(When and How) Do Voters Try to Manipulate?

Experimental Evidence from Borda Elections[†]

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Abstract

We study strategic voting in a laboratory experiment using a Borda mechanism. We find that manipulation rates are surprisingly low, even for individuals who know that they possess superior information about the other agents' preferences. Exploring possible explanations, we find that manipulation rates rise significantly if individuals are not only informed about the other agents' preferences but also about their actual votes. This suggests that uncertainty plays a key role in understanding strategic behavior in elections. By contrast, fairness considerations are found to play a negligible role in our context.

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1 Introduction

Strategy-proofness, or "non-manipulability," is commonly held to be a very desirable property of a voting mechanism; it requires that no individual can benefit from insincerely reporting his preferences, for any given distribution of the other agents' votes. Unfortunately, the well-known Gibbard-Satterthwaite theorem tells us that no voting mechanism except dictatorship of one individual is strategy-proof on an unrestricted preference domain provided that there are at least three alternatives. Thus, in many cases of interest, all reasonable voting mechanisms are susceptible to potential strategic manipulations. But do people in fact try to manipulate if they can? And if so, how do they manipulate?

In this paper, we study these questions in a laboratory experiment using the Borda count, a voting mechanism that is known to be highly vulnerable to strategic manipulations.[1] In our experiment, voters' preferences over a set of alternatives are induced by assigning a fixed monetary payoff to each alternative for each player. One of the players in our voting game is informed not only about his own, but also about the other players' preferences and thus has a distinctive opportunity to manipulate the final outcome by casting an insincere vote. We will refer to a strategic manipulation that results in a higher payoff than that resulting from sincere behavior as a *maximizing manipulation*. The uninformed players do not have a comparable opportunity to manipulate, because they are only informed about their own payoffs.

We find that despite the theoretical possibilities, the occurrences of such maximizing (or *outcome*) manipulations are overall surprisingly low. Only in the absence of any uncertainty, i.e. when a player is not only informed about the others' preferences but in addition about their actual votes, do we find that the rate of manipulations that change the outcome of the election rise significantly. Interestingly, this does not mean that informed voters always submit their true preference ranking under uncertainty. A significant fraction of informed subjects votes insincerely not in order to bring about their best

[1] There are numerous contributions in the literature that theoretically study the manipulability of the Borda count, see, among many others, Black 1976, Barbie et al. 2006, Favardin et al. 2002, Felsenthal 1996, Lehtinen 2007, Ludwin 1978, or Saari 1990.

possible outcome, but in order to increase the winning probability of the outcome that would have also resulted from sincere voting (in our case, their second-best alternative). We refer to such behavior as *satisficing* strategic voting.

Our findings are robust with respect to variations of the underlying payoff distribution that keep the ordinal ranking of alternatives fixed for each player. In particular, shifting the equal payoff distribution among players from the sincere outcome to the competing strategic outcome does not affect the behavior of the informed players. This suggests that fairness considerations do not play a significant role in our voting context. Our paper thus provides further evidence for classifying economic contexts in terms of the impact of fairness considerations.

To the best of our knowledge, the present paper provides the first experimental test of strategic behavior under a Borda mechanism. Earlier experimental studies have focussed on other voting mechanisms (see, e.g., Felsenthal et al. 1998 for simple majority voting, Cherry and Kroll 2003 for primary elections, and Blais et al. 2007 for one round plurality voting versus two round majority runoff elections). While most of these studies also find relatively low manipulation rates, the reasons for the observed behavior remain unclear because the implemented information structure was always symmetric. By contrast, we facilitate manipulation by providing some voters with superior information about others' preferences. Therefore, the low manipulation rates reported below seem all the more surprising. In addition, our specific experimental design allows us to distinguish between what we have called "outcome manipulations" and strategic behavior due to "satisficing" motives.

