Strategic Altruism[1]

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Abstract

One of the open questions in the behavioral revolution is the rationalization of non-selfish behavior. The debate mostly focuses on the relative validity of theories dealing with inequity aversion versus reciprocity as plausible explanations in strategic environments. In this paper we show that pure altruism should not yet be disregarded as a plausible explanation for social behavior in these strategic contexts. We define s*trategic altruism* as a positive relationship between altruistic behavior and individual marginal impact on social outcomes, and analyze it in the context of voting mechanisms, where individual donations are the result of a voting scheme. Our experimental evidence supports altruism as an important motivation in strategic contexts, which could be exploited by organizations (e.g. charities) in the design of fund raising strategies.

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1. Introduction

The behavioral revolution in Economics has yet several challenges to face. One of them is the rationalization of non-selfish behavior. From an economic perspective, this revolution has generated a supply excess; that is, a growing number of competing theories that try to account for it. These theories can be associated by a simple criterion to three mayor regularities in non selfish human behavior: altruism (subjects care unconditionally about others), reciprocity (decisions are affected by intentions) and inequity aversion (the final distribution of outcomes alters decisions)[3].

In this dispute, every behavioral economist has a number of winning horses. In our view, a clear majority coincides in minimizing the role of altruism in strategic situations. Hence, altruism is restricted to simple decision problems where no strategic interaction takes place, like the so-called dictator game. In this game, one individual (the *dictator*) decides how to allocate an endowment (usually 10 dollars) between himself and another person (the *recipient*). The dictator choice is final, so the recipient plays a passive role in the game. This game was devised as a simplification of the simplest bargaining problem (Ultimatum Game) for understanding sender's behavior in the absence of strategic considerations (Guth et al. (1982)).

Experimental evidence support altruism in the dictator game. The modal offers are typically 0%, with means usually falling in the 20 to 40% range. It is also found that subjects' behavior is sensitive to framing effects: on one hand, anonymity conditions trigger self-regarding offers (see Hoffman et al. (1994)) while on the other hand, replacing the recipient with a respectable charity promotes altruistic offers (see Eckel and Grossman (1996)).

Being altruism confined to simple decision problems does not mean that altruistic behavior is not economically relevant. Based on the results mentioned above, the design of optimal campaigns for charitable fund-raising is an active field of research. Its main purpose is to explore the determinants of giving behavior so as to design charity strategies for maximizing funds. The announcement of receipts (Romano and Yildirim (2001)), the announcement of a large contribution by a single wealthy donor (Andreoni (2006)), the presence of recommended contributions (Croson and Marks (2001)), seed-money and refunds (List and Lucking-Reiley (2002)) are examples of fund-raising strategies used by charities to increase donations.

[3] Given that it is far from the intention of this paper to survey both the theoretical models and the evidence of non selfish behavior, we offer one illustrative reference for every line of argumentation: Andreoni and Miller (2002) for altruism, reciprocity by Rabin (1993) and inequity aversion by Fehr and Schmidt al (1999). Sobel (2005) surveys this literature.

In this paper we want to vindicate pure altruism in the broader framing of strategic contexts. Our goal is to check whether or not altruistic subjects are immune to strategic reasoning. To this end, we enlarge the usual setting of the dictator game by assuming that a number of dictators, each endowed with 10 euros, rather than deciding in an isolated way how much to allocate to a charity, are engaged in a voting mechanism, whose outcome determines the (common) allocation of each dictator to the charity. Our aim is to detect what we call *strategic altruism*, which is defined as the positive relationship between altruistic behavior and individual marginal impact on social outcomes.

We focus on voting mechanisms because they are important in some real world situations where subjects set rules to manage common property. Instead of choosing an individual level of cooperation, people frequently use a voting procedure. Political science is the natural field to check for the properties of alternative voting processes[4], but there are many other interesting examples. In the context of voting institutions, the experimental method is particularly useful because allows us to fine-tune the marginal impact on social outcomes while controlling for everything else.

Ledyard and Palfrey (1994) tested efficient public goods decisions in majority voting schemes and Walker et al (2000) found efficiency gains via an enforcing voting rule in an experimental public goods setting. In this line, Messer et al. (2005) suggest that enforcement is a key issue, as they find that voting by itself has little effect on contributions in public good experiments. The Kyoto protocol is a nice real life example of the consequences of the non existence of an enforcing agency. Whenever a third party is able to fully enforce the results of the rule, efficiency gains are obtained, as people cooperate more[5].

In our experiment we consider two group sizes (small and large) and three fully enforceable voting institutions, which correspond to the outcome of the voting mechanism being the average, the minimum and the maximum vote. We find experimental support to strategic altruism. That is, we find that for every group size, votes in the maximum mechanism are larger than those in the average one, which in fact are larger than those in the minimum mechanism.

[4] Fiorina and Plott (1978) and Eckel and Holt (1989) are classical cites. Some recent examples include Fréchette et al (2003) on the differential effects of amendment rules in legislative bargaining and Sibert (2003) and Fatas and Pallardo (2006) on their look at reputation formation and voting rules in monetary policy committees.

[5] Tax compliance is another case in point. Feld and Tyran (2002) observed in a tax experiment that an endogenous fine on tax evasion (agreed on by a majority rule) resulted in higher tax compliance.

Our paper is also related to research on Tullock's example of the charity of the uncharitable (see Tullock (1971)). He compares two situations: donating some amount of money to a charity and voting to be taxed for that amount that will be later donated to the charity. This example is central to the theory of expressive voting, as developed by Brennan and Buchanan (1984). According to this theory, an expressive voter votes according to his material interest whenever the cost of voting in favor of a morally worthy cause is too high, but votes morally if the cost is small.

Evidence on expressive voting is actually mixed and inconclusive, regardless of the nature of the data, either from the field or experimental. From the field, Sobel and Wagner (2004) finds evidence of expressive voting whereas Faith and Tollison (1990) disputes it. In the experimental arena, initial evidence from Carter and Guerette (1992) contrasts with the negative findings by Tyrant (2004).

Our paper distinguishes from the literature in that it does not focus on a particular voting institution but investigates strategic behavior in a variety of social institutions, trying to draw connections between the properties of strategic behavior and the features of the social institutions. Our findings support the idea that subjects react to the larger possibilities of driving an altruistic outcome by voting for larger donations. Regardless of the group size, subjects react to the strategic environment. Almost half of the altruistic subjects in our sample are consistent with a rather strict definition of strategic altruism. In our paper, and by eliciting subjects' beliefs about others' behavior, we also derive a simple test for expressive voting. We find 4% of expressive voters, what plainly implies a strong rejection of the expressive voting theory.

The rest of the paper is as follows. Section 2 describes the experimental design and procedures. Experimental results are presented and discussed in Section 3 whereas Section 4 concludes.

2. Experimental Design and Procedures

2.1 Experimental design

We devised a 3x3 experimental design -three group sizes and three voting institutions- in a way such that every participant went through all three institutions in the same order. The following table provides a summary of all three treatments.

[Table 1 around here]

Participants were informed about the sequence of voting rules along the three stages of the experiment. They were also told that in

each stage or institution, they were to be allocated to groups of variable size (with a minimum of 1 and a maximum of ten).[6] In fact, the unique information subjects had in each institution was their group size. They were only informed about decisions and results when the experiment came to its conclusion. Note that this construct is crucial to consider their three decisions in an almost complete independent way. The group size was kept fixed for every subject across period to allow for a within subjects analysis.[7]

The whole experiment was run in a fully anonymous environment: subjects did not know about the identity of other group members or the identity of recipients at the individual level. As group size was settled at the beginning of each round, subjects did not know their group size in period 2 and 3 when making a decision in period 1. This design reinforces the independence of decisions from a behavioural point of view.

