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MEAN VOTING RULE AND STRATEGICAL BEHAVIOR: AN EXPERIMENT

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Mean voting rule and strategical behavior: an experiment*

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Abstract

This paper considers the problem of voting about the quantity of a public good. An experiment has been run in order to test the extent of the strategic bias that arises in the individual vote when the social choice rule is to select the mean of the quantities voted for. Conflicting theoretical predictions are available in the literature on this purpose. The political implications of the mean rule and its effects upon efficiency are also discussed. The role of voters' information is considered. A comparison is made with the working of the median rule.

1 Introduction

Many mechanisms that have been suggested for collective choice do not provide incentives for sincere disclosure of preferences; misrepresentation can arise e.g. under majority voting, or, with reference to choices pertaining to public goods, in procedures à la Wicksell and Lindhal.

Two recent studies by Ehlers et al. (2) and by Renault and Trannoy (4) have revived the discussion about strategic behavior in social choices by focussing upon the mean vote procedure. They describe the social choice process as aimed at locating a point within a bounded space (e.g. an interval of the real line, on which the amount of a public good is measured). Under the mean vote procedure society chooses the mean of the quantities voted for by the agents. The conclusions reached by the aforementioned papers about the working of mean vote are opposite, as the former predicts sincere disclosure of preferences, while the latter predicts widespread strategical behavior.

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In this paper, after a discussion of the theoretical problems involved by mean voting, an experiment is used to test which predictions, if any, are supported by data.

2 Mean vote and strategic behavior

Strategical voting behavior in social choice procedures can be ruled out only under specific conditions. Moulin, in a classical paper (3), analyses the working of a mechanism in which each participant directly announces his preferred point on the real line, on which e.g. the quantity of a public good is measured. The median point among those voted for represents the social choice. Restriction of preferences (single peakedness) secures in this case strategy-proofness, which consists of the stability of a non-cooperative Nash equilibrium, as no agent has an incentive to respond to the other agents announcing their "peak" alternative by announcing any other alternative than his true peak[1]. This result, however, does not carry over to cases in which preferences have an unrestricted domain or the problem is multidimensional. Other approaches aimed at securing sincere revelation of preferences, and specifically designed for the revelation of public goods demand (like e.g. the Groves and Clarke mechanisms, which, in the most widely known versions, imply that truth telling is a dominant strategy), have other possible drawbacks, like budget imbalance.

Recently the discussion about strategy proofness in voting has been revived from a non standard point of view in a paper by Ehlers et al. (2), who adopt a kind of bounded rationality approach to the problem of collective choice. A basic assumption made by these authors is Lipschitz continuity of the voters' utility function, a characteristic that broadly speaking means that utility does not change too fast when its arguments vary. Lipschitz continuity implies that a choice not aligned with what the agent prefers entails an utility loss not larger than L times the "distance" between the preferred point and the socially chosen one. This representation of preferences, while obviously restricting the permissible transformations of the utility function, is in line with the idea of a kind of limited ability of agents in perceiving the utility effects of decisions pertaining to public goods. This might be justified by the complexity which characterizes the collective action and the provision of public goods. Agents might simplify things by considering e.g. that no more than a given utility amount can ever be gained through a unit increase in the amount of a public good.

The mechanism studied by Ehlers et al. (2) refers to a multidimensional decision problem: i.e. society must choose a point within a finite subset of an Euclidean space, whose dimensions refer to the issues at stake (i.e. in each dimension the amount of a given public good, or the availability of a given political attribute in a decision is measured). The suggested procedure is the mean vote, i.e. society chooses the point whose coordinates are the mean of the coordinates of the points voted for by citizens. Every participant thus votes

[1] Strategy-proofness holds for coalitions as well.

for a point, by supplying the vector describing her preferred choices in each dimension.

