TSE WP working paper series

09-088

Research Group: *Behavioral and Experimental Economics*

September 2009

Revised April 2010

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Risk Aversion, Over-Confidence and Private Information as determinants of Majority Thresholds*

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April 2010

Abstract

We present and experimentally test a theoretical model of majority threshold determination as a function of voters' risk preferences. The experimental results confirm the theoretical prediction of a positive correlation between a voter's risk aversion and the corresponding preferred majority threshold. Furthermore, the experimental results show that a voter's optimal majority threshold negatively relates to the voter's confidence about how others will vote. Moreover, in a treatment in which individuals receive a private signal about others' voting behavior, the private signal tends to replace confidence.

Keywords: majority threshold, risk aversion, (over-)confidence, laboratory experiment.

JEL classification: C91, D72, H11, D81.

*We thank Unal Zenginobuz, Robert Sugden, Antonio Nicolò, Olivier Armantier and participants at the PET 2008 in Seoul, at the PET 2009 in Lyon, and at the seminar series at Catholic University of Milan for useful comments and suggestions.

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1 Introduction

Voting determines a large number of collective decisions. As a major expression of a system's democracy, the design of voting institutions should account, among other things, for citizens' preferences regarding the threshold required in order to determine the winning majority. We argue that people's preferences for a given majority threshold depend on their attitudes towards risk. In this paper, we experimentally test a theoretical framework aimed at modelling individual risk attitudes as a factor that should be taken into account in the design of voting institutions, and especially in the determination of majority thresholds.

An agent knows that future common decisions will be made by voting. Those decisions may be favorable or unfavorable to her, but she does not know how others will vote. Voting becomes a lottery: there is a chance that a favorable majority will form, but also a risk to be tyrannized by an unfavorable majority. The expected value of this lottery crucially depends on the voting rules: for example, less decisive voting rules, such as a high super-majority, reduce the tyranny risk but also the chance to get a favorable outcome. Intuitively, a risk averse agent is more sensitive to the prospect of falling into a minority than to the chance of ending up into a majority. We expect preference for higher super-majorities and less decisive rules from more risk averse agents, and vice versa.

Simple majority is less frequent in the real world, than it may appear. Most countries have de facto super-majority requirements because of bicameral legislatures: it is not easy to undo the status-quo if a bill has to pass a two-house majority. Legislation processes are often subject to executive vetoes or other forms of check and balances. International agreements usually require unanimity (WTO), veto power (the UN Security Council), or high super-majorities (the Council of the EU). When corporate boards vote on major actions (mergers and acquisitions, major capital expansions, etc.), high super-majorities are generally required. We claim that this extensive use of super-majorities de facto reflects a general aversion towards the risk of being tyrannized. In many cases, the trade-off between protection and decisiveness is solved in favor of protection.

We add a further dimension to our analysis: the agent's priors about how others will vote. The simple intuition is that when an agent thinks of herself as substantially different from the others, then she thinks that the others are less likely to vote like her; thus she assigns a higher probability to the event of being tyrannized. Given her risk attitudes, she demands for stronger protection: i.e., for a higher threshold. With this dimension, we explore how preferences for voting rules depend either on exogenous psychological attitudes, such as subjective confidence, or on the "rational" use of information about the policy preferences of other people.

Reality shows that those who think of themselves as different from the majority ask for more protectionist rules. This is the case of ethnic minorities, that are usually protected by constitutional provisions that cannot be undone by the majority. In the EU, members may always invoke a conditional veto power when decisions concern their crucial interests (the so-called Luxemburg compromise).

We support theoretical predictions with experimental data. We find a positive and significant correlation between the majority threshold chosen by an agent and her degree of risk aversion as measured by standard experimental techniques. Moreover, agent's preferred majority threshold is negatively and significantly correlated with her subjective over-confidence. However, when agents can observe a private signal on the distribution of voters' preferences over the policies to vote, we find that preferred majority thresholds are fully determined by the signal, rather than their naive priors.

