of table 5 in Appendix A); hence 492 eurocents per member.

Table 2: Average earnings per player per round including vetoes (in eurocents)

All regions	Av. payoff	Possible gain[a]
No rotation	438	10.9 %
Equal rotation	450	8.6 %
Unequal rotation	454	7.8 %

[a]The 'possible gain' is the difference between actual payoffs and the payoffs that could have been realised by choosing the option that maximizes the total committee payoff in a given round.

the participants vote strategically, the composition of the committee will be a crucial factor in determining the outcome.

Overall, more than 88% of the results is consistent with at least one behavioral mode. In what follows, we analyze the extent to which the behavior of the participants is consistent with the different modes described in section 2.2.

Unfortunately, using actual voting behavior to distinguish among the alternative theoretical predictions is not as straightforward as it may seem, as in many cases the theoretical predictions yield similar outcomes. We thus have to find ways to distinguish between the various modes. We start by observing that blocking a decision is inconsistent with all behavioral modes. Therefore, in what follows we exclude rounds where the final option was vetoed. Figure 3 shows the percentage of decisions that is consistent with each of the modes considered. Clearly the (quasi-) naive voting is not very prominent, and maximization of the common payoff seems to do worse than strategic voting. Although the decision-making procedure adopted in our experiment is based on unanimity it is interesting to see that *'Median voter decisive'* seems to be able to explain a large share of the outcomes.

Next we try to explore the degree to which players behave strategically. To maximize the utilitization of our data, we take the behavioral modes two by two, excluding rounds with identical (outcome) predictions and test which mode performs best. Two such tests are displayed in table 3, where we report percentages of rounds in which observed outcomes are consistent with the theoretical predictions. The upper half of table 3 reports test statistics for 'median voter decisive' against 'maximum committee payoff' for those rounds where the predicted outcomes are different. The predictions are sufficiently different to test the two modes in all three treatments. Clearly, 'maximum committee payoff (committee efficiency)' mode is not frequently observed in our experiment.[27]

[27]Similar results are found testing 'median voter decisive' against 'maximum common pay-

Figure 3: Empirical performance of different behavioral modes

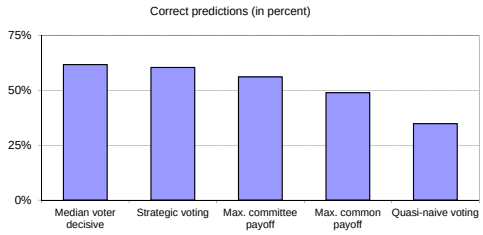


Table 3: Testing the behavioral modes (percentages of correct predictions)

	No rotation	Equal rotation	Unequal rotation
Median voter decisive	42.9%	56.0%	55.1%
Max. committee payoff	29.7%	27.2%	28.9%
p-value χ^2 test	0.1	0.0	0.0
Median voter decisive	50.4%	-	-
Strategic voting	39.3%	-	-
p-value χ^2 test	0.0	-	-

Note: Only rounds where the predictions differ are considered; rounds with blocked decision are excluded. The 'median voter decisive' and 'strategic voting' yield identical outcome predictions in the rotation treatments, which explains '-' entries in the table.

The lower half of table 3 shows p-values (χ^2 test) for strategic voting versus the median voter decisive. Again, the behavioral mode 'median voter decisive' is more prominent, as it can explain more committee decisions than strategic voting (a χ^2 test reveals that the differences are statistically significant at 1% level).

Since the two modes yield identical outcome predictions in the rotation treatments (see tables 5/6 in Appendix A), to differentiate between 'median voter decisive' and 'strategic voting' in these treatments, additional evidence is required. We postulate that for an outcome to be consistent with the 'median voter decisive' mode, the first proposal also needs to be the preferred outcome

off'.

Table 4: Median voter decisive versus strategic voting (first proposals, percentage of correct predictions)

	No rotation	Equal rotation	Unequal rotation
Median voter decisive	42.5%	43.9%	53.4%
Strategic voting	19.7%	22.1%	21.0%
p-value χ^2 test	0.0	0.0	0.0

Note: Only rounds where the predicted first proposal differs are considered.

of the median voting member, whereas in the case of strategic voting the first proposal must be consistent with the theoretical prediction.[28] Table 4 reports on the ability of these two behavioral modes to explain the first proposal observed in those rounds where these two modes yield different predictions. Across all treatments, 'median voter decisive' significantly outperforms 'strategic voting' (p-value <0.01). A similar comparison between 'median voter decisive' and 'maximum committee payoff (efficiency)' reveals that the 'median voter decisive' mode better explains subjects' behavior. Finally, looking at observed committee decisions in the rounds where the median voting member differs across treatments, we find that outcomes change accordingly in 71% of the cases. Overall, we find that the 'median voter decisive' mode can best describe the outcomes of committee decision making; This holds irrespective of the voting procedure (treatment).

With respect to strategic voting, figures in table 4 seem to suggest that subjects find it easier to behave strategically in the rotation treatments, which could be due to the fact that the backward induction is easier for committees with three members than for committees with five members.[29] Further analysis indicates that in the rotation treatments, the predictive power of strategic voting increases in later rounds, indicating that the ability of subjects to vote strategically increases with experience.