The three voting institutions differ in the order statistic chosen to determine the collective outcome: the effective donation is driven by the minimum, the average and the maximum vote. Every subject went through the three voting institutions always in the same sequence: average (AVG), minimum (MIN) and finally maximum (MAX).[8] Order effects were kept under control as subjects did not receive any information about the behavior of the rest of their group until the end of the experiment (additionally, no emphasis was placed on that particular sequence, see the instructions for details).

In each institution, each subject was endowed with 10 euros, and his vote referred to how many euros, out of his endowment, he voted for allocating to the recipient. Hence, in the overall experiment, each subject was endowed with 30 euros. Also, each subject received three additional euros when correctly predicting the outcome of each voting institution without the inclusion of his own vote.[9]

2.2 A procedural definition of strategic altruism

We now elaborate on how behavior in the above voting institutions helps us define the concept of *strategic altruism*. Note that

[6] As the number of subjects attending every session was not rounded, the perception that subjects were participating in different group sizes was toughened.

[7] We were very careful when choosing both the wording of the instructions and the experimental procedures to avoid any deception. Subjects were informed that the different group sizes were chosen by the experimenters in a predefined sequence, with a natural bottom (size 1) and an arbitrary and reasonable ceiling (size 10).

[8] Note that all subjects went through all three institutions regardless of the group size. That means that single dictators made three decisions under three different but identical rules. The reason for that was to get a baseline to compare.

[9] Note that this prediction exercise is nonsense for group size one. They were however requested to predict their own vote to make procedures homogeneous.

the crucial issue in the voting mechanisms is the probability of being pivotal. Assume that the voting distribution in the population resembles the usual giving distribution in a standard dictator game. Then, for fixed group size, the chances that a person casting a large vote, i.e. voting a number close to 10, determines the outcome in the MIN institution are quite small, whereas they are actually quite high in the MAX institution. In this context, a person casting larger votes in the MAX than in the MIN will be named strategic altruist.

In fact, we can define strategic altruism more precisely. To this end, let us fix the population voting behavior and let us compute the probability distribution of the voting outcome in each voting institution for fixed group size. It is clear that by definition the probability distribution of the outcome in the MIN institution will place the highest probabilities on the left side of the voting space; also, the probability distribution of the outcome in the MAX institution would place higher probabilities on the right side of the voting space whereas for the AVG institution, the probabilities will be placed somewhere in between.

Even more, we can order the aforementioned voting institutions with the help of the concept of stochastic dominance: that is, for fixed group size, the probability distribution of the outcome in the MIN institution dominates that of the AVG institution according to first order stochastic dominance, while the latter dominates that of the MAX institution. We now state the first definition of this paper:

Definition 1: A person is a *Strict Strategic Altruist (SSA)* if her votes are ordered inversely to stochastic dominance.[10]

The natural implication of Definition 1 for our design is that every SSA will cast votes in the following way:

$$v_i^{MAX} > v_i^{AVG} >_i^{MIN} \qquad (1)$$

As subjects faced different decisions in our experiment, there is room for being an altruist some of the times whilst not contradicting the essence of the definition in the others. This leads to the second definition of the paper:

Definition 2: A person is a *Weak Strategic Altruist (WSA)* if her votes are ordered inversely to stochastic dominance at least once and no pair of votes is ordered according to stochastic dominance.

The natural implication of Definition 2 for our design is that every WSA will cast votes in one of the following two ways:

[10] It is somehow paradoxical that we fix the population voting behaviour for defining strategic altruism, whose definition means a change in the voting behaviour at the individual level.

$$v_i^{MAX} > v_i^{AVG} =_i^{MIN}$$
$$v_i^{MAX} = v_i^{AVG} >_i^{MIN} \qquad (2)$$

The simplest way to look for existence of WSA in our sample would be to check whether subjects' votes are larger in the MAX rule than in the MIN (for both cases, a WSA satisfies $v_i^{MAX} >_i^{MIN}$).[11]

We now focus on the aggregate consequences of strategic altruism. To this end, consider now a population mainly composed of strategic altruists, either in the strict or weaker sense, and think of the distribution of votes in the different voting institutions. Given that individual votes of strategic altruists increase in the sequence MIN-AVG-MAX, it must be the case that the distribution of the votes in the MIN institution will dominate that of the AVG institution according to first order stochastic dominance, while the latter will dominate the vote distribution in the MAX mechanism. Hence, the aggregate effect of strategic altruism is also a clear dominance sequence MIN-AVG-MAX.

Finally, note that the definition of strategic altruism refers to properties of voting behavior when varying the voting mechanism (for fixed group size). There might be however another direction in which strategic altruism could be defined: the size dimension (for fixed voting rule). In this case, the analysis is less straightforward as an increase in the group size reduces the probability of being pivotal[12] but it increases the monetary impact of the recipient conditional of being pivotal, rendering the total effect indeterminate. We therefore prefer to leave the question open and let the experiment to shade light on it.

2.3 Procedures.

The computerized experiment was conducted at the experimental laboratory LINEEX, in Valencia (Spain), using the z-tree software. The total duration was around 60 minutes and the average payoff was 24.71 euros. Participants were undergraduate students, most of them from Business and Economics degrees, from the University of Valencia and had no previous experience in distribution or bargaining games. The total number of subjects was 96, distributed in 14 groups of size 1, 14 groups of size 3 and 4 groups of size 10. For every institution, we have 14 independent observations (votes) when the group size is 1, 42 when the group size is 3 and 40 when the group size is 10.[13]

[11] It is clear that both definitions are not equivalent, as the WSA definition also implies that no inconsistency is observed in the AVG vote. A more detailed discussion on both ways is provided in the result section.

[12] Note that as the group size tends to infinity, the above probability distributions will degenerate to the minimum, the maximum and the average value of the population distribution if the MIN, MAX and AVG institutions respectively.

[13] Even when fully independency from the statistical point of view cannot be guaranteed, the results suggest that this is almost the case from the behavioral point

Neutral instructions (which are available from the authors upon request) were read aloud before the experiment began and all questions were answered publicly. After the instructions were read and before the game started, subjects fulfilled a simple questionnaire to assure they had understood the logic of the game.[14]

The enlarged dictator game was conducted using the double blind procedure as in Hoffman et al. (1994), in which individual decisions could not been known by the experimenter or anyone else except the individual. We replaced the collective anonymity of the recipient by a reputable Spanish charity[15], following Eckel and Grossman (1996). This provides variance in the altruistic behavior that would help us have a rich enough dataset.

At the end of the experiment, subjects were informed about the outcome of each institution in their group (and the predictive success of their predictions) and their earnings. Immediately after that, the donation was made in a public way. In real time, the experimenter switched onto the NGO webpage using a video projector and donated the money. Each participant received their individual earnings in a sealed envelope with a computer code. The envelope was distributed by a lab assistant, while all participants remained seated in their fully private, individual cubicles.

3. Results and Discussion

Table 2 in the appendix shows the full data set at the individual level, i.e. votes and predictions for every voting mechanism. In this section we follow a three step analysis, starting with some aggregate descriptive data; then, we check for the existence of strategic altruism and finally get a glimpse on the presence of expressive voting in our setup.