2 Experimental Setup

2.1 Experimental Design

Our game features a small committee consisting of 3 players (A, B and C) who have to vote on a set of four alternatives (a, b, c and d) under a Borda scoring rule. Each player has to assign $4, 3, 2$ or 1 point(s) to the alternatives (with each score occurring exactly once). The sum of scores over all players is computed for each alternative, and the one receiving the most points wins (see Figure 1). In case that two or more alternatives tie for the highest score, the winner is determined by a fixed tie-breaking rule, say in alphabetical order.

$$\overset{A}{\begin{pmatrix} a \\ b \\ c \\ d \end{pmatrix}} \quad \overset{B}{\begin{pmatrix} b \\ a \\ c \\ d \end{pmatrix}} \quad \overset{C}{\begin{pmatrix} c \\ b \\ a \\ d \end{pmatrix}} \Rightarrow \begin{array}{c} a = 4 + 3 + 2 = 9 \\ b = 3 + 4 + 3 = 10 \\ c = 2 + 2 + 4 = 8 \\ d = 1 + 1 + 1 = 3 \end{array} \Rightarrow \begin{array}{c} b \succ a \succ c \succ d \\ b \text{ wins} \end{array}$$

Figure 1: Induced preferences

The final monetary payoff Π_i of player i depends on the winning alternative. The payoff structure is chosen so as to induce the preferences given in Figure 1, i.e.:

$$\begin{array}{c} \Pi_A(a) > \Pi_A(b) > \Pi_A(c) > \Pi_A(d) \\ \Pi_B(b) > \Pi_B(a) > \Pi_B(c) > \Pi_B(d) \\ \Pi_C(c) > \Pi_C(b) > \Pi_C(a) > \Pi_C(d) \end{array}$$

The specific values of the payoffs are our first treatment variable. As can be seen from Table 1, we induced the same ordinal preferences in all treatments but varied the underlying cardinal payoff structure (i.e. we changed the absolute values keeping their relative position constant for each player). In the treatments Sequ1 and Sim1 the values are chosen so that the first-best alternative of player A (alternative a in Table 1) leads to an equal distribution of payoffs amongst the players, whereas the same is true for his second-best alternative in treatments Sequ2 and Sim2 (alternative b in Table 1).

In order to make successful outcome manipulations possible, we give some players additional information about other players' preferences and/or decisions. Accordingly, our second treatment variable is the information struc-

Table 1: Payoffs (in thaler)

Treatments Sequ1 and Sim1

player A	player B	player C
$\Pi_A(a) = 14$	$\Pi_B(b) = 17$	$\Pi_C(c) = 19$
$\Pi_A(b) = 9$	$\Pi_B(a) = 14$	$\Pi_C(b) = 16$
$\Pi_A(c) = 3$	$\Pi_B(c) = 6$	$\Pi_C(a) = 14$
$\Pi_A(d) = 0$	$\Pi_B(d) = 0$	$\Pi_C(d) = 0$

Treatments Sequ2 and Sim2

player A	player B	player C
$\Pi_A(a) = 14$	$\Pi_B(b) = 9$	$\Pi_C(c) = 15$
$\Pi_A(b) = 9$	$\Pi_B(a) = 7$	$\Pi_C(b) = 9$
$\Pi_A(c) = 3$	$\Pi_B(c) = 6$	$\Pi_C(a) = 6$
$\Pi_A(d) = 0$	$\Pi_B(d) = 0$	$\Pi_C(d) = 0$

ture. In one version of the game, before taking a decision, player A is informed about the preferences of players B and C, who are only informed about their own preferences. The three subjects then cast their vote simultaneously (treatments Sim1 and Sim2).

By contrast, in treatments Sequ1 and Sequ2, players vote sequentially. After player B and C made their decisions (simultaneously), player A is in addition informed about their decisions and can thus condition his choice on their actual votes. In all treatments, an uninformed person does only know his own preferences, and does not know whether someone else receives superior information. By contrast, the informed player A knows that he is the only one receiving additional information about the others. Table 2 lists a summary of all treatments.

The computerized[2] experiments were run at the University of Bonn in 2006. We conducted two sessions per treatment with 18 subjects each. The subjects were randomly divided into groups of 6. Within each group, two committees consisting of 3 players were randomly formed at the beginning of

[2]The program was written in PASCAL using the RATImage-Units by Abbink and Sadrieh (1995).