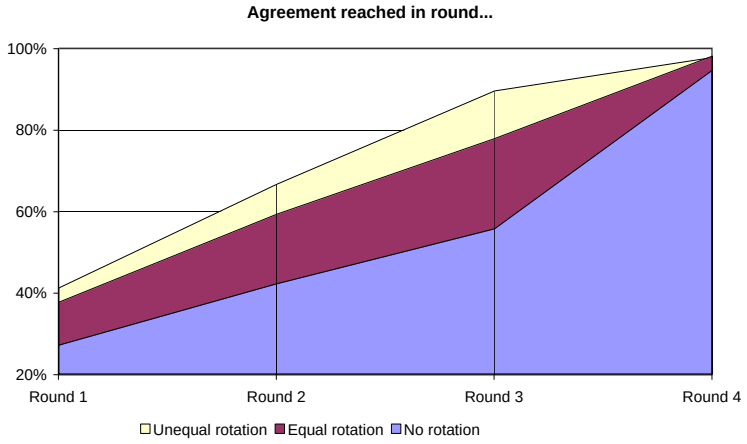
3.3 Which decision-making procedure is preferred?

We have shown that implementation of a rotation scheme affects earnings and induces distributional effects. However, there are also other ways to investigate the attractiveness of the various decision-making procedures. In what

[28] Note that in some cases various 'paths' lead to the same outcome. We only look at the 'shortest' path, i.e., the most direct way to obtain the unique subgame perfect equilibrium option.

[29] However, one should be cautious about this since we find that the null hypothesis of first proposals observed across treatments being drawn from the same distribution is not rejected.

Figure 4: How long does it take to reach a decision?



follows differences across treatments are discussed with regard to how quickly decisions are reached, how many decisions are blocked, and how often the reward/punishment option is utilized.

Do smaller committees make faster decisions?

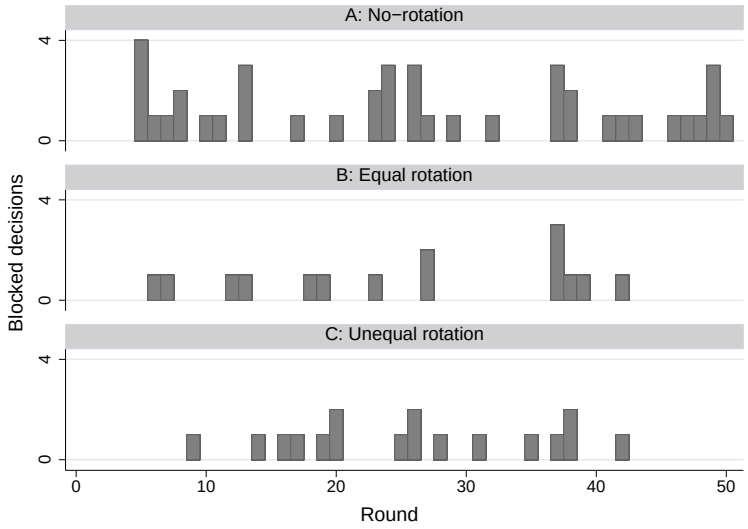
To investigate whether rotation speeds up a committee's ability to make decisions, we examine how many proposals are made before a decision is reached.

Figure 4 shows how long does it take to reach a decision. The first proposal was unanimously accepted in 41% and 38% of all cases under unequal and equal rotation, respectively. In contrast, only 27% of first proposals were accepted in the no rotation treatment. Clearly, with rotation decisions are made in earlier phases of the decision-making process compared to no rotation. In addition, it takes fewer proposals to reach an agreement in UR than in ER.[30]

This is consistent with our theoretical predictions. The shortest path to a committee decision is never shorter without rotation, and in 37 rounds the shortest path to a final agreement is shorter under unequal rotation. Hence, if fast decision making is important, data in our experiment favor unequal rotation.

[30] All results are statistically significant ($p < 0.01$; Pearson χ^2 test).

Figure 5: Blocked decisions



Why are deadlocks important?

Interestingly, introduction of a rotation scheme reduces the number of vetoes. In the NR treatment we observe that in 41 rounds committees are deadlocked. In rotation treatments this number is much lower: respectively, 15 and 17 rounds in ER and UR.[31] To test for habituation, we provide the number of deadlocked committees for each treatment (Figure 5). The number of deadlocks fluctuates somewhat over time, but there is no clearly significant declining pattern. Further testing indicates that the relationship between the number of deadlocks and the rotation schemes is stable over time suggesting that committees do not learn to avoid deadlocks over time.

These findings also raise the question whether fewer deadlocks in rotation treatments are the result of having fewer voting members, or whether each voting member becomes less 'likely' to veto a proposal. The latter is the case. In the NR treatment, the likelihood that an average committee member vetoes the last proposal is 1.2%; in the ER and UR treatments the likelihood figures are 0.71% and 0.79%, respectively. Thus, voting members in the rotation treatments are less likely to block the last proposal (similar results are found for earlier proposals).

[31] The differences between NR and rotation treatments ER are statistically significant at 5% level (Pearson χ^2 tests).