With reference to a large enough polity, the mean will become about insensitive to the individual vote, thus implying only a small benefit of lying in preference reporting. By considering that Lipschitz continuity also sets a cap on the effects in utility terms, mean voting turns out to be "sharply threshold strategy proof", as the gain from lying cannot encompass a given threshold. By considering that finding an advantageous strategy for misrepresentation of preferences is likely to be demanding in terms of information and calculus, threshold strategy proofness implies a prediction of truth telling in mean voting procedures whenever the costs of strategical behavior encompass the threshold. The level of the threshold in turn depends positively on the Lipscitz constant L (i.e. the parameter describing the maximum reactivity of the utility function), which is assumed to be the same for all the voters, and negatively upon the number of participants in the decision process. Note that threshold strategy proofness occurs at the price of individual rationality in voting (why should one vote if the effect on the collective choice is negligible?), a well known problem that arises also with reference to the majority voting rule in large electoral bodies. Another problem arising from the Ehlers et al. (2) approach is that they consider a multidimensional decision in which only public goods or dimensions of a social choice are involved, i.e. in their model all individual utility functions are defined on the same domain. Hence, to apply their approach to a problem pertaining to public goods, one must assume that tax shares have already been set, in order to eliminate the private good from the utility function. This means also, as routinely happens in median voter models, that a change in the rule for sharing costs modifies the induced individual preferences and the result of voting. Even with these limitations the approach of Ehlers et al. (2) seems to open a quite relevant way out with respect to the problem of strategical behavior in collective choices.

2.1 The mean vote game

A somewhat more pessimistic message is conveyed by another recent paper that deals also with the mean voting mechanism and considers the voters' optimal strategies in this case. The differences in the conclusions with respect to the paper by Ehlers et al. (2) that will be discussed in the following are largely due to the fact that Renault and Trannoy (4) consider standard fully rational economic agents. In their setting voters have single peaked preferences defined on a segment of the real line (on which e.g. the quantity of a public good is measured), i.e. their problem is unidimensional. Like in the Moulin (3) paper, voters announce (either sincerely or not) their "peak" point. Society, however, does not select the median but the mean, where the mean can be simple (i.e. one man one vote) or weighted. Building upon results available in the literature, the authors are able to show that there is a unique Nash equilibrium allocation for this game. The allocation represents a cut point, that separates players into two groups, i.e. all the members of one group would like an amount larger than

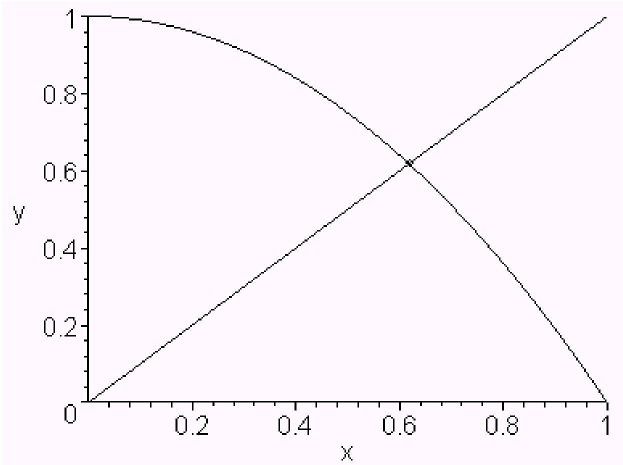

Figure 1: Nash equilibrium of mean vote

the equilibrium one and thus vote for the maximum quantity of the public good (with reference to the interval in which the social choice must lie); the members of the other group would like instead a quantity lower of the equilibrium amount and thus vote for the minimum quantity. The working of the model is illustrated in Figure 1. Let us assume perfect information of voters about all the peaks and the corresponding voters' weights. Consider a continuum of voters indexed by x, uniformly distributed[2] on the unit interval $[0, 1]$. Consumers with a high x have a low bliss point y, i.e. a low preferred quantity of the public good. In Figure 1 thus the negatively sloped curve represents bliss points as a function of x, while the positively sloped curve represents the cumulative weight in terms of votes. As an equal weight for all the voters has been assumed in the Figure, the latter curve is the 45° line. Note that the cumulative weight curve measures also the value progressively assumed by the mean if voters vote 1. The cut point is the abscissa of the point where the two curves intersect, while the equilibrium allocation is the ordinate of the same point. On the left hand side with respect to the equilibrium point, until the bliss points curve lies above that of cumulative weights, the agent by voting 1 reduces as much as possible the gap between the social choice so far (i.e. the cumulative weight) and her bliss point. Note that such a voter does not fear that the vote of the next agent might push the mean too up, as the next agents are less eager of the public good. The opposite reasoning holds on the other side, where the curve of cumulative weights lies above the bliss points curve. Voters on this side vote 0. For the agent located at the cut point the bliss point and the progressive mean coincide. On the other hand, because of the continuity assumption, this type is