[Table 2 around here]

3.1 Descriptive statistics and baseline treatment

Tables 3 and 4 describe the average behavior of subjects in the experiment. These tables are important because they illustrate the main findings of the paper.

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of view. Recall that no information feedback was provided until the end of the experiment; as it was explained in the previous section.

[14] A translated version of the questionnaire is also available upon request from the authors. 91 out of 96 subjects passed the quiz on the first attempt. The remaining five did it in the second attempt.

[15] "SOS Ayuda en Acción" is a Spanish charity that takes care of homeless children all over the world. Of course subjects did not know about the individual identity of the recipients.

[Tables 3 and 4 around here]

The average behavior in the baseline treatment (a standard dictator game) is displayed in Table 3. As we see, average donations across voting rules are flat around 16% of the endowment. Our charity effect is not as strong as observed by Eckel and Grossman (1996)[16] although is slightly larger than the observed by Hoffman et al (1994) which maintained the recipient's anonymity (9%).[17]

Figure 1 depicts the distribution. We observe that the modal offer is 0 (it accounts for 52% of the observations) while the remaining observations are scattered along the interval (1, 8).

[Figure 1 around here]

Figure 2 displays the histogram for the 82 subjects (and 246 decisions) who were assigned to small and large groups. As we see, the modal offer is again a donation of zero euros, which accounts for 42% of the observations. Note that the larger the donation the lower the frequency (with the exception of a donation of 10 euros).

[Figure 2 around here]

Table 4 displays average behavior for the small and the large group. As we see, the average donation, 21.5% of the €10 endowment, is slightly larger than in the baseline treatment. By inspection, results are in line with the existence of strategic altruism. The average vote in the maximum institution (29.1%) is two times the average vote in the minimum institution (14.9%)[18]. However, there is no size effect, i.e. the average vote on the small group (size 3) is 2.07 whereas that in the large group (size 10) is 2.23 (a non significant increase of 7%).[19]

Figure 3 and 4 display the cumulative distribution of votes for group sizes -Figure 3- and for voting institutions –Figure 4-. As we see, both in the small and the large group the cumulative distributions are ordered according to the SA sequence MIN-AVG-MAX whereas this is not the case for group size 1. As regards the size effect, we see no dominance pattern.

[Figure 3 around here]

[Figure 4 around here]

[16] Their percentage of donations went up to 30%.

[17] These results are in line with culture findings in public good games. Croson et al (2006) and Brandts and Fatas (2001) get similar cultural effects with Spanish subjects.

[18] A Mann-Whitney non parametrical test reveals that this difference is statistically significant at the 1% level (p value=.0021). A more rigorous econometric analysis is presented in the next section

[19] MW p value=.6125.

Table 4 also displays actual donations –the outcome of the group- for every mechanism as well as subject's predictions about the behavior of their fellow group members. It is straightforward that the own definition of the voting mechanisms, together with the presence of strategic altruism, must necessarily imply a large difference in actual donations across voting institutions. And this is the case, as the average actual donation with the minimum rule is €0.22 whereas that for the maximum rule is €6.85 and the average rule is €2.21.[20] Finally, actual donations across group sizes rise by 43% (from 2.55 to 3.67).[21]

We now review subjects' prediction across institutions to find out whether predictions also satisfy our definition of strategic altruism. And in fact, this is the case, as the average predicted vote in the MIN institution is 0.88, 2.43 for the AVG and eventually reaches 4.06 for the MAX rule[22].

Finally, Table 5 displays the predictive success of subjects in the experiment. As we see, the average success rate is 25.20%, with the highest success rate for the MIN institution and with the lowest success rate for the MAX mechanism.

[Table 5 around here]

Hence, the picture that we obtain by looking at the raw data is that strategic altruism is a real phenomenon which is actually perceived by subjects. Next section performs a more rigorous econometric exercise whose aim is the verification of these preliminary results.

3.2 Strategic altruism

3.2.1 Voting behavior

Recall that strategic altruism is defined on the basis of the relative size of the votes in the different voting institutions. In order to make the required comparisons we perform a simple econometric exercise of voting behavior based on a standard OLS estimation without constant.

We generate a dummy variable for each group size. That is, dummy GS1 (GS3, GS10) takes a value of 1 whenever the groups size is 1 (3, 10) and zero otherwise. In addition, we generate dummies for the voting mechanisms. Dummy AVG (MIN, MAX) takes the value of 1 whenever the voting rules is the mean (minimum, maximum) of all group proposals to compute the effective donation. TIME is the time subjects spent making decisions.

[20] All three pair wise comparison are statistically significant at the 1% level (MW p value <.0000).
[21] This difference is significant at the 5% level (MW p value = .0388).
[22] Again, all three pair wise comparison are statistically significant at the 1% level (MW p value <.0000).

We then create interaction terms for each combination of group size and voting mechanism. We use the standard OLS technique to estimate a model whose reduced form is the following:

$$\begin{aligned} v_i = {} & TIME + \beta_1 * GS1 * AVG + \beta_2 * GS1 * LOW + \beta_3 * GS1 * HIGH + \\ & + \beta_4 * GS3 * AVG + \beta_5 * GS3 * LOW + \beta_6 * GS3 * HIGH + \\ & \beta_7 * GS10 * AVG + \beta_8 * GS10 * LOW + \beta_9 * GS10 * HIGH \end{aligned} \quad (3)$$

where v_i is subject *i*'s vote.

Note that this econometric specification makes easier the analysis of strategic altruism: we simply need to keep fixed the group size and test the null hypothesis of equal coefficients for the different voting institutions. The results of our econometric regression for voting behavior are displayed in Table 6.[23] The first thing to note is that, as expected, whenever the group size is one (actually, there is no such thing as a group), dictators' behaviour does not depend on the particular voting institution.

[Table 6 around here]

Table 7 below displays the coefficients comparisons, one for each group size. All coefficients rank in the order predicted by our definition of strategic altruism (MAX>AVG>MIN) for both the small and the large group. Differences across coefficients are always significant, in line with the existence of strategic altruism. Pair-wise comparisons of the estimates reveal that the estimate for the MAX institution is significantly larger than the corresponding to the other institutions for both group sizes. That is, votes under the MAX institution are higher than under any of the other two institutions, regardless of the group size. Votes' estimates on the MIN are below the ones obtained on the AVG institution but are never significantly different.[24]

[Table 7 around here]

Hence, our first result at the aggregate level easily comes.

Result 1: *Strategic altruism has a statistically significant effect on voting behavior for both the small and the large group.*

Table 8 below displays the coefficients comparisons, one for each voting institution. We now fix the voting rule and check whether or not

[23] As it has been previously noted it is relevant to emphasize that we will check for the existence of group size effects using a between subjects' analysis (comparing cells in the same row in Table 1) whereas the impact of the different voting mechanisms will be analyzed via a within subjects' analysis (comparing cells in the same column in Table 1).

[24] p-value=0.8880 for group size 3 and p-value=0.9562 for group size 10.

the group size has a significant effect on voting behavior. Note that for all three voting rules (the AVG, the MIN and the MAX) the group size has no significant effect. The same result is obtained when pair wise comparisons are made.