Because the payoff for deadlocks is considerably lower than that of every player's least preferred option, one might argue that it is not rational to veto the last proposal. However, deadlocks can be seen as a costly signal to the other committee members that certain options are unacceptable. Emotions such as anger may lead to deadlocks, but one can also use deadlocks to acquire a 'reputation'. That fewer deadlocks are observed under rotation appears to have two important implications.

- First, it increases players' satisfaction: groups that experienced deadlocks are less happy than groups that always reach a decision. Comparing groups in which decisions were deadlocked with groups where deadlocks never occurred, we find that deadlocks have a negative effect on subjects' happiness. This effect is found for each of the first three measures of happiness (Mann-Whitney test, $p = 0.001$); It is not found in the data collected after round 35. This may be the result of habituation, i.e., players get used to occasional deadlocks.[32]

- Second, deadlocks influence the extent to which players wish to (costly) punish or reward other committee members after the experiment.

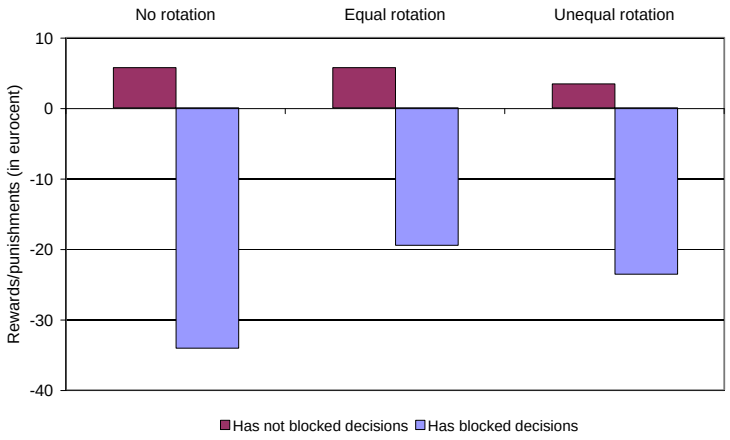
Rewards, punishments and emotions

As reported in section 2.2, as part of a debriefing, each player had the opportunity to reward or punish other players on the committee. As rewards and punishments were costly and occurred after the experiment, one can think of them as measuring substantive feelings about other players that apparently persist when negotiations have ended. Such spill-over feelings may be important for real life committees, as one may meet others on other occasions. Finding compromises is facilitated by good interpersonal relationships (see Thagard and Kroon, 2006). Hence, an optimal setup of a committee should avoid punishment, as this signals strong negative feelings which may diminish cooperation in repeated interactions.

In our experiment, 51.6% of the subjects made use of the opportunity to reward and/or punish. We find clear evidence that members who veto the last proposal are punished (see figure 6): subjects blocking last proposals are on average punished by 26.9 eurocents (-34.1, -19.5 and -23.6 eurocents in NR, ER

[32]This result is not driven by the number of vetoes, as in the later rounds the number of vetoes does not decrease significantly.

Figure 6: Rewards and punishments



and NR, while those who do not are (on average) rewarded by 4.9 eurocents (5.7, 5.7 and 3.4 eurocents in NR, ER and UR). Additional analysis shows that the number of subjects causing a deadlock is substantially greater under the NR treatment than under the two rotation treatments (28% of all players blocked one or more last proposals under no rotation, whereas only 19% of the subjects did so under the two rotation treatments). Deadlocks occur more often in the NR treatment, and this is regarded as sufficiently negative to make subjects willing to punish, even though the experiment was completed when they made these decisions.

Rewards and punishments are not related to total earnings (that is, it is not the case that 'low income' members are rewarded or 'high income' members are punished). Further analysis reveals differences in rewards and punishments between treatments. First, subjects spend significantly more money to reward or punish in NR than in ER (Mann-Whitney test, p=0.02). Second, slightly more money is spent under unequal rotation than under equal rotation (Mann-Whitney test, $p = 0.07$). Both findings can be explained as follows: subjects who do not rotate (i.e., the ones with permanent voting rights) feel a stronger 'emotional interest' in the performance of the committee. This clearly shows up in the UR treatment: distinguishing the two large regions, we find that the region with the permanent seat spends about twice as much on rewards and punishments than the 'rotating' large region (Mann-Whitney test, $p = 0.09$).

Rewards and punishments can be interpreted as a sign that strong emotions occur. Since participants report their emotions before they rewarded or punished (see section 2.1) we can cross-check this information with the propensity to punish/reward other committee members. Indeed, we do not find differences in the 'level' of emotions between the treatments, but in the extent to which they generate punishments. Data reveal that three negative emotions (anger, irritation and contempt) significantly influence punishments,[33] but the relationship between negative emotions and punishments is (i) stronger in unequal rotation than in the other two treatments, (ii) stronger for the large region with permanent voting rights than for the rotating large region, and (iii) stronger for the larger regions than for the smaller regions. Rewarding is less straightforward to interpret as rewards and emotions are not statistically correlated in our data.[34]

The data on emotions, and rewards/punishments can also be interpreted as measures of the attractiveness of the different decision-making procedures. As punishments under equal rotation are relatively low, this voting system seems to produce a minimum of frustration among the committee members. Participants may view equal rotation as the 'fairest' decision-making procedure for rotation, as all participants get to vote equally often. An important caveat in this regard is, however, that the experiment was set up in very symmetrical way, i.e., every player had equal opportunities to 'exploit'. Suppose that one of the players differs substantially from the rest of the group (maybe because the region he represents is economically very different). In this case the player may not have equal opportunities to recoup the losses his region faces when he is not allowed to vote. It is likely that in such situations this player's frustration might increase quite sharply under any form of rotation.