Table 2: Treatments

treatment	Sequ1	Sim1	Sequ2	Sim2
position of equal outcome (for A)	1^{st}-best	1^{st}-best	2^{nd}-best	2^{nd}-best
info about others' preferences	A	A	A	A
info about others' decisions	A	-	A	-
only own info	B & C	B & C	B & C	B & C
move order	sequential	simultaneous	sequential	simultaneous

each period. We played a total of three periods, so that that every participant was once in the role of player A, B and C, respectively.

In order to guarantee (quasi-)independence, the committees were reshuffled each period, and the labeling of the alternatives changed in each period. Moreover, subjects neither knew the number of periods nor the group sizes. In addition, they were informed about the outcome of each period only at the end of the experiment. We thus treat each subject's decision as an independent observation (one in the role of the informed player A and two in the role of the uninformed players B and C), resulting in 36 informed decisions and 72 uninformed decisions in total per treatment.

Each session lasted approximately 1 hour. After the experiment subjects received their accumulated earnings at a conversion rate of 0.30 Euro per thaler and a show-up fee of 3 Euro. Average earnings of subjects in informed (uninformed) periods were 3.28 Euro (4.65) in Sim1, 2.68 (2.62) in Sim2, 3.61 (4.44) in Sequ1, and 3.53 (2.28) in Sequ2. The instructions were written in a meaningful language avoiding loaded terms (the exact wording of the instructions is available from the authors upon request).

2.2 Behavioral Predictions

If all committee members vote sincerely, we obtain $b \succ a \succ c \succ d$ according to the Borda method (cf. Figure 1). To assume that players B and C vote sincerely seems natural since they are only informed about their own preferences. By contrast, A might use the superior information to maximize his monetary gains. By voting strategically (see Figure 2 for an example) individual A can achieve his first-best alternative a with a payoff gain of 5 thalers.

$$
\begin{array}{cc}
A & B+C \\
\text{manip.} & \text{original} \\
\begin{bmatrix} a \\ d \\ c \\ b \end{bmatrix} & \begin{pmatrix} b & c \\ a & b \\ c & a \\ d & d \end{pmatrix}
\end{array}
\Rightarrow
\begin{array}{l}
a = 4+3+2 = 9 \\
b = 1+4+3 = 8 \\
c = 2+2+4 = 8 \\
d = 3+1+1 = 5
\end{array}
\Rightarrow
\begin{array}{c}
a \succ b \succ c \succ d \\
a \text{ wins}
\end{array}
$$

Figure 2: An example of an outcome manipulation

On the other hand, it is also possible that participants have other objectives besides the maximization of their own monetary payoff. In particular, empirical evidence suggests that, in many contexts, subjects care about efficiency and/or fairness (see, among many others, Kirchsteiger 1994, Fehr and Schmidt 1999, Bolton and Ockenfels 2000, Charness and Rabin 2002); especially the fairness issue has received much attention over the past years. In our setup, if a player is sufficiently inequality averse, his preferences over the money distribution might differ from the one induced by self-centered preferences. For instance, if a player A has self-centered preferences, he will always prefer a over b due to the higher payoff associated with a. However, if a player A is inequality-averse, it is possible that he prefers alternative b in treatments Sim2 and Sequ2 due to the inequality associated with alternative a (cf. Table 1). Concretely, consider a person with the following type of utility function (see Fehr and Schmidt 1999)

$$U_i(x) = x_i - \frac{1}{n-1}\left[\alpha_i \sum_j \max\{x_j - x_i, 0\} - \beta_i \sum_j \max\{x_i - x_j, 0\}\right] ,$$

where $n = 3$ is the number of committee members, x_i and x_j are the payoffs of members i and j, and α_i and β_i are the individual "envy" and "guilt" parameters, respectively. In this model, players with strong feelings of guilt prefer b to a because the higher payoff associated with a cannot compensate for the "cost" of the higher inequality resulting from a, provided that $\beta \geq 2/3$:

$$\begin{array}{rcl} & a \preceq b & \Leftrightarrow \\ \Pi_A(a) - \frac{1}{2}\beta(2\Pi_A(a) - \Pi_B(a) - \Pi_C(a)) & \leq \Pi_A(b) & \Leftrightarrow \\ \frac{2(\Pi_A(a) - \Pi_A(b))}{2\Pi_A(a) - \Pi_B(a) - \Pi_C(a)} & \leq \beta & \Leftrightarrow \\ \beta & \geq \frac{2}{3} & . \end{array}$$

Thus, if there are (A-)players with a sufficiently high guilt parameter β, we should observe lower frequencies of manipulation in Sim2 and Sequ2 than in Sim1 and Sequ1.

To abstract from possible efficiency concerns, the total distributed amount of money is kept constant between alternatives a and b in each treatment. In Sim1 and Sequ1 the sum of thalers in state a ($\Pi_A(a) + \Pi_B(a) + \Pi_C(a) = 14 + 14 + 14 = 42$) equals the sum in state b ($\Pi_A(b) + \Pi_B(b) + \Pi_C(b) = 9 + 17 + 16 = 42$). The same holds for Sim2 and Sequ2, in which a leads to $\Pi_A(a) + \Pi_B(a) + \Pi_C(a) = 14 + 7 + 6 = 27$ and b to $\Pi_A(b) + \Pi_B(b) + \Pi_C(b) = 9+9+9 = 27$. Efficiency considerations should thus not influence the decision between a und b, and any difference in the manipulation rate between Sim1 and Sim2, as well as between Sequ1 and Sequ2, should be attributable to fairness concerns.

With respect to our other treatment variable (information about others' preferences (Sim) vs. information about others' preferences *and* actual decisions (Sequ)), there seems to be no reason why it should have an impact on *rational* agents' behavior. While common knowledge of rationality does, of course, not by itself imply that uninformed players will not manipulate in equilibrium, there seems to be no plausible story of why they should indeed try to do so, given their lack of information about the other players' preferences. For instance, sincere voting is easily seen to be optimal under the belief of a uniform distribution of the others players' votes. One would therefore expect uninformed players to always report their true preferences, and informed players to anticipate this and try to manipulate in order to achieve a higher monetary payoff under both information structures.

However, once we move away from the assumption of full rationality and allow for uninformed players to *make mistakes* or *tremble*, the behavior of informed players in Sim and Sequ might differ. Clearly, the same applies if the informed players only *believe* that uninformed players are not fully rational. Informed players in the Sim treatment face a situation of uncertainty, and might be afraid ending up with their third- or fourth best alternative if they (try to) manipulate. Indeed, giving only one point to the second-best alternative b (as in the specific manipulation shown in Figure 2 above) not only increases the probability of getting the first-best alternative but also decreases the probability of receiving the second-best alternative and increases the risk of getting a worse alternative than b. Thus, compared to the sincere outcome b, an informed player might win 5 thalers by manipulating but at the same time risks loosing (at least) 6 thalers. Depending on the likelihood that the informed player assigns to the corresponding events, he might refrain from manipulating if he is sufficiently risk-averse.

An alternative hypothesis, which would induce informed players not to manipulate in the way suggested in Figure 2 is that they exhibit *satisficing* behavior (see the seminal work by Simon 1959). The hypothesis behind satisficing behavior is that subjects, rather than try to achieve their highest possible payoff, are satisfied with a certain "acceptable" payoff. Intuitively, the rationale for satisficing behavior seems to be the stronger the more uncertain the environment becomes (see, e.g., Ben-Haim (2006) for an argument along these lines). In our setup, this suggests that, in face of the uncertainty of the uninformed subjects' behavior, informed players might simply be satisfied with the payoff resulting from the sincere outcome b which represents their second-best alternative. Interestingly, this motivation does not necessarily imply sincere voting behavior, as we shall see presently.