[Table 8 around here]

In line with our previous discussion on the mixed effects of strategic altruism when varying the group size (for fixed voting mechanism), the second result is the following:

Result 2: *For any given voting rule, the group size effect has no significant net effect on voting behavior.*

3.2.2 Predictive behavior

Recall that subjects were awarded three additional euros for correctly predicting the average (minimum and maximum) vote of the rest of their group in the AVG (MIN, MAX) institution. We now investigate whether subjects anticipated the presence of strategic altruism, i.e. whether subjects' predictions of others' behavior are ordered inversely to stochastic dominance. Table 9 contains the econometric estimates for predictions with a model described in (3).

[Table 9 around here]

As before, all variables have a statistically significant effect. Tables 10 and 11 show the comparisons among coefficients.

[Table 10 around here]

[Table 11 around here]

Table 10 strongly supports the idea that for both small and large groups, behavior incorporates the existence of strategic altruism. Again, all coefficients rank in the order predicted by our definition of strategic altruism (MAX>AVG>MIN) and comparisons across coefficients are always significant from the statistical point of view. The third result comes from this observation:

Result 3: *Strategic altruism significantly alters predictions. Subjects anticipate the existence of SA in both the small and the large group.*

Table 11 results are in line with previous findings. No significant differences are observed for the AVG and the MIN rule. The only significant differences are the ones coming from the straightforward comparison between single dictators and groups dictators (1MAX vs. 3MAX and 1MAX vs. 10MAX) in the MAX rule. But, as for the other rules, predictions are not significantly different when a comparison between groups is made in the MAX institution.

Result 4: *For any given voting rule, the group size effect has no significant net effect on predicting behavior.*

Note that the overall picture that emerges from the analysis is qualitatively similar to the obtained from the average data: experimental subjects are aware of the "altruistic externalities" built-in the MAX scheme in comparison to the MIN and AVG mechanism, use them and expect others to do so. Besides this, the size dimension of strategic altruism is absent.

3.2.3 Donations

We finally turn our attention to the analysis of the voting externalities, i.e. the effect of the voting behavior into the final contribution of subjects. Next tables display the corresponding estimates and the econometric tests.

[Table 12 around here]

[Table 13 around here]

[Table 14 around here]

The relevant features are that strategic altruism makes the estimates be statistically different for each group size. Funds raised in the MAX institution are significantly larger than those raised in the AVG, and funds raised under the AVG rule are significantly larger than those raised in the MIN. Finally, the size effect on final contributions is only clear for the MAX institution, but it is not present for AVG and MIN.[25]

Result 5: *Strategic altruism and voting rules significantly alters effective donations.*

3.2.5 A tentative taxonomy

Given our previous results, we can make a within subjects analysis to establish a simple and tentative taxonomy of subjects according to definitions 1 and 2. Tables 15 and 16 show the results of such taxonomy. In addition to the selfish and SSA and WSA categories, two additional altruistic types have been introduced in the analysis. *Kantian* altruists are the ones who always vote for the same positive donation, while *other* altruists are the ones with altruistic behavior (they vote for a positive donation at least once) but they cannot fit in any of the three altruistic types.

[Table 15 around here]

[25] A comparison on the two group sizes yields this specific result.

[Table 16 around here]

Table 15 shows that the proportion of purely selfish subjects is rather small (23 out of 82 of them always vote for no donations). Table 16 remarks the relevance of strategic considerations for altruists: almost half of altruistic subjects respond to the strategic environment (last row of Table 16). Their behavior fits in either definition 1 or 2 of strategic altruism.

3.2.6 Instinctive versus cognitive decisions

In line with Rubinstein (2006), we explored the deliberation process of decision makers based on their response times. As Rubienstein (2006) notes, this is a common practice in psychology (Luce (1986) ius a classical review, Kosinski (2005) a recent survey), but just a few of experimental papers in economics have reported responses times (one exception is Wilcox (1993) experiment on lottery choices). The basic issue when measuring response time in economic experiments is the interpretation of results.

Rubinstein's view is intuitive and simple at the same time. A cognitive action is associated to a relatively deeper reasoning process, while an instinctive one involves less reasoning, as it is associated to little reasoning about the decision problem. So, his claim is that "choices which require more cognitive activity will result in longer response times than choices which involve an instinctive response" (page 5).

Our results go in the same direction, as TIME coefficient (time spent by subjects to make a decision) is negative and significant in all three regressions, see Tables 6, 9 and 12). In a relatively simple decision problem like our dictator game, the instinctive action seems to react as a strategic altruist, whilst voting for a null donation takes more time, and so it should be associated to a more cognitive reasoning.[26]

3.3 Expressive voting

We finally investigate the presence of expressive voters in our experiment. Expressive voters vote according to moral considerations whenever the associated costs of doing so are small; otherwise, they will vote according to material interest.

In our setup there is a treatment in which the costs of voting according to moral issues are quite small: the MIN mechanism. In this mechanism, any vote larger than the predicted behavior of the rest of the group goes in the direction of moral sentiments, does not affect the outcome of the mechanism and therefore is irrelevant from the point of view of material payoffs. This idea gets reinforced as a very small

[26] Example 5 in Rubinstein (2006) yields very similar results: in an ultimatum game, it takes less time to make an instinctive decision (the equal split) than to make the cognitive one, in which the proposer demands almost the entire sum.

donation is actually an accurate prediction of the lowest vote of the rest of the group, leaving enough room for expressive voting.

[Figure 5 around here]

Figure 5 displays the distribution of the difference between the vote and the prediction of the lowest vote for rest of the group for the MIN treatment. We see that over two thirds of the subjects cast a vote equal to their prediction. An expressive voter would definitively cast a vote larger than his prediction. We see that around one out of three subjects votes according to moral considerations in both group sizes.

We next analyze the relationship between vote and prediction for the MAX mechanism. In this case there is small room for expressive voting because the direction of increasing moral sentiments (large votes) might entail a monetary cost. Hence, an expressive voter has only one option: to vote exactly for his prediction.

[Figure 6 around here]

Figure 6 displays the distribution of the difference between the vote and the prediction for the MAX treatment. As we see, in both group sizes, about one third of the population cast a vote equal to his prediction, a behavior which is consistent with expressive voting. It is also interesting to notice that over half of the population cast a vote smaller than their prediction.

The overall picture is that for every mechanism, either MIN or MAX, and every group size, either small or large, around 30% of the voting behavior is consistent with expressive voting. However, there is an interesting issue related to the fact that every subject played both the MIN and the MAX mechanism: Which percentage of the voting population voted according to expressive voting in both mechanisms? The surprising answer is that only three players (out of 82). And this fact is what leads us to claim that expressive voting theory is strongly rejected in our experiment.

Result 6: *Expressive voting obtains very limited support from our data, as it accounts for a minority (less than 5%) of actual decisions.*

4. Conclusions

This paper has considered an enlarged version of the Dictator Game. In this version, a group of dictators –each endowed with 10 euros- decide, using a voting mechanism, how much to allocate to a common charity. Note that this situation is a real game as now the payoffs to each dictator are determined by the outcome of the mechanism which in fact depends on the votes of all dictators.

We have considered a variety of voting mechanisms, under the suspicion that different voting institutions entailing different possibilities of influencing the mechanism outcome might prompt different voting behavior. The AVG (MIN, MAX) mechanism has the average (minimum, maximum) vote as its outcome.

We have detected an interesting pattern in the voting behavior across the above mechanisms: votes in the MAX mechanism are larger than votes in the AVG mechanism, the latter being larger than votes in the MIN mechanism. And even more, this happens regardless of the group size, as we have found it for small groups (size 3) and large groups (size 10).