4 Conclusion

Our main results can be summarized as follows:

- First, rotation is likely to induce distributional effects. With rotation voting committee members have additional scope to promote their own interests (as opposed to maximizing the total committee payoff). Consequently, their earnings increase relative to non-voting committee members; Having permanent voting rights increases own payoff even more.

[33] The correlation between emotion and punishment is 0.25, 0.15 and 0.21 for anger, irritation and contempt, respectively.

[34] As Sefton et al. (2007) argue rewarding is generally less well-understood than sanctioning.

- Second, all committee members could have increased their earnings by voting for the option with the highest total committee payoff in each round. By trying to maximize their own (round) payoffs, voting members get caught in a prisoner's dilemma-like situation. This effect seems stronger without rotation than with rotation.

- Third, committees using a rotation scheme decide faster. Without rotation, committees tend to block decisions more frequently.[35]

- Fourth, there is a positive correlation between deadlocks and reported frustration by subjects. Subjects vetoing last proposals get punished, even though this is only possible after the experiment.

The design of the experiment captures various important aspects of real life committee decision making (albeit in a highly stylized manner), such as the U.N. Security Council, WTO trade negotiatons, or monetary policymaking. Consider the U.S. Federal Reserve System: it is composed of a central 'hub' – the Board in Washington – and twelve regional 'spokes' (the regional Federal Reserve Banks, which are scattered across the country). The FOMC, the body responsible for U.S. monetary policy, is comprised of seven Board members and the President of the Federal Reserve Bank of New York, plus four of the other eleven regional FED Presidents. Among the latter the right to vote rotates following a pre-determined sequence.[36] The twelve FED districts are not equal in size (whether measured in terms of economic size or population).

In various respects, our design can be related to procedures of the FOMC: we have (i) regions of different sizes, (ii) a region with a permanent seat and (iii) the trade-off between common and individual interests. Meade and Sheets (2005) suggest that at least some FOMC members face a trade-off between regional and 'common' interests. Given these similarities, our results indicate that decisions taken by the FOMC need not always maximize aggregate welfare. Our experimental study indicates that FOMC members may use their right to

[35] For monetary policy committees timeliness of a decision may not be paramount, but for other committees – e.g., the U.N. Security Council – the ability to reach a compromise may be very important.

[36] The 1942 amendment to the Federal Reserve Act prescribes a rotation scheme of four seats on the FOMC among eleven Federal Reserve districts. This annual rotation began on March 1, 1943; since 1990, the rotation has taken place each year on January 1. One voting seat is rotated in a fixed fashion among members of each of the following FED districts: Cleveland and Chicago; Atlanta, Dallas, and St. Louis; Boston, Philadelphia, and Richmond; Kansas City, Minneapolis, and San Francisco (see Meade and Sheets, 2005). Johnson (1995) provides a good summary of the founding of the Federal Reserve.

vote to address economic conditions in their regions, rather than addressing the interest of the U.S. economy as a whole. This is consistent with the empirical findings of Chappell et al. (2004), who show that non-voting FOMC members do not appear to have much influence on FOMC decision making. Relative to a situation where all FOMC members vote, U.S. monetary policy may thus be biased. In addition, decisions also may be systematically biased in favour of the New York FED, as it has a permanent seat. That said, regional representation has a number of advantages, e.g., ensuring broad regional representation, gathering and sharing of regional information by regional FED Presidents, etc., which are not captured in our experimental design. These are clearly issues for future research.

Appendix A: Theoretical predictions

Overview

In determining how subjects behave we can distinguish two alternative approaches: first, own interests dominate group interests. This can come in the form of 'quasi-naive' or 'strategic' voting: quasi-naive voting requires that participants simply vote for their first-best option, without considering possible strategic interactions. 'Strategic' voting is possible as every member has perfect information about all committee members' preferences, so backward induction applies. Alternatively, it could be the case that committee interests are more important than individual interests. In that case individuals could strive to maximize the total payoff for the committee as a whole (i.e., the sum of private and common payoffs of all committee members), or simply aim at the highest common payoff.

Tables 5 and 6 contain theoretical predictions for the five behavioral modes we consider. For each mode, we have included in the table (top rows) theoretical predictions with respect to: (i) efficiency (Committee payoff): the total payoff of all committee members if options predicted by the mode are agreed upon, (ii) foregone efficiency measured as the shortfall of the mode predicted committee payoff from the maximum possible committee payoff, (iii) Gini Index of the income distribution at an option predicted by the behavioral mode, (iv) foregone equity measured as the shortfall of the mode predicted Gini Index from the minimum possible Gini Index and (v) range of payoffs (as another measure of inequality) measured as the difference between the highest and the lowest payoffs

(in eurocents) at options predicted by the mode. Predicted winning options for each mode and for each round are also reported. The five behavioral modes we consider are:

- *Quasi-naive voting:* Players make sincere proposals and vote sincerely (absence of any strategic behavior) and always accept the last proposal (avoiding this way a deadlock);
- *Strategic voting:* [37] Players behave strategically both in proposing options and vetoing them;
- *Maximum common payoff:* Players propose and accept only options that maximize the common payoff;
- *Maximum committee payoff:* Players propose and accept only options that maximize the total committee payoff.
- *Median voter decisive:* Players accept only the most preferred option by the median player of the committee members who have the right to vote.