[2] We resort to some simplifying assumptions only for expository purposes. For a more general treatment see Renault and Trannoy (4).

of measure zero. Thus the model predicts that virtually all the agents will hide their preferences and choose an extremist behavior. When there is a discrete number of agents instead, it might happen that one agent[3] exactly reaches her preferred quantity by fine tuning her vote within the interval, thus adopting a non extremist behavior. Renault and Trannoy (5) find also that the strategic bias is independent of the information structure of the game, and thus occurs also when the assumptions pertaining to the participant's information about the other people's bliss points or weights in the vote are relaxed.

As far as the equilibrium allocation is concerned, it might coincide or not with the mean of actual bliss points. Mean vote performs better than the median one in eliciting the actual mean of bliss points if the latter (once data have been normalized) is central in the interval $[0, 1]$.

2.2 The theoretical and political relevance of the mean vote rule

From a theoretical point of view, Ehlers et al. (2) show that the mean rule is the unique anonymous and unanimous[4] mechanism that secures threshold strategy proofness when there are five or more voters. From a political point of view, up to our knowledge, there is no political tradition about the use of a mean rule in voting. One may, however, find procedures that work more or less as if a mean rule was adopted. Some interesting cases are reviewed by Renault and Trannoy (4). They focus particularly upon the "forced to pay free to choose" mechanisms, under which agents choose which share of the taxes they pay must go to specific uses, e.g. to the financing of their preferred school district or to a specific religious confession. One can thus see the amount of money devoted by the society to each of these uses as the mean of the shares chosen by taxpayers, weighted by the amount of taxes that each citizen pays. In fact the currently used mechanisms only allow discrete choices (e. g. in Italy one must decide wether to allocate 8% of the income tax to a religious confession or not), but if the prediction of extremist behavior holds the only relevant alternatives are in fact discrete and extreme, and thus the idea of mean voting is tenable.

One might also rationalize in terms of mean vote the procedures based on rotation, under which the choice is made by a member of the relevant body that stays in charge for a given (short) period and then steps down while a second member takes charge. The policy that ensues over a period (e. g. one year) can then be described as the mean of the policy choices made by the members, where individual choices are weighted by the span of time in which everyone is in charge and by the appropriate time discount factor if relevant. Rotation has been widely used in the European institutions and is also provided for in the recently designed constitution, where it is mandated for the presidency of the

[3] If there are many voters in this position there might be multiple Nash equilibria, while, however, the equilibrium allocation is still unique.

[4] i.e. such that when all the voters prefer a given point the latter is also elicited by the mechanism.

EU's sectorial Councils and for the members of the Commission, which must correspond to two thirds of the number of Member States.

Another approach that can be rationalized in terms of the mean rule is the random assignment of the right of deciding to a member of a social body, that stays in charge for a short period and is followed by another member chosen at random too, and so on. The method of drawing lots was widely used in the classical Athen to select chairmen of political assemblies, members of the government, officials and judges; in fact drawing was the rule while other methods of selection were the exception. Drawing was often used jointly with rotation. Arisoteles[5] e.g. refers that the epistate of the Pritaneon, who, among other powers and duties, was in charge of guarding the Treasury of the State, was drawn to serve for one day and could hold that position only once in life.