Either behavioral assumption (uncertainty-aversion and satisficing) is effective only in the Sim treatments but not in the Sequ treatments. Here, informed players face a situation of certainty as they are also informed about the other players' decisions (and in particular, whether they have voted sincerely). Informed players can thus decide to manipulate without risk, and we might therefore find a higher rate of outcome manipulations in the Sequ treatments than in the Sim treatments.

3 Experimental Results

For obvious reasons, we focus on the informed subjects in the description of our results. We start by presenting the differences in the behavior of informed vs. uninformed subjects. As one would expect, the frequency of sincere votes is significantly higher if subjects are uninformed rather than informed. Subsequently, we analyze the potential influence of information and inequality on the decisions. As we shall see, the degree of outcome manipulation is sensitive to variations in the information structure, but not to inequality. Yet, the overall frequency of outcome manipulation is unexpectedly low, so we finally try to identify possible motivations for the behavior that we observe.

Figure 3: Frequency of sincere votes

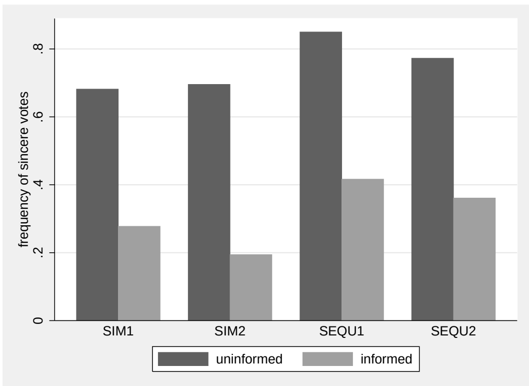


Figure 3 shows the total frequency of sincere votes of uninformed and informed players per treatment. Overall, the total frequency of sincere votes is 31% if informed and 75% if uninformed.[3] In all but two groups, the

[3]For the informed players, we simply count the total number of sincere votes and divide by the total number of informed decisions per treatment (=36). For the uninformed players, we count the total number of sincere votes in the *first period* that are not random (as classified from the questionnaire answers) and divide by the total number of first

frequency of uninformed sincere decisions is higher than of informed sincere decisions. This also holds at the level of treatments (signrank-test, 2-sided, $p = 0.0269$ in Sim1, $p = 0.0273$ in Sim2, $p = 0.0747$ in Sequ1, and $p = 0.0747$ in Sequ2). It thus seems safe to say that informed players behave differently than uninformed players. Nevertheless, the number of informed players stating their true preferences is surprisingly high, uniformly across treatments.[4]

Result 1: *Despite the possibility of a successful outcome manipulation, a non-negligible fraction of informed players report their preferences truthfully. Yet, compared to the uninformed players the additional information crowds out sincere voting behavior.*

Next, we look in more detail at the behavior of informed players, checking how often they manipulate the outcome. In the sequential treatments, informed players know the actual votes of the other two members in the committee. Therefore, we define the frequency of manipulation in these treatments as:

$$frequency\ of\ manipulation = \frac{\#\ manipulations}{\#\ manipulation\ possibilities},$$

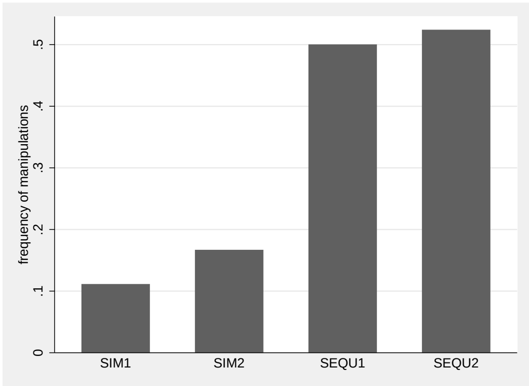
where the manipulation possibilities are all instances in which there existed a way to achieve a higher-ranked alternative than the one resulting from sincere voting. A decision is counted as a manipulation if the informed player casts one such manipulative vote. Note that the term "manipulation" thus refers here only to strategic voting which results in an outcome that is *strictly*

period, non-random uninformed votes per treatment (22 in Sim1, 23 in Sim2, 20 in Sequ1, 22 in Sequ2). We consider only first-period choices in the case of uninformed players to control for potential dependencies between informed and uninformed periods stemming from information spill-overs between periods. Looking only at first-period's decisions does not alter the results significantly, but helps to reduce the noise in our sample. Otherwise, the total frequency of sincere votes of uninformed players is still twice as high (63%), but p-values are slightly higher due to the additional noise. Note that a similar problem does not exist for informed players' decisions.