[37] A formalized derivation of (stage game) subgame perfect equilibria for this mode is available upon request.

Table 5: Theoretical predictions

	No rotation (NR) (2459; 0.064; 138)[a]					**Equal rotation (ER)** (2459; 0.064; 138)[a]					**Unequal rotation (UR)** (2462; 0.064; 140)[a]				
	NV[b]	SV[c]	MV[d]	CP[e]	TP[f]	NV[b]	SV[c]	MV[d]	CP[e]	TP[f]	NV[b]	SV[c]	MV[d]	CP[e]	TP[f]
committee Payoff	1902	2342	2430	2425	2459	2187	2367	2360	2425	2459	2130	2404	2404	2450	2462
Foregone Efficiency	22.65	4.75	1.14	1.35	0.00	11.06	3.72	4.03	1.35	0.00	13.48	2.36	2.36	0.47	0.00
"Gini" Index	0.125	0.092	0.098	0.115	0.108	0.094	0.115	0.114	0.115	0.108	0.099	0.105	0.105	0.113	0.107
Foregone Equity	0.958	0.441	0.536	0.805	0.693	0.472	0.797	0.783	0.805	0.693	0.552	0.650	0.650	0.781	0.682
Range of Payoffs	219	208	224	243	231	197	243	242	243	231	203	234	234	251	238
Round	Predicted winning options (rounds 1-20)														
1	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2
2	4	1	1	1	1	1	1	1	1	1	2	1	1	1	1
3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	3	2	2	2	2	3	2	2	2	2	3	2	2	2	2
5	2	3	3	3,4	3,4	2	3	3	3,4	3,4	2	3	3	4	4,3
6	2	4	3	4	3	2	3	3	4	3	2	3	3	4	3
7	3	1	2	1,3	2	3	1	1	1,3	2	3	2	2	1	2
8	1	3	4	4	4	3	4	4	4	4	3	2	2	2	2
9	3	3	2	2	2	3	2	2	2	2	3	4	4	4	4
10	3	2	2	4	2	3	2	2	4	2	3	2	2	4	2
11	1	3	3	3	3	2	3	3	3	3	4	3	3	3	3
12	4	3	3	3	3	4	3	3	3	3	3	2	2	3	3
13	3	2	2	4	4	3	2	2	4	4	3	2	2	4	4
14	3	1	1	1	1	3	1	1	1	1	3	1	1	1	1
15	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1
16	4	3	3	3	3	2	2	2	3	3	2	4	4	4	4
17	3	3	2	2	2	3	4	4	2	2	1	2	2	2	2
18	3	2	3	3,4	3,4	3	1	1	3,4	3,4	2	3	3	4	4,3
19	2	1	2	2	2	2	1	1	2	2	2	2	2	3	3
20	1	4	3	3,4	3,4	3	4	4	3,4	3,4	2	3	3	2	2

[a](Maximum Committee Payoff, Minimum Gini Index, Minimum Range of Payoffs)
[b]Quasi-naive voting
[c]Strategic voting
[d]Median voter decisive
[e]Maximum common payoff
[f]Maximum committee payoff

Table 6: Theoretical predictions (cont. rounds 21-50)

	No rotation (NR)					Equal rotation (ER)					Unequal rotation (UR)				
Round	NV[a]	SV[b]	MV[c]	CP [d]	TP[e]	NV[a]	SV[b]	MV[c]	CP[d]	TP[e]	NV[a]	SV[b]	MV[c]	CP[d]	TP[e]
21	3	2	2	1	2	1	1	1	1	2	3	4	4	4	4
22	3	4	4	4	4	3	4	4	4	4	1	1	1	1	2
23	2	4	3	4	4	2	4	3	4	4	3	4	4	4	4,3
24	3	2	2	2	2	3	2	2	2	2	2	1	1	2	2
25	2	3	2	3	2	2	3	3	3	2	1	3	3	4	4
26	3	4	4	4	4	3	4	4	4	4	3	2	2	2	2
27	3	2	2	1	2	3	2	2	1	2	3	2	2	1	2
28	3	3	4	4	4	3	3	3	4	4	3	3	3	4	4
29	1	3	2	2	2	3	2	2	2	2	3	2	2	2	2
30	1	3	3	3	3	3	3	3	3	3	3	4	4	4	4
31	2	3	3	3	3	2	3	3	3	3	3	2	2	2	2
32	1	3	3	4	4	3	4	4	4	4	3	3	3	3	3
33	1	2	2	2	2	1	2	2	2	2	2	3	3	3	3
34	1	2	2	2	2	3	2	2	2	2	4	3	3	4	3
35	2	3	3	4	3	2	3	3	4	3	1	2	2	2	2
36	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
37	4	2	2	1	1	3	2	2	1	1	1	4	4	1	1
38	2	3	2	1	1	1	4	4	1	1	3	2	2	1	1
39	3	2	3	2	2	3	2	2	2	2	4	4	4	4	4
40	1	2	2	2	2	3	2	2	2	2	3	3	3	3	3
41	4	4	4	4	4	4	4	4	4	4	3	2	2	2	2
42	2	3	3	3	3	2	3	3	3	3	2	3	3	3	2
43	4	2	2	2	2	1	1	1	2	2	1	2	2	2	2
44	1	3	2	2	2	2	3	3	2	2	3	2	2	2	2
45	3	2	1	1	1	3	2	2	1	1	3	1	1	1	1
46	4	1	1	1	1	1	1	1	1	1	3	1	1	1	1
47	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
48	1	3	3	3	3	3	3	3	3	3	1	3	3	3	3
49	3	2	3	4	4	3	1	1	4	4					
50	1	2	1	1	1	1	2	2	1	1					