The logic behind these approaches seems that of protecting against dictatorship and corruption, avoiding a too fierce political struggle for power and securing low transaction costs. When equal weights are adopted, participants to the decision process are endowed with equal power and are assumed to have equal ability to representing the whole body. Mean voting differs from the rotation and random selection procedures mainly as it avoids the variance around the mean (and then the risk) that the latter systems involve. Reanult and Trannoy (4) also stress a potential role of the mean rule for protecting minorities. In the "forced to pay free to choose" model e.g., religious minorities can convey funds to their preferred schools, while a median voting procedure might disregard in full their preferences (i.e. the median voter might choose a zero amount for a good that is of vital interest for a minority). Thus mean voting might prevent social unrest or secessions in multiethnic or multireligious countries or federal states.

Unfortunately, the mean rule does not secure efficiency in the choice of the collective good amount, even in cases in which sincere revelation of preferences occurs. While Bowen (1), in a famous contribution, has shown that efficiency occurs when the mean of marginal rates of substitution equals marginal cost/N (which is the equivalent of the Samuelson efficiency rule, i.e. the sum of marginal rates of substitution equals marginal cost), this is a condition referred to mean demand prices, and not to mean quantities. From this point of view, the mean rule does not seem better than the median rule implied by majority voting, i.e. both do not secure efficiency in collective choices.

3 The experiment

A laboratory experiment is used to test whether the mean rule actually prompts sincere revelation of preferences or not, and in the latter case if extremist behavior prevails. The experiment is aimed also at testing the effects of the mean voting rule upon social welfare. The median vote rule is used in the experiment as a control treatment.

[5] in the Athenaion Politeia, 44, 1.

The experiment has been run[6] so far with 24 participants assigned to groups of 3 people. The main variable that varies during the experiment is the information supplied to the participants. The design is in a sense prone to elicit strategical behavior, as, even according to the Ehlers et al. (2) approach, the smaller the group of voters the larger the threshold for strategy-proofness. Even in a small group, however, one should see a more widespread sincere revelation of preferences under lack of information than with information, as in the former case it is more cumbersome to design efficient strategies. Sincere disclosure of preferences should be the rule under median voting.

In order to keep the experiment simple, it has been designed in just one dimension, by inviting the participants to voting for their preferred amount of a public good in the interval $[0-10]$. Participants receive payoffs based on quadratic utility functions, which are thus single peaked and are assumed to describe each participant's net benefit[7] as a function of the amount of the public good. As attention is restricted to the interval $[0, 10]$, the utility functions considered are Lipscitz continuous. However, it is obviously by no means granted that when the payoff is evaluated by each participant on the basis of her actual individual utility function this characteristic still holds.

In the experiment payoffs are provided to the participants on paper instructions - in a table and through a graphical representation -and they can also digit an amount for the public good on their computer and check the result in terms of payoff on the computer's screen before voting. The actual payment to each participant is represented by her payoff in a randomly selected round out of the 15 actually played. The experiment took about an hour and the payment was around 10 euros per capita.

8 types of preferences were assigned to the participants: hence some types appear more than once. The number of types was kept small in order to have round bliss points, to ease the perception. During the experiment, agents always kept the same utility (i.e. payoff) function. This should ease the learning during the experiment. Agents were always informed about the procedure used for making the collective choice (either the mean or the median).

Agents are assigned to groups of 3 people and receive 3 treatments in sequence as described in Table 1. Groups are formed without repetition (i.e. each agent always meets other people having different bliss points) and with the aim of forming collectives in which the mean vote differs from the median one in case of sincere revelation. A half of the participants start with full information about bliss points of the other two members of their group, while the remaining participants have no information about either the bliss points or the number of members in their group. After five rounds of mean vote the scenario is reversed, i.e. those who had information are told that they are now part of a group with

[6] The experiment was run at the ALEX laboratory of the University of Eastern Piedmont. It was programmed by Marie-Edith Bissey and conducted with the software z-Tree (Fischbacher 1999).

[7] It is thus assumed that the cost shares have been set, so that each agent's utility only depends on the public good.