We have named this behavioral pattern *strategic altruism* because it implies that subjects react to the large possibilities of driving an altruistic outcome in the MAX mechanism by voting for a large donation. And what it is more interesting, upon revealing their prediction about rivals' behavior; we have come to know that subjects correctly anticipated strategic altruism

We finally claim that these results can not be easily explained by the existence of inequity aversion and reciprocity. On one hand, inequity aversion can not account for our experimental results because all possible outcomes are symmetric with respect to the players of the game, i.e. the voters, and hence no inequality whatsoever is present in our experiment. On the other hand, reciprocity can not explain votes in the MAX rule to be larger than votes in the MIN because experimental subjects had no information about previous outcomes of the game, so intentions were not explicitly considered.

Summarizing, in our sample, more than 70% of subjects exhibit some non selfish behavior. This non selfish behavior cannot be explained neither by reciprocity nor by inequity aversion but by pure and altruistic reasons. Almost half of the observed altruism in our experiment can be associated to a rather restrictive definition of strategic altruism. This result opens the door for further research to investigate the role and potentiality of altruism in explaining non selfish behavior in different strategic environments.

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Appendix

Table 1: Summary of treatments

Voting Mechanism	Group size		
	N=1	N=3	N=10
Mean	AVG-1	AVG-3	AVG-10
	↓	↓	↓
Minimum	MIN-1	MIN-3	MIN-10
	↓	↓	↓
Maximum	MAX-1	MAX-3	MAX-10

Table 2. Full data set

Size	Subject	AVG Vote	AVG Pred	MIN Vote	MIN Pred	MAX Vote	MAX Pred
1	1	5	5	3	3	4	4
1	2	0	0	0	0	1	1
1	3	0	0	0	0	0	0
1	4	5	5	8	8	7	7
1	5	0	0	0	0	0	0
1	6	0	0	0	0	0	0
1	7	0	0	0	0	0	0
1	8	0	0	0	0	1	1
1	9	0	0	3	3	3	3
1	10	1	1	2	2	5	5
1	11	1	1	0	0	0	0
1	12	5	5	4	4	1	1
1	13	5	5	3	3	1	1
1	14	0	0	0	0	0	0
3	15	0	3	1	1	7	3
3	16	10	5	2	2	10	10
3	17	2	2	0	0	1	2
3	18	0	0	0	0	0	0
3	19	4	3	2	2	7	5
3	20	3	2	2	0	6	10
3	21	4	2	4	3	3	2
3	22	0	2	0	0	4	6
3	23	4	5	0	0	10	10
3	24	0	0	0	0	0	0
3	25	0	2	0	0	0	2
3	26	0	3	0	1	0	1
3	27	3	3	3	3	5	5
3	28	0	0	0	0	0	4
3	29	3	3	3	1	4	6
3	30	0	0	0	0	0	2
3	31	0	1	1	0	7	10
3	32	5	5	0	0	0	0
3	33	2	3	2	1	2	5
3	34	1	3	1	1	1	2
3	35	0	1	0	0	0	0
3	36	2	3	0	0	3	3
3	37	0	0	0	1	0	2
3	38	0	0	0	0	10	10
3	39	0	0	0	0	2	1
3	40	3	2	3	0	2	2
3	41	0	1	0	0	0	2
3	42	0	1	0	1	0	1
3	43	0	0	0	0	0	0
3	44	0	2	0	0	1	2
3	45	6	4	8	4	7	8
3	46	6	4	5	2	9	10
3	47	4	3	3	3	6	8
3	48	1	3	1	0	1	5
3	49	2	4	1	0	1	3
3	50	1	1	1	1	1	1
3	51	7	5	5	2	4	3
3	52	2	1	2	0	1	2
3	53	6	4	2	2	9	7
3	54	0	1	1	0	0	10
3	55	1	1	1	1	1	1
3	56	0	1	0	0	0	0
10	57	1	3	1	1	1	1
10	58	0	2	0	3	0	2
10	59	0	1	0	0	0	3
10	60	0	2	0	0	6	6
10	61	2	3	3	2	3	5
10	62	0	2	0	1	1	4
10	63	0	0	0	0	0	0
10	64	0	0	0	0	1	1
10	65	4	4	0	1	5	5
10	66	1	3	2	2	3	4
10	67	3	4	1	2	6	6
10	68	0	0	0	0	0	0
10	69	1	3	2	1	3	6
10	70	10	10	10	10	5	5
10	71	0	2	0	0	0	3
10	72	4	5	4	4	4	3
10	73	2	2	2	1	2	3
10	74	5	4	5	3	10	5
10	75	10	4	1	3	2	4
10	76	0	2	0	0	0	2
10	77	3	4	1	0	6	8
10	78	1	3	5	0	5	5
10	79	0	1	0	0	0	0
10	80	0	2	0	0	0	5
10	81	0	1	0	1	0	1
10	82	5	5	3	0	5	9
10	83	2	3	0	0	0	0
10	84	0	3	5	0	8	10
10	85	3	4	4	0	4	10
10	86	2	3	0	0	4	6
10	87	0	2	0	0	0	3
10	88	6	4	4	4	7	8
10	89	10	1	10	0	10	10
10	90	3	3	1	0	3	4
10	91	0	4	0	0	1	4
10	92	0	1	0	0	2	3
10	93	0	0	0	0	0	0
10	94	2	3	0	0	3	5
10	95	4	4	2	0	2	4
10	96	2	3	2	1	2	4

Table 3. Baseline treatment

Voting Institution	Average vote
AVG	1.57
MIN	1.64
MAX	1.64
Avg	**1.62**

Table 4: Average behavior

Variable	Voting Mechanism	Size 3 n=126	Size 10 n=120	*Avg 3-10* n=246
Vote	AVG	1.95	2.15	**2.05**
	MIN	1.29	1.70	**1.49**
	MAX	2.98	2.85	**2.91**
	Vote avg	**2.07**	**2.23**	***2.15***
Actual donation	AVG	1.93	2.50	**2.21**
	MIN	0.43	0.00	**0.22**
	MAX	5.29	8.50	**6.85**
	Actual avg	**2.55**	**3.67**	***3.09***
Prediction	AVG	2.12	2.75	**2.43**
	MIN	0.76	1.00	**0.88**
	MAX	3.95	4.18	**4.06**
	Predicted avg	**2.78**	**2.64**	***2.46***

Table 5: Average predictive success (%)

Voting Mechanism	Size 3 n=126	Size 10 n=120	*Avg 3-10* n=246
AVG	14.29	15.00	**14.63**
MIN	45.24	60.00	**52.44**
MAX	14.29	2.50	**8.54**
Average	**24.60**	**25.83**	***25.20***

Table 6. Voting behavior

Parameter	Estimated coefficient (std error)
TIME	-0.0141*** (0.0049)
GS1*AVG	1.2649* (0.7017)
GS1*MIN	1.7507*** (0.6944)
GS1*MAX	1.9806*** (0.7035)
GS3*AVG	1.5484*** (0.4247)
GS3*MIN	1.4635*** (0.4051)
GS3*MAX	3.2336*** (0.4104)
GS10*AVG	1.9343*** (0.4171)
GS10*MIN	1.9015*** (0.4163)
GS10*MAX	3.1637*** (0.4248)

Adjusted R^2: 0.4058
Number of obs.: 288

Table 7. Strategic altruism on voting behavior .