[a]Quasi-naive voting
[b]Strategic voting
[c]Median voter decisive
[d]Maximum common payoff
[e]Maximum committee payoff

Appendix B: Statistical tests of key findings

Non-proposers vs. proposers within treatments			
Treatment	NR	ER	UR
Earnings (non-proposers, proposers)	(433, 442)	(422, 468)	(423, 475)
t-test	-9.3 [± 5.1]$^{0.07}$	-46 [± 4.1]$^{0.00}$	-52 [± 4.3]$^{0.00}$
Mann-Whitney test	z=-1.71$^{0.09}$	z=-8.64$^{0.00}$	z=-8.39$^{0.00}$
Proposers across treatments			
Treatment	(NR, ER)	(ER, UR)	(NR, UR)
Earnings	(442, 468)	(468, 475)	(442, 475)
t-test	-25 [± 4.4]$^{0.00}$	-7 [± 4.0]$^{0.71}$	-27 [± 4.5]$^{0.00}$
Mann-Whitney test	z=-5.32$^{0.00}$	z=-0.72$^{0.47}$	z=-5.75$^{0.00}$
Non-proposers across treatments			
Treatment		(NR, ER)	(NR, UR)
Earnings		(433, 422)	(433, 423)
t-test		11 [± 4.8]$^{0.02}$	10 [± 5.0]$^{0.02}$
Mann-Whitney test		z=2.67$^{0.01}$	z=2.93$^{0.00}$
Total group earnings across treatments			
Treatment	(NR, ER)	(ER, UR)	(NR, UR)
Group Earnings	(2192, 2248)	(2248, 2271)	(2192, 2271)
t-test	-57 [± 24.0]$^{0.02}$	-23 [± 20.0]$^{0.86}$	-79 [± 29.0]$^{0.07}$
Mann-Whitney test	z=-2.18$^{0.03}$	z=-0.10$^{0.92}$	z=-1.64$^{0.10}$

Note: Two-sided p-values in supercripts; standard errors in square brackets

References

Bernheim, B. D., Ranqel, A. and Rayo, L.: 2006, The power of the last word in legislative policy making, *Econometrica* **74**, 1161–1190.

Blinder, A. S.: 1998, *Central Banking in Theory and Practice*, MIT Press, Cambridge.

Blinder, A. S.: 2004, *The Quiet Revolution: Central Banking Goes Modern*, Yale University Press.

Blinder, A. S. and Morgan, J.: 2005, Are two heads better than one? An experimental analysis of group vs. individual decisionmaking, *Journal of Money, Credit and Banking* **37 (5)**, 789–812.

Bosman, R. and Winden, F. V.: 2002, Emotional hazard in a power-to-take experiment, *Economic Journal* **112**, 147–169.

Bulkley, G., Myles, G. D. and Pearson, B. D.: 2001, On the membership of decision-making committees, *Public Choice* **106 (1-2)**, 1–22.

Chappel, Jr., H. W., McGregor, R. R. and Vermilyea, T.: 2004, Majority rule, consensus building, and the power of the Chairman: Arthur Burns and the FOMC, *Journal of Money, Credit, and Banking* **36 (3)**, 407–422.

Cox, James C., and Sadiraj, V.: 2012, Direct Tests of Individual Preferences for Efficiency and Equity, *Economic Inquiry* **50(4)**, 920-931.

Drouvelis, M., Montero, M., and Sefton, M.: 2010, Gaining power through enlargement: Strategic foundations and experimental evidence, *Games and Economic Behavior* **69 (2)**, 274-292.

Engelmann, D. and Strobel, M.: 2004, Inequality aversion, efficiency, and maximin preferences in simple distribution experiments, *American Economic Review* **94**, 857–869.

Fréchette, G. R., Kagel, J. H. and Lehrer, S. F.: 2003, Bargaining in legislatures: An experimental investigation of open versus closed amendment rules, *American Political Science Review* **97 (2)**, 221–232.

Gerling, K., Grüner, H. P., Kiel, A. and Schulte, E.: 2003, Information acquisition and decision making in committees: A survey, *European Central Bank Working Paper* **256**.

Gilligan, T. W. and Krehbiel, K.: 1990, Organization of informative committees by a rational legislature, *American Journal of Political Science* **34 (2)**,, 531–564.

Johnson, R. T.: 1995, *Historical Beginnings. The Federal Reserve*, Federal Reserve of Boston.