Voting rule	Mean		Median
Round	1,..,5	6,..,10	11,..,15
Sequence of the treatments for:			
12 people in *groups of* 3	*i*	*ni*	*ni*
12 people in *groups of* 3	*ni*	*i*	*i*
Total number of observations	120	120	120

i: players have information about other people's bliss point
ni: players do not have information about other people's bliss point

Table 1: the experiment design

an undefined number of possibly new partners (and the composition of their group is in fact changed), while those who beforehand had no information now receive it. This design aims at verifying if there are effects arising from the sequence in which the treatments are administered. In the final five rounds every agent keeps her previous status in terms of information about the other people's bliss points and about the composition of the group, while the median voting rule is used. As the problem is unidimensional and single peaked, no misrepresentation of preferences should occur in this case (see Moulin, (3)).

3.1 Data Analysis

A preliminary data analysis has shown that a behavioral mode that was often followed by the participants is a "rule of thumb" based on the observation of the previous round results. This rule provides that the agent increases her reported amount if the collective choice in the previous round was under her bliss point, and decreases it in the opposite case. To capture the relevance of this conduct, observations pertaining to the first round[8] were dropped to compile Table 2.

Whenever the rule of thumb implies lying, agents vote strategically in a broad sense. A strategical vote is expressed also by those who behave according to the preditiction of Renault and Trannoy. Hence agents can be classified according to whether they vote sincerely, strategically (i.e. according either to the rule of thumb or to the Renault and Trannoy's predictions; the latter will be termed extremist for brevity), or do not match anyone of the mentioned cases.

Strategical behavior (as previously defined) and sincere revelation are able to describe the conduct of $70 - 80\%$ of the participants. Strategical behavior prevails under mean voting, while sincere revelation does under median voting. On the other hand, sincere revelation occurs quite often also under mean voting, and extremist behavior is neither widespread nor specially linked to mean voting, two facts that cast some doubts about the predictions based upon the Renault and Trannoy approach.

Repetition of the voting game under the mean rule seems, however, to induce the participants to increase their resort to alternatives to the sincere revelation

[8] First either in terms of sequence of the overall experiment or of information availability or of voting rule.

Voting rule	Strategical behavior		Sincere revelation
		of which: extremist	
Mean (total)	**37.98%**	**15.38%**	**33.17%**
Mean (without information)	38.89%	15.74%	32.00%
Mean (with information)	37.00%	15.00%	34.26%
Median (total)	**29.17%**	**16.67%**	**50.00%**
Median (without information)	35.42%	20.83%	43.75%
Median (with information)	22.92%	6.25%	56.25%

Table 2: Modes of behavior under different treatments

	With Information	Without Information	Total
1st round	50%	41.67%	45.83%
5th round	33.33%	33.33%	33.33%
10th round	25%	33.33	29.17%
15th round	58%	50%	54,17%

Table 3: percentage of sincere disclosures in rounds

of preferences (Table 3). On the other hand, under the median voting rule (to which the 15th round refers) people seem to learn somewhat that sincerity pays.

To further investigate the voter's behavior in comparison with the predictions respectively of the Ehlers et al. (2) and the Renault and Trannoy (4) papers, let us consider the sequence of treatments. The chi-square test[9] shows that under the mean voting rule with full information there are differences in behavior according to whether the treatment is administered at the beginning of the experiment or after five rounds of mean voting without information (Table 4). Experienced subjects resort more often to extremist voting, while, however, the overall incidence of this mode remains small [10].

	Without experience	With experience
Sincere	43.33%	6.67%
Extremist	18.33%	23.73%
Other	38.33%	70.00%

Table 4: modes of behavior under mean voting rule with information

[9] $\chi^2 = 12.42$, df=2, critical value=9,21, significant at $\alpha = 0.01$. The nul hypothesis is rejected ($\chi^2 > Critical\ Value$) . The null hypothesis states that the player's experience does not affect his behaviour (i.e., sincere disclosure of preferences, Renault and Trannoy strategical behaviour, other)

[10] Paritioning Table 4 in two tablets, it turns out that the only significative Chi-square refers to the modalities "sincere+extremisl" versus "other".