[4]We do not find significant treatment effects with respect to the number of informed sincere votes. The 2-sided p-values from a corresponding ranksum-test are 0.7453 (Sequ1/Sequ2), 0.4029 (Sim1/Sequ1), 0.402 (Sim1/Sequ2), 0.1629 (Sim1/Sim2), 0.1824 (Sim2/Sequ1), and 0.2087 (Sim2/Sequ2).

preferred to the sincere outcome, and not to insincere voting in general. As can be seen from Figure 4, the total rate of manipulation is 50% in Sequ1 and 52.4% in Sequ2.

Figure 4: Frequency of manipulations



In treatments Sim, informed players know the preferences but not the actual decisions of the other members. When deciding how to cast the vote, the informed member needs to form beliefs (conditional on the preference information) about the other players' decisions. In accordance to the procedure in Sequ, a decision should be classified as a manipulation if, *given the beliefs*, it leads to a higher-ranked alternative than the one achievable by a sincere vote. It seems reasonable to assume that an informed player's beliefs about the others' actions and his information about the others' preferences match, i.e. that he expects them to report their preferences truthfully. Under this assumption, each informed decision problem is a manipulation possibility by design, and we speak of a manipulation if the vote actually casted would have yielded a better (=first-best) outcome given that the others vote sincerely. Application to our data in Sim shows (Figure 4) that the total frequency of manipulation is 11.1% in Sim1 and 16.7% in Sim2.[5]

[5] Another possible approach would be to determine the manipulation frequency in Sim by naively assuming that the informed member perfectly predicts the others' decisions, i.e. that his beliefs about the others' decisions and their actual decisions coincide even when the uninformed subjects do not vote sincerely. While lacking a clear conceptual foundation, such an approach does not qualitatively change the results reported in the text.

Turning to the analysis of treatment effects, recall from Section 2.2 that we have two treatment variables: information and fairness. As already noted, the behavior of fully rational, self-centered, money-maximizing individuals should not be affected by variations of these two variables. But empirical evidence suggests that economic agents are neither fully rational, nor always self-centered. In our present context, the uncertainty about the other players' behavior, and in particular about their rationality, creates a situation of *ambiguity* which might lead to lower manipulation rates in Sim1 (Sim2) as compared to Sequ1 (Sequ2). On the other hand, fairness in the sense of inequality aversion might lead to lower manipulation rates in Sim2 (Sequ2) as compared to Sim1 (Sequ1).

We find that the difference in the manipulation frequency between Sim1 and Sim2 is only 5.6 percentage points, and 2.4 between Sequ1 and Sequ2; neither of the two differences is significant (ranksum-test, 2-sided, $p = 0.6045$, resp. $p = 0.6267$). Furthermore, in the questionnaire data, only one person states to have manipulated because of fairness concerns (Sim1 and Sequ1), and only two subjects write that they did not manipulate (Sim2 and Sequ2) because of fairness concerns.[6] Taken together, this suggests that fairness concerns in our context have only a negligible impact on voting behavior.

On the other hand, the additional information about other members' decision strongly affects the manipulation rate. The manipulation frequency is more than four times higher in Sequ1 than in Sim1 (difference of 38.9 percentage points), and more than three times higher in Sequ2 than in Sim2 (difference of 35.7 percentage points); both differences are significant (ranksum-test, 2-sided, $p = 0.0152$, resp. $p = 0.0509$).