Group size	Econometric test	Prob > F
1	GS1*AVG=GS1*MIN=GS1*MAX	0.7687
	GS1*AVG=GS1*MIN	0.6245
	GS1*AVG=GS1*MAX	0.4776
	GS1*MIN=GS1*MAX	0.8154
3	GS3*AVG=GS3*MIN=GS3*MAX	0.0031
	GS3*AVG=GS3*MIN	0.8880
	GS3*AVG=GS3*MAX	0.0063
	GS3*MIN=GS3*MAX	0.0020
10	GS10*AVG=GS10*MIN=GS10*MAX	0.0543
	GS10*AVG=GS10*MIN	0.9562
	GS10*AVG=GS10*MAX	0.0446
	GS10*MIN=GS10*MAX	0.0308

Table 8. Size effect on voting behavior .

Voting Rule	Econometric Test	Prob > F
AVG	1AVG=3AVG=10AVG	0.6565
	1AVG=3AVG	0.7238
	1AVG=10AVG	0.4071
	3AVG=10AVG	0.5041
MIN	1MIN=3MIN=10MIN	0.7435
	1MIN=3MIN	0.7202
	1MIN=10MIN	0.8518
	3MIN=10MIN	0.4455
MAX	1MAX=3MAX=10MAX	0.2672
	1MAX=3MAX	0.1190
	1MAX=10MAX	0.1431
	3MAX=10MAX	0.9031

Table 9. Predictions .

Parameter	Estimated coefficient (std error)
TIME	-0.0086** (0.0042)
GS1*AVG	1.3836** (0.6066)
GS1*MIN	1.7089*** (0.6003)
GS1*MAX	1.8497*** (0.6081)
GS3*AVG	1.8715*** (0.3672)
GS3*MIN	0.8708** (0.3502)
GS3*MAX	4.1100*** (0.3548)
GS10*AVG	2.6179*** (0.3606)
GS10*MIN	1.1234*** (0.3598)
GS10*MAX	4.3671*** (0.3672)

Adjusted R^2: 0.5786
Number of obs.: 288

Table 10. Strategic altruism on predictions .

Group size	Econometric test	Prob > F
1	GS1*AVG=GS1*MIN=GS1*MAX	0.8601
	GS1*AVG=GS1*MIN	0.7046
	GS1*AVG=GS1*MAX	0.5926
	GS1*MIN=GS1*MAX	0.8686
3	GS3*AVG=GS3*MIN=GS3*MAX	0.0000
	GS3*AVG=GS3*MIN	0.0555
	GS3*AVG=GS3*MAX	0.0000
	GS3*MIN=GS3*MAX	0.0000
10	GS10*AVG=GS10*MIN=GS10*MAX	0.0000
	GS10*AVG=GS10*MIN	0.0042
	GS10*AVG=GS10*MAX	0.0010
	GS10*MIN=GS10*MAX	0.0000

Table 11. Size effect on predictions .

Voting Rule	Econometric Test	Prob > F
AVG	1AVG=3AVG=10AVG	0.1397
	1AVG=3AVG	0.4819
	1AVG=10AVG	0.0777
	3AVG=10AVG	0.1357
MIN	1MIN=3MIN=10MIN	0.4796
	1MIN=3MIN	0.2272
	1MIN=10MIN	0.4017
	3MIN=10MIN	0.6106
MAX	1MAX=3MAX=10MAX	0.0012
	1MAX=3MAX	0.0012
	1MAX=10MAX	0.0004
	3MAX=10MAX	0.6045

Table 12. Donations

Parameter	Estimated coefficient (std error)
TIME	-0.0098*** (0.0038)
GS1*AVG	1.3577** (0.5392)
GS1*MIN	1.7180*** (0.5336)
GS1*MAX	1.8783*** (0.5405)
GS3*AVG	1.6468*** (0.3264)
GS3*MIN	0.5525* (0.3113)
GS3*MAX	5.4652*** (0.3153)
GS10*AVG	0.1404 (0.3198)
GS10*MIN	2.3496*** (0.3205)
GS10*MAX	8.7187*** (0.3264)

Adjusted R^2: 0.7998
Number of obs.: 288

Table 13. Strategic altruism on donations .

Group size	Econometric test	Prob > F
1	GS1*AVG=GS1*MIN=GS1*MAX	0.7888
	GS1*AVG=GS1*MIN	0.6366
	GS1*AVG=GS1*MAX	0.5014
	GS1*MIN=GS1*MAX	0.8323
3	GS3*AVG=GS3*MIN=GS3*MAX	0.0000
	GS3*AVG=GS3*MIN	0.0187
	GS3*AVG=GS3*MAX	0.0000
	GS3*MIN=GS3*MAX	0.0000
10	GS10*AVG=GS10*MIN=GS10*MAX	0.0000
	GS10*AVG=GS10*MIN	0.0000
	GS10*AVG=GS10*MAX	0.0000
	GS10*MIN=GS10*MAX	0.0000

Table 14. Size effect on donations .

Voting Rule	Econometric Test	Prob > F
AVG	1AVG=3AVG=10AVG	0.1580
	1AVG=3AVG	0.6390
	1AVG=10AVG	0.1105
	3AVG=10AVG	0.1141
MIN	1MIN=3MIN=10MIN	0.0406
	1MIN=3MIN	0.0593
	1MIN=10MIN	0.0114
	3MIN=10MIN	0.3504
MAX	1MAX=3MAX=10MAX	0.0000
	1MAX=3MAX	0.0000
	1MAX=10MAX	0.0000
	3MAX=10MAX	0.0000

Table 15. A tentative taxonomy .

Absolute frequency	Selfish $v_i^{MAX} = v_i^{AVG} = v_i^{MIN} = 0$	K altruism $v_i^{MAX} = v_i^{AVG} = v_i^{MIN} > 0$	SSA $v_i^{MAX} > v_i^{AVG} > {}_i^{MIN}$	WSA $v_i^{MAX} > v_i^{AVG} = v_i^{MIN}$ $v_i^{MAX} = v_i^{AVG} > v_i^{MIN}$	Other altruism
Size=1 (n=14)	5	0	0	2	7
Size=3 (n=40)	12	5	7	7	11
Size=10 (n=42)	11	5	6	8	10

Table 16. Altruistic subjects .

%	Kantian Altruism	Strict Strategic Altruism	Weak Strategic Altruism	Other Altruism	*Strategic Altruism*
Size 3	16.67	23.33	23.33	36.67	*46.67*
Size 10	17.24	20.69	27.59	34.48	*48.28*

Figure 1. Aggregated data for baseline treatment.