Kagel, J. H., Sung, H., and Winter, E.:2010, Veto Power in Committees: An Experimental Study, *Experimental Economics* **13(2)**, 167-188.

Lang, P. J.: 1980, Behavioral treatment and bio-behavioral assessments: Computer applications, *in* J. B. Sidowsky, J. H. Johnson and T. A. Williams (eds), *Technology in Mental Health Care Delivery Systems*, NJ Ablex, Norwood.

Li, H., Rosen, S. and Suen, W.: 2001, Conflicts and common interest in committees, *American Economic Review* **91 (5)**, 1478–1497.

Lombardelli, C., Proudman, J. and Talbot, J.: 2005, Committees versus individuals: An experimental analysis of monetary policy decision-making, *International Journal of Central Banking* **165**, 181-205.

Meade, E. E. and Sheets, D. N.: 2005, Regional influences on U.S. monetary policy, *Journal of Money, Credit, and Banking* **37 (4)**, 661–677.

Montero, M., Sefton, M., and Ping, Z.: 2008, Enlargement and the balance of power: an experimental study, *Social Choice and Welfare* **30(1)**, 69-87.

Mueller, D. C.: 2003, *Public Choice III*, Cambridge University Press, Cambridge.

Robinson, M. D. and Clore, G. L.: 2002, Belief and feeling: Evidence for an accessibility model of emotional self-report, *Psychological Bulletin* **128**, 934–960.

Roth, A. E.: 2002, The economist as engineer: Game theory, experimentation, and computation as tools for design economics, *Econometrica* **70 (4)**, 1341–1378.

Sefton, M., Shupp, R. and Walker, J.: 2007, The effect of rewards and sanctions in provision of public goods, *Economic Inquiry* **45 (4)**, 671-690.

Thagard, P. and Kroon, F.: 2006, Emotional consensus in group decision making, *Mind and Society*, 85-104.

Waldner, V., Kocher, M. and Sutter, M.: 2003, Rotation schemes in politics: An experimental examination, *mimeo* .

Instructions (not for publication)

The following instructions[38] were distributed during the equal rotation treatment. Largely similar instructions were handed out during the other treatments, the main difference being that in the no rotation treatment information on rotation was not included and the number of committee members to take a decision was five (in place of three).

Introduction

In today's experiment you can earn money. How much depends on the decisions which you take and the decisions of other participants. It will not be possible to link your decisions to your name, not even after the experiment. Hence anonymity is guaranteed. Below you will find the instructions for the experiment. While reading the instructions and during the experiment *you must remain silent and must not communicate with others.* If you have a question, raise your hand. Someone will then come to you to answer the question.

Types and groups in the experiment

In the experiment you will be one of two types. You will be either *type small* or *type large.* Your type plays a role in calculating the earnings, as will be explained below. What type you will be has been decided at random. But note that you will remain the same type throughout the experiment.

In the experiment everyone will be part of a *group of five people.* In each group, so including your group, there are always three types small and two types large. Every participant will be given a number, with his or her type added in brackets, for instance '2 (large)' or '4 (small)'. In the experiment the following will always apply: participants 2 and 5 from your group will always be type large, while participants 1, 3 and 4 will always be type small.

Note that the composition of each group will remain the same throughout the experiment. *You will always stay with the same participants in your group, and each of you will keep his or her number and type throughout the experiment.* The distribution of participants across types and groups is random. We have already assigned a type and group to each table. Because you drew your table number in the reception room, the distribution is completely random.

[38] Instructions are translated from Dutch.

Group decision and earnings

The experiment consists of 50 rounds. In each round your group must take a decision. How the group takes a decision is explained below. The decision concerns a choice between four options, 'option 1', 'option 2', 'option 3' and 'option 4'. Each option yields both *private earnings* and *common earnings*. All earnings are expressed in eurocents. We will now explain the earnings.

1. Private earnings:

   For everyone in your group, each option will yield a certain private earning. These private earnings are equal to one of the following four amounts: 25, 100, 200 or 350 eurocents. Note that if your group does not take a decision (see below), then everyone in your group will receive earnings of only 10 eurocents. It is possible that different options will yield the same earnings. But there is always only one option for which you will receive 350 eurocents. As the number of any other option is lower than the number of this option (for which you will receive 350 eurocents), the earnings will be lower. We will illustrate this in the example below.

   Example

	Option 1	Option 2	Option 3	Option 4
1 (small)	200	350	200	100
2 (large)	100	200	350	200
3 (small)	200	350	200	100
4 (small)	100	200	350	200
5 (large)	25	100	200	350

   For participant 1 (small), option 2 yields the highest earnings. Options 1 and 3 yield earnings of 200 for this participant, option 4 yields earnings of 100. The distribution of the private earnings across the options can be regarded as a mountain, with the summit for participant 1 (small) at option 2. The further away from the summit, the lower the earnings. Thus for participant 5 (large) the summit of the mountain is at option 4 and the options further away from option 4 yield lower earnings for this participant, down to 25 eurocents for option 1.

   Note that the location of the summit (i.e. the option with earnings of 350 eurocents) changes for you and the other participants in your group over the rounds. Everyone will have, over all rounds, 12 rounds with the

summit at option 1, 12 rounds with the summit at option 2, 12 rounds with the summit at option 3 and 12 rounds with the summit at option 4. In the last two rounds of the experiment, the summit will be randomly chosen for each participant. In the experiment everyone will thus be equal in terms of the number of occasions on which a certain distribution of the private earnings can occur.