Result 2: *The behavior of informed subjects is not affected by fairness considerations, but strongly affected by the degree of uncertainty, i.e. by differences in the information structure.*

[6]Six subjects in Sequ2 give more points to their second-best alternative (the payoff-equalizing one), although this alternative would also have won if they had voted sincerely - this might also be interpreted as a preference for fairness. However, according to their questionnaire answers, only three did so because of fairness concerns.

Figure 5: Categorization of informed votes

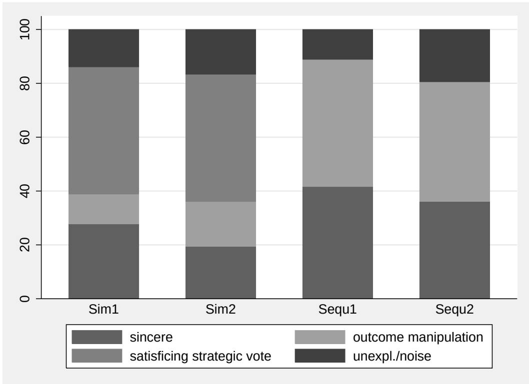


Figure 5 displays the different categories of informed votes for each treatment. Adding up the instances of sincere and manipulative votes, we see that this explains 88.89% in Sequ1 and 80.56% in Sequ2, but only 38.89% in Sim1 and 36.11% in Sim2 of all informed decisions.[7] The remaining decisions in Sequ1 and Sequ2 are difficult to classify and we count them as random or noise. By contrast, the remaining decisions in Sim1 and Sim2 do not appear to be random upon closer examination. In fact, in each of these two treatments 47.22% of all informed decisions can be classified as *conformative* votes.[8] These votes take the form of $b \succ a \succ c \succ d$, or $b \succ c \succ a \succ d$. In the first case, the informed player switches the ranks of his first- and second-best alternative so as to *agree* with the highest-ranked alternative resulting from the other members' (sincere) votes. In the second case he adopts the entire aggregate ranking resulting from the other members' sincere votes (cf. Figures 1 and 2).[9]

One might be tempted to attribute such behavior simply to a "preference for conformity."[10] In light of our results from Sequ, however, one has to be

[7] We classified as "explainable" also those cases where already a sincere vote of the informed member would have yielded the first-best outcome and the outcome resulting from actual insincere voting was first-best as well (four cases in Sequ1 and two in Sequ2), and three decisions that were unambiguously attributable to fairness concerns (all in Sequ2).

[8] Leaving us with 13.9% unexplained decisions in Sim1 and 16.7% in Sim2.

[9] Full adoption of the other's aggregate ranking occurred once in Sim1 and five times in Sim2.

[10] see, e.g. the seminal work by Asch (1951)

careful in interpreting the results in this direction. Indeed, we do not observe similar "conformity behavior" in Sequ1 and Sequ2, which suggests that it is caused by uncertainty aversion rather than by a genuine preference for conformity. Informed players in Sim might expect that uninformed players do not behave in a rational way and, for whatever reason, do not state their true preferences. More specifically, there is evidence that informed players fear ending up with a bad alternative (their third- or fourth-ranked) if uninformed subjects vote in an unpredicted way. When manipulating in the way described in Figure 2, the election ends in a close race from the viewpoint of the informed member: his first/second/third - ranked alternatives receive 9/8/8 points, respectively, provided the other members vote sincerely. In this situation, a *tremble* of an uninformed member is likely to switch the winning alternative since the highest alternative only leads by one point. For example, if B switches the points she gives to a and c, c wins the election (cf. Figure 2). On the other hand, by giving 4 points to his second-best alternative (exactly the opposite to what one has to do to successfully manipulate), the informed player can significantly reduce the risk of receiving a bad alternative due to trembles, since the winning alternative then receives three points more (8/11/8 points under sincere voting of the other members). Some subjects' behavior can thus be described as satisficing behavior in that they attempt to achieve some aspiration level (here the second-best alternative) rather than to maximize payoff using (possibly complex) computations based on uncertain hypotheses about other voters' behavior. Evidence for this motivation can also be found in the questionnaire data. Subjects were asked to describe how they decided in case they were in the role of the informed player. Most of the informed subjects who switched the ranks of alternatives a and b state that they did so because they wanted to increase the probability of getting a high alternative, or decrease the chances of "loosing" or receiving a low payoff. A representative answer is the following:

> "I gave most points to my second-best alternative, because this one already received many points from the other members. In any case, I wanted to avoid receiving only my third- or fourth-highest alternative."