Voting Rule	Mean		
Information	Yes (a)	No (b)	Total (a+b)
Renault et al.	3,55	3,37	3,45
Ehlers et al.	2,06	2,08	2,06

Table 5: standard deviation with respect to predicted values

	Welfare loss
Actual outcome	-2.60%
Renault et al.	-0.53%
Ehlers et al.	-0.90%

Table 6: welfare gap with respect to social optimum

Table 5 reports the standard deviation[11] of the actual voters' choice with respect to the two predictions. The prediction which exhibits a smaller deviation is the one which exhibits more predictive accuracy. Table 5 suggests that there is a general better fit of the Ehlers et al. predictions, which seem also more accurate when players vote in absence of information.

An issue which deserves attention concerns the social welfare first best outcome, and in particular the voting mechanism that gets closer to the social optimum. To cope with this point, firstly it is required to define the objective social welfare function. To this purpose a standard Bergson-Samuelson social welfare function, given by the sum of individuals' utility functions, is set. Each electoral group is associated with a group specific social welfare function and, therefore, to a social welfare maximizing choice. Then the welfare gap with respect to this social optimum is calculated, and compared with the one that would have arisen under the predictions respectively of Ehlers et al. (2) (sincere revelation of preferences) and of Renault and Trannoy (4) (extremist behavior). Table 6 shows that the welfare loss that actually occurred in the experiment is larger than both predictions.

Thus the standard deviation [12] of the actual choice with respect to the social optimum is computed and reported in Table 7. It is compared to the standard deviation predicted in the light of the Ehlers et al. (2) and Renault and Trannoy (4) articles (Table 7). The deviations of actual choices from efficiency

[11] The standard deviation has been calculated as:: $\sqrt{\frac{\sum_{i=1}^{N}(x-x^*)^2}{N-1}}$, where x^* is the predicted value under consideration, x is the individual choice and N is the total number of votes in the relevant rounds.

[12] The standard deviation has been calculated this way: $\sqrt{\frac{\sum_{i=1}^{N}(x-x^*)^2}{N-1}}$, where x^* is the social optimum for the group, while x is the social choice (either actual, or predicted respectively by Ehlers et al. (2) or by Renault and Trannoy (4) an N is the number of groups which receive the specified treatment.

Voting Rule	Mean			Median			
Inform.	Yes (a)	No (b)	Total (a+b)	Yes (c)	No (d)	Total (c+d)	(a+b+c+d)
Actual choice	1.26	1.19	1.22	1.14	2.31	1.80	1.43
Renault et al.	0.78	1.03	0.91	0.32	1.07	0.78	0.86
Ehlers et al.	0.65	0.74	0.69	0.14	0.91	0.65	0.67

Table 7: standard deviation with respect to social optimum

are generally larger than both the predicted ones. On the other hand, mean voting does not seem worse than median voting from this point of view.

4 Econometric analysis

Econometric analysis can help in describing the interplay of the variables that might influence the individual behavior in voting.

The panel consists of cross-sections of individuals observed for a 15 round time series. The total number of observations is 360.

Thus a regression is set where *strategy* represents the regression's dependent variable. It measures the player's strategic behavior and it is expressed by the absolute deviation of the player's actual choice with respect to his individual optimum. The more this distance increases, the more the player behaves strategically, i.e. the more he deviates from his true preferences.

The following explanatory variables were considered:

period is a sort of trend variable useful to capture the players' experience. It varies from 1 (first period) to 15 (last period). The use of a lagged variable (*ruleofthumb*) reduces the time series to 14 time observations (the first period has been lost);

inf is equal to 1 when full information is provided to the player, 0 otherwise;

votingrule is equal to 0 when a mean voting rule is implemented, 1 when the median voting rule is implemented;

ruleofthumb explanatory variable is obtained by the difference between the individual bliss point with respect to the actual amount of the public good chosen inside each group (on the basis the actual individuals' votes) at time t-1;

mgvar measures the marginal gain/loss. It represents the player's marginal utility variation with respect to the public good;

deltapref represents the distance in absolute value of the individual preferred amount of public good with respect to the group specific mean value, i.e. the public good amount which would be chosen by the group when all the members truly reveal their preferences;

delta_rt_pref is a variable intended to catch the predictive accuracy of the Renault and Trannoy expectations. The value of this variable represents the distance, in absolute terms, between the Renault and Trannoy voting prediction and the individual's true preferences;

constant is the constant term.