During the experiment you will receive information in each round about the private earnings of the other people in your group, in the form of the table used as an example above.

2. Common earnings:

   In addition to private earnings, each option will also yield common earnings, which will be same for everyone in the group. The common earnings for a particular option are a *weighted average of the private earnings* for that option. In this case type large will have a greater weight than type small (hence the labels 'large' and 'small'). The private earnings of type large for a particular option will have a weight of 35 % and those of type small will weigh for 10 % in the calculation of the collective earnings. Note that this weighting will only be applied in the calculation of the common earnings.

   On the basis of the above example we will illustrate how the common earnings for a particular option will be calculated. Let us look at option 1. This option yields private earnings of 200 for participant 1 (small), private earnings of 100 for 2 (large), private earnings of 200 for 3 (small), private earnings of 100 for 4 (small) and private earnings of 25 for 5 (large). Because type large has a weight of 0.35 and type small a weight of 0.10, the common earnings are equal to 0.10*200 + 0.35*100 + 0.10*200 + 0.10*100 + 0.35*25 = 94 eurocents (rounded to full cents). Thus for option 1 *everyone* in the group will receive common earnings of 94 eurocents.

   In the experiment you will not have to calculate the collective earnings yourself. For each option you will receive information about both the private earnings and the common earnings.

3. Total earnings:

   Your total earnings for an option are the sum of your private earnings and the common earnings. In the example the total earnings for participant 1

(small) for option 1 are equal to 200 (individual) + 94 (common) = 294 eurocents; while for participant 2 (large), for instance, the total earnings for option 1 are equal to 100 (individual) + 94 (common) = 194 eurocents. Again, you will not have to calculate your total earnings for an option. This information will be provided for all options.

Rotation and voting procedures for group decisions

As mentioned, your group has to choose an option in each round. The following procedure will be used. In each round only *three participants can vote* on the option to be chosen. Which of the three participants can vote in a particular round has been determined in advance. You have just received what is called a *rotation scheme*. This scheme shows which three participations are allowed to vote (marked with +) in each of the 50 rounds. In the first round, for instance, this will be 1 (small), 3 (small) and 4 (small). Note that *over all rounds each participant in the group will rotate to the same extent*. In total everyone in the group will be allowed to vote in 30 of the 50 rounds. Hence there is no difference between participants of type large and type small in this respect. Furthermore, in each round one voting participant will be replaced by one of the non-voters.

The three participants who are allowed to vote will do so as follows. In each round a *sequence* will be decided *in which these three participants have to propose an option*. This sequence is announced to everyone at the start of a round. A possible sequence would be 3 (small), 2 (large) and 4 (small). This means that participant 3 (small) must be the first to make a proposal, followed by 2 (large) and then 4 (small). Note that over all rounds, *each participant* makes the first, second or third proposal on the same number of occasions.

When a proposal is put to the vote, each of the voters (excluding the proposer) must indicate *simultaneously* whether they *agree* with the proposal or whether they *veto* it. There are then two possibilities: either everyone agrees or there are one or two vetoes. If everyone agrees, the proposal is approved. Everyone (including the non-voting participants) will then receive total earnings associated with the proposed option. If a proposal is vetoed by one or two of the voting participants, the proposed option is rejected. In that case the voting participant whose turn it is to put forward a proposal will then do so. Note that the next proposal must always be a different one, that is, be another option. If the third and last proposal is also rejected, then only one option remains (since there are four options). If this is option is not approved either (because of one

or two vetoes), then the group has not chosen an option. Note that *if no option is chosen*, everyone in the group (including the non-voting participants) will receive total earnings of only 10 eurocents in the round in question.

After a proposal has been put to vote, you will receive information on how the voters in your group voted. Note that when a proposal is put to vote, each of the voters (except the proposer) in the group has to vote simultaneously. Then the votes cast in your group are made public to the group. You will then know exactly who in your group agreed with the proposal and who may have vetoed it.

Information on previous rounds

During the experiment you will have information on all previous rounds. For each round this information consists of the collective and the total earnings for the various options for each participant in your group, all proposals and voting records in your group, as well as the options chosen (including 'no decisions').

Payment procedure

At the end of the experiment your earnings will be calculated and paid out. The following procedure will be used. *The computer will select at random 10 rounds from all 50 rounds.* Your total earnings for these rounds will be summed up, and this will constitute your actual earnings. Your earnings from the experiment will be paid in cash and in private.

Questions to be answered

During and at the end of the experiment you will be asked several questions. Your answers will not be divulged to others, neither during nor after the experiment. Your answers cannot be linked to your name. Hence anonymity is guaranteed also for the analysis of the results of the experiment.

Explanation of computer screen and trials

When everyone has finished reading the instructions, we provide a short explanation of the information which you will later see on your computer screen. Then we ask you to answer several trial questions. After the trial questions, we play two trial rounds. You cannot earn any money during the trial rounds.

Their purpose is to familiarize you with the computer screens and the procedures. You can still ask questions during the trial rounds. Once the trial rounds have been completed, the experiment will start and you can start to earn money.