Often satisficing behavior is also explainable by the hypothesis of maximizing expected utility with respect to appropriately specified beliefs. For instance, in our context the observed satisficing behavior could be explained by assuming that uninformed players cast their vote in any possible way with equal probability, and that these "trembles" are independent from each other. In this case, the probability that a "bad" outcome (c or d) wins almost doubles. It is 13.89% if informed subjects switch a and b, i.e. report $b \succ a \succ c \succ d$, and 37.15% if they manipulate in the way described in Figure 2 by reporting $a \succ d \succ c \succ b$.[11] On the other hand, the probability of receiving the first-ranked alternative drops from 56.08% when reporting $a \succ d \succ c \succ b$ to 31.6% when only switching a and b. While such considerations may indeed *rationalize* the observed satisficing behavior, it is by no means evident that they provide an accurate description of the cognitive processes that govern actual behavior. In any case, we obtain the following result:

Result 3: *Under uncertainty, rather than to try to bring about their best alternative, the majority of informed subjects shows satisficing behavior: They try to secure themselves at least their second-best alternative.*

4 Conclusion

In this paper, we examined the voting behavior of asymmetrically informed members in a small committee under a Borda scoring-rule mechanism. A variation of the underlying payoff structure did not lead to a change in behavior, implying that subjects were not motivated by fairness, or more specifically, by inequality aversion. By contrast, introducing uncertainty about the actual decisions of uninformed members had a significant impact on informed subjects' behavior. While they frequently manipulated in order to bring about their most preferred outcome in a situation of certainty, they

[11] Remember that more than one way of manipulating exists. For example, reporting $a \succ c \succ d \succ b$ also leads to a as the winner of the election if the others vote sincerely. In this case, the probability of c or d winning through trembles is still 36.46%. The probabilities are calculated for the labeling of alternatives as shown in Figure 1. Changing the labels might result in slightly different probabilities due to the lexicographical tie-breaking rule.

rather tried to *satisfice* or secure themselves a specific payoff when acting under uncertainty.

Our results have a number of implications, both for the advancement of existing theories and for the design of voting mechanisms in practice. First, it is doubtful whether the "fear" of strategic manipulations is always justified in an applied framework. Axiomatic approaches usually call for non-manipulability of the selection mechanism, implicitly assuming that subjects manipulate the outcome whenever this is possible. However, the actual frequency of manipulations in our experiments is rather low. Recall that even in the easiest possible situation for manipulations, i.e. in a one-shot, sequential setup with only three members where the last mover is informed about the others' preferences and decisions, only half of the subjects really do manipulate. Consequently, this figure can be viewed as an upper bound for actual manipulations. In naturally occurring environments with increased level of complexity and inexperienced subjects we should expect to observe even fewer occurrences of strategic manipulations.

Furthermore, our findings inform the growing literature on behavioral social choice (see, e.g., the recent monograph by Regenwetter et al. 2006) in a specific way. Besides sincere votes and manipulations that aim at changing the probable outcome of the election, we observe "satisficing" strategic behavior, i.e. insincere votes that are attributable to the desire to avoid bad outcomes rather than to achieve the best possible outcome. Indeed, many informed subjects deviate from their sincere vote in order to reinforce the alternative that is likely to receive the highest number of points from the other voters. This might add much to our understanding of how people really take decisions in voting contexts such as the one considered here.

Finally, our analysis also sheds light on the recent research work on social preferences. Neither in the simultaneous game with strategic interaction, nor in the sequential game in which the decision is a simple choice between different payoff distributions, do we observe behavior to be shaped by inequality aversion and/or fairness considerations. It seems to be a worthwhile task for further work to clarify why this might be so.

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