The presence of heteroskedasticity across panels has been assessed by the likelihood ratio test and the modified Wald test for groupwise heteroskedasticity in fixed effects regression model. A cross sectional correlation (in fixed effect model) has been detected by the Breusch-Pagan statistic for cross-sectional independence in the residuals of a fixed effect regression model.

Finally the Wooldridge test for serial correlation in panel data models rejects the null hypothesis of no first order serial correlation.

To take into account all of these problems, a feasible generalized least square model which considers heteroskedastic panels with cross sectional correlation and panel specific correlation has been implemented.

Table 8 reports the results of a feasible generalized least square estimate which allow to consider heteroskedastic with cross sectional correlation and panel-specific AR(1).

Dependent variable: **strategy**	Coef.	$P > \|z\|$
period	0.0574587*	0.007
inf	0.1564729	0.188
votingrule	−0.709308*	0.000
ruleofthumb	0.1133996*	0.000
mgvar	10.50003*	0.000
deltapref	0.019639	0.689
delta_rt_pref	0.955562	0.152
Constant	−0.3032722	0.292
cross-sectional time series FLGS	Time periods:14	
Panels: heteroskedastic with cross-sectional correlation	N. of groups: 24	
Correlation: panel-specific AR(1)	N. of obs. 336	
Wald Chi2(7)=38.05	Prob>chi2=0.0000	

Table 8: FGLS estimate

* Significant at 5% level of significance

The two explanatory variables "*period*" and "*votingrule*", which refer to the agent's experience and to the voting rule, have the correct sign and they are significant. This result confirm what found in the previous non parametric analysis: the player's strategic behaviour increases with experience but decreases when the median voting rule takes the place of the mean voting rule. The *"inf "(information) variable* does not significantly affect the dependent variable, nevertheless it assumes the expected sign: information boosts the strategic deviation from truth.

The "*rule of thumb*" is highly significant. Together with the autoregressive nature of the model (which probably captures also some effects of incremental experience and information), this suggests that subjects reacts through partial adjustments in each round and this conduct was rewarding for them.

Also the marginal effect of public good variation ("*mgvar*") is significant at 5% level of significance. This result suggests that strategic behaviour is deeply

affected by potential loss/gain inherent to the individual specific utility.

The variable *deltapref* which measures the distance between the agent's bliss point and the group mean, is not significant but the associated sign is the expected one. This result may suggest both that players are unable to guess their own group mean (in particular when no information is provided) and that the individual preferred amount of public good does not affects the player's sincere disclosure of preferences, at least when it is not weighted for the associated gain.

The last variable which deserves attention is "*delta_rt_pref"*. The fact that this variable is not significant may suggest that the Renault and Trannoy predictions are unable to explain the player's strategic behaviour, but the positive sign suggests that at least they are able to catch their "strategy trend".

5 Conclusions

The experiment was designed in order to have at least a reference case in which people are likely to cheat in voting, as they are put in small groups and have information about other people's bliss points, while mean voting is used. Besides this case, in the further treatments, it was expected that, under lack of information and under median voting, more sincere revelation of preferences would occur. In fact the experiment disconfirmed in a sense these expectations: it turned out that about one third of the votes were sincere also in the reference case, thus suggesting that even in small groups and with full information the difficulties of finding suitable strategies are great. One might also imagine that some people do prefer always telling the truth, but just one agent chose this conduct in all the rounds, and thus this interpretation is not supported by our results.

Since even in the reference case sincere revelation was chosen to some extent, the behavioral predictions made by Ehlers et al. (2), based on a kind of bounded rationality approach, receive some support by this experiment and seem likely to work in large groups. While experimental tests with larger groups remain to be done, we expect e.g. that in the real life a social choice systems based on the "forced to pay free to choose" mechanism, in which people vote once in a while in very large collectives, do offer small incentives for strategical misrepresentation.

On the other hand it turns out that simple strategical conducts are in fact implemented. Hence it seems also reasonable to expect that in committees made of experienced professionals strategical behavior do arises, and that the extremist strategies might represent a relevant limit result for this cases.

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