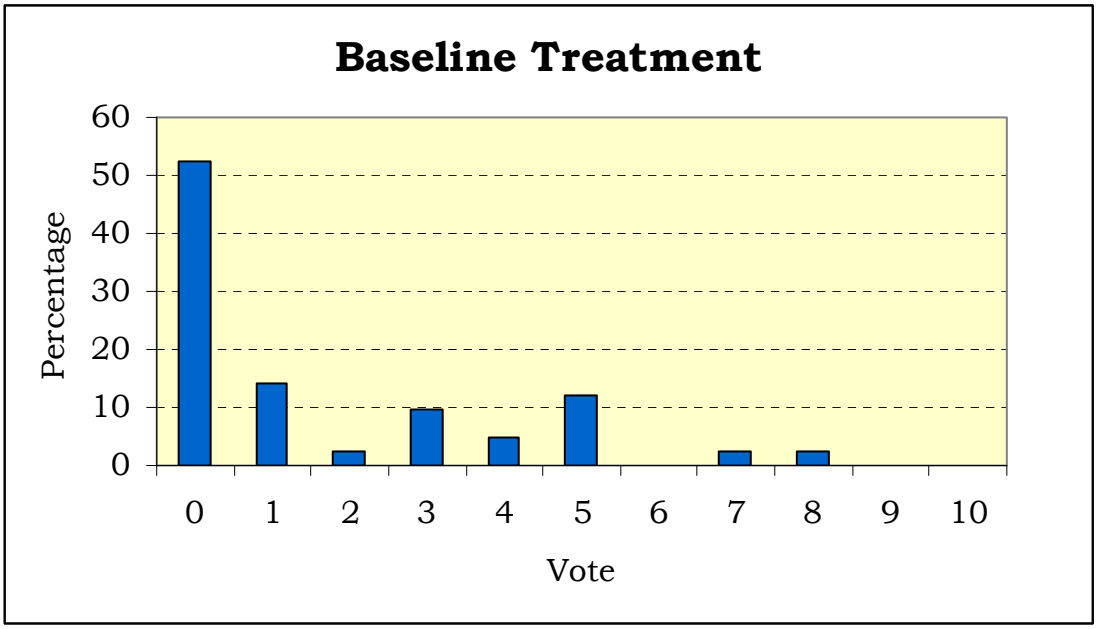


Figure 2. Aggregated data for small and large groups.

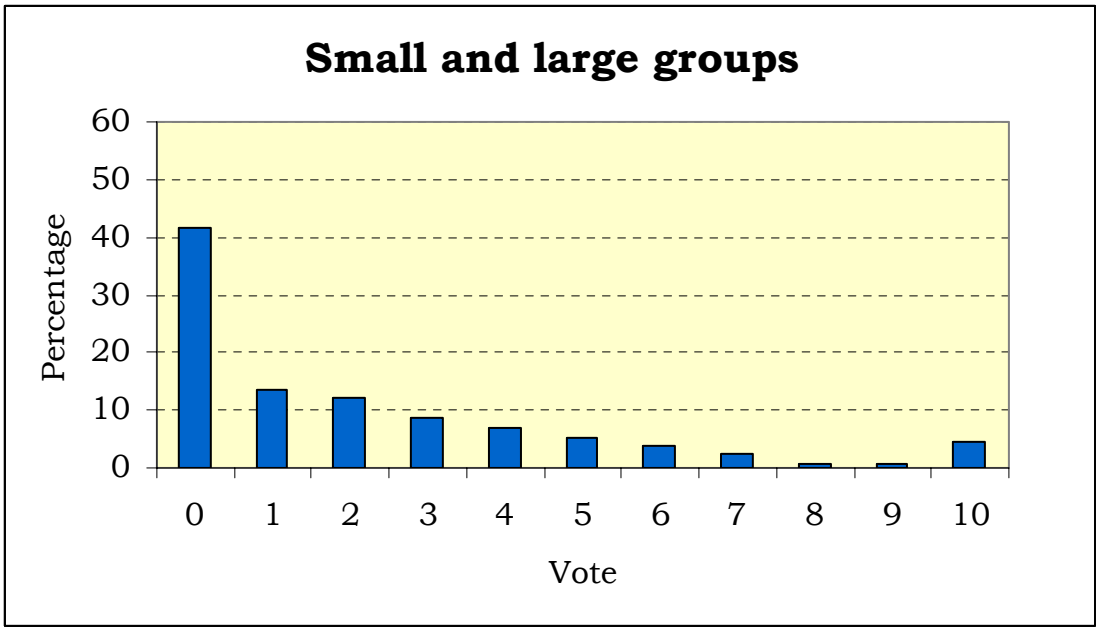
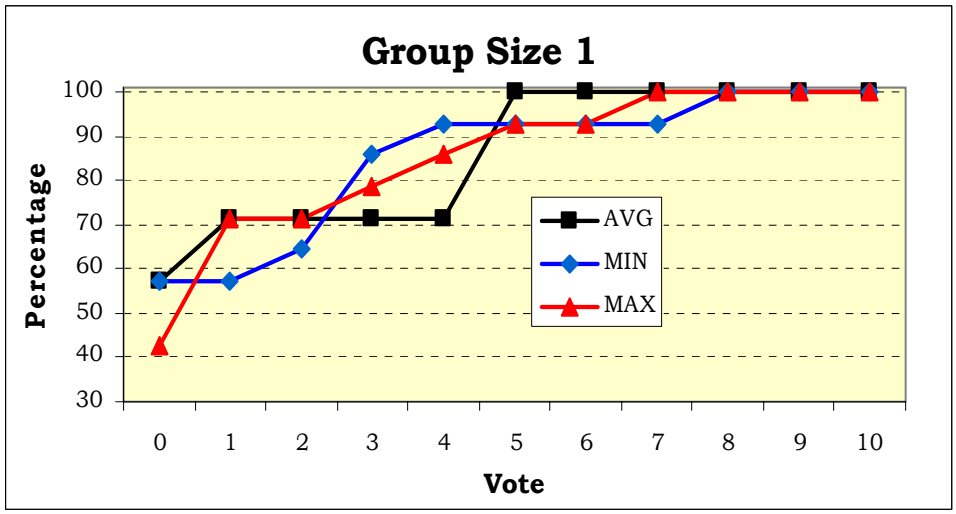
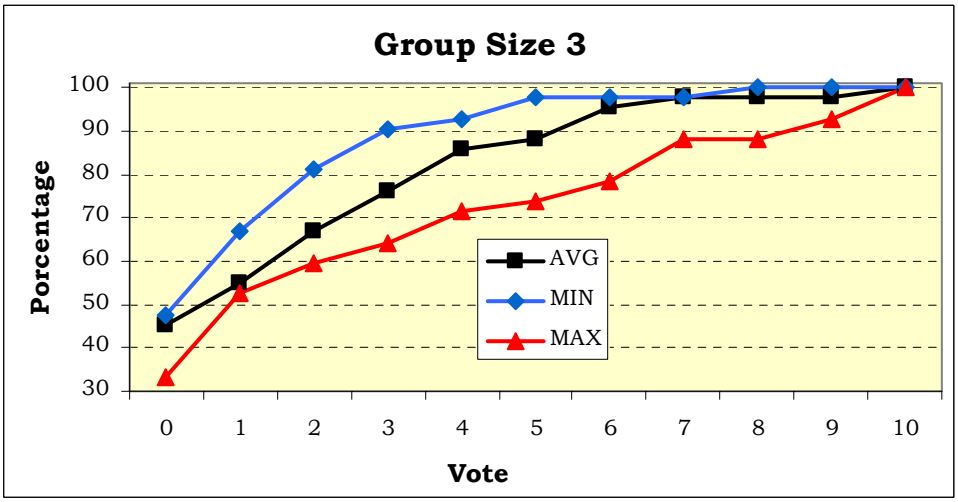


Figure 3. Cumulative distribution of votes for group size.





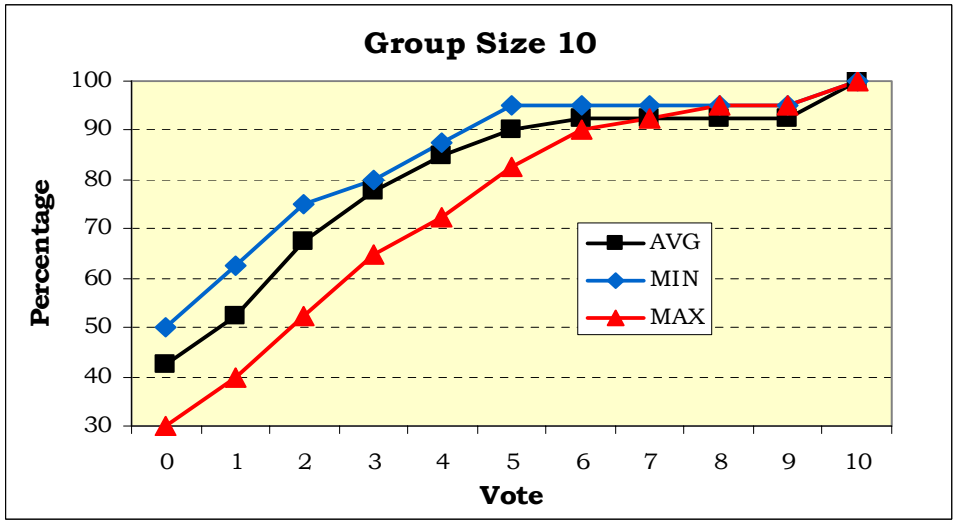


Figure 4. Cumulative distribution of votes for each voting institution.

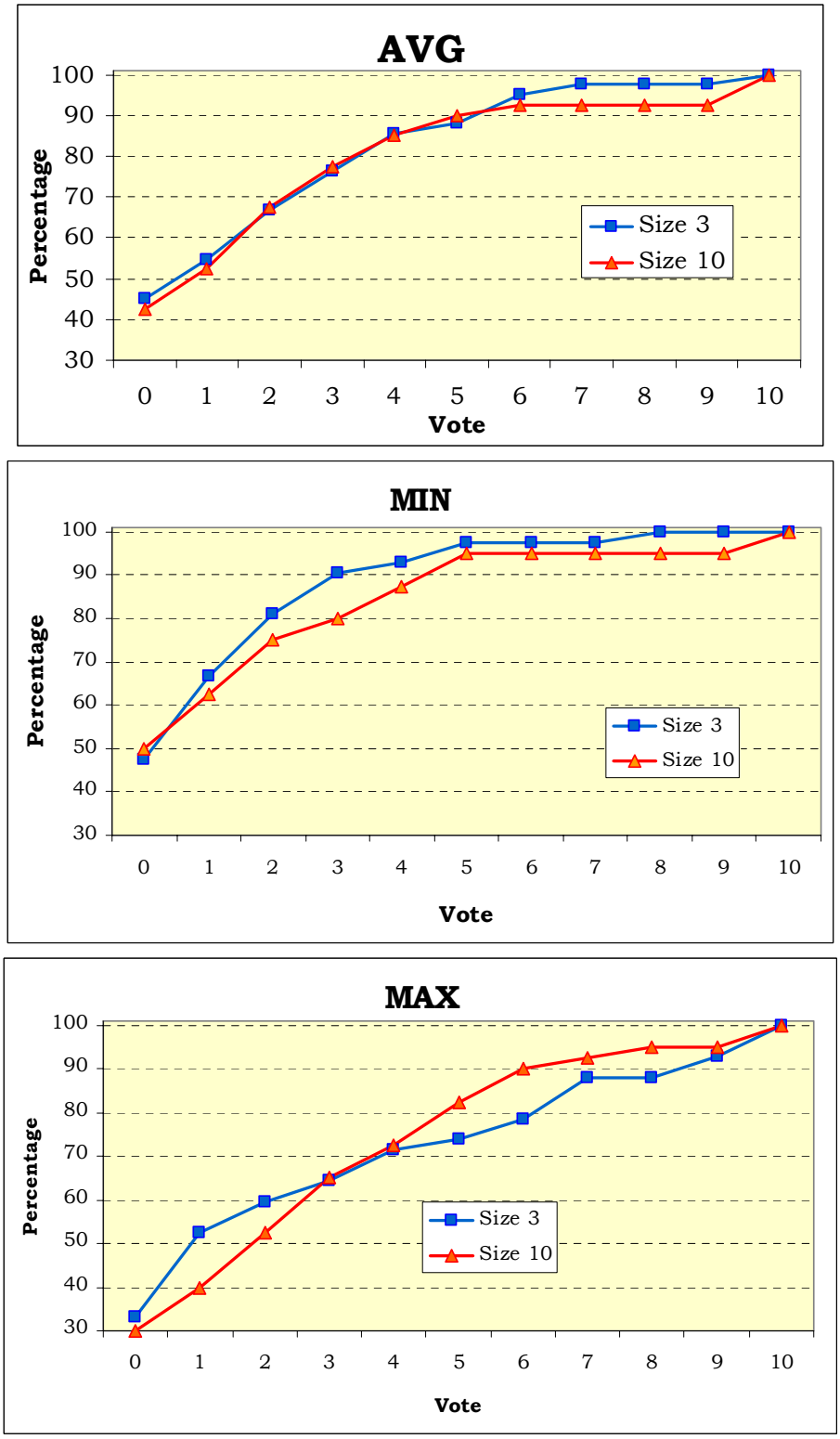


Figure 5. Distribution of expressive voters in the MIN mechanism.

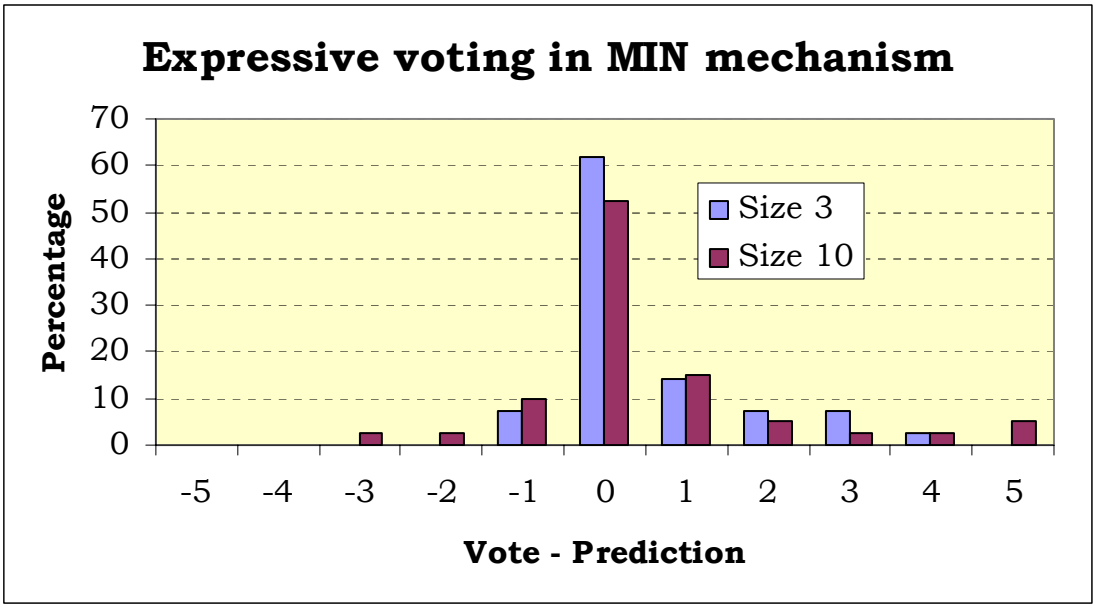


Figure 6. Distribution of expressive voters in the MAX mechanism.