The rest of the paper is structured as follows. In section 2 we relate our paper to the existing literature on public choice. In section 3 we describe our experimental design. Section 4 draws the main theoretical predictions to test. In section 5, we present experimental results and section 6 concludes.

2 Related Literature

In order to focus on risk attitudes, voting is presented as a lottery where uncertainty derives from ignorance about how others will vote. Thus the outcome risk can be controlled by setting up an appropriate majority threshold.

The idea that the preferences for voting rules reflect the uncertainty about the voting outcome and risk aversion is not new in the literature. Rae (1969) focuses on the uncertainty related to gains or losses generated from the making of a law. He suggests that the bare majority is the only rule that minimizes the expected cost of being part of the minority. This result is formally proved in Taylor (1969). In fact, Rae's result applies to voting contests in which costs and gains are equal and also equally likely to arise from a bill that is opposed to the status quo. Attanasi, Corazzini and Passarelli (2009) extend Rae's (1969) setting to a wider range of situations. The most preferred voting rule optimizes the trade-off between the risk of ending up into an unfavorable minority and the chance to be part of the majority. Of course, risk aversion implies stronger preference for more conservative rules. This tendency to protect from the risk of bad policy decisions is the same reason why in Aghion, Alesina and Trebbi (2004) a representative agent prefers a lower degree of insulation of political leaders. The authors do not specifically consider qualified majorities, but it is easy to see that an Executive is less insulated when a higher super-majority is required to pass laws in the Parliament. The optimal degree of insulation depends on the cost of compensating the losers, uncertainty about gains and losses, the degree of risk aversion. In Aghion and Bolton (2002) risk derives from ex-ante ignorance about losses or gains from the provision of a public good. In this scenario, if the expected cost of compensating the losing minority raises, then agents prefer a higher qualified majority threshold.

We claim here that an individual who is more optimistic about how the others will vote perceives a lower risk of tyranny. As a consequence, she prefers more decisive voting rules. This relationship between confidence and preferences for voting rules is new in the literature. So far confidence has been directly related to voting preferences rather than to the preferences for voting rules. Seminal papers are Buchanan and Faith (1980,1981) and Zorn and Martin (1986).

In our experimental setting, uncertainty originates from the random assignment of subjects' favorite alternatives. To the best of our knowledge, there are no experimental works analyzing the choice of majority thresholds at the individual level and relating them to risk aversion and confidence. The experimental literature has paid much more attention to strategic voting, as a situation that arises due to the tension between an individual voter's true preferences and the expected effect of a vote on the final outcome. Specifically, the studies by Fiorina and Plott (1978) and Plott (1991) report experimental results supporting the notion of the core. On the contrary, voting through truthful revelation of voters' preferences has received little, if any, attention because of researchers' lack of interest in the apparently trivial situation in which a voter simply translates her preference into an actual vote. However, our paper shows that truthful voting may still be a fruitful area of research, in the framework of which we can study voters' preferences over different voting institutions. A number of experimental studies have paid attention to the role of majority rules (Fiorina and Plott (1978)) and other alternatives like Borda rule, approval voting (Forsythe *et al.* (1996)) and unanimity (Guarnaschelli, McKelvey and Palfrey (2000)) on the observed outcomes. Recently, some experiments have been conducted, such as Hortala-Vallve (2004) and Casella *et al.* (2006, 2008), which explore the behavior of laboratory committees using novel voting methods that allow members to express strength of preference. However, in all these papers the majority rule is exogenously imposed by the experimenter while the focus of the studies is on the voting outcomes obtained. Therefore, the emergence of different voting institutions as the result of agents' preferences over them remains unexplored. Furthermore, as we argue in this paper, it is anything but trivial to investigate some of the sources of a voter's preference for a particular majority threshold. Rather than exogenously imposing the threshold as an invariant political institution, we consider voters with different idiosyncratic features which may give rise to different preferences for a higher or a lower majority threshold in a given voting process.

Following the insights of our theoretical model, we relate the subject's preferred majority threshold to her subjective degree of risk aversion. We also relate the majority threshold chosen by the subject to her belief about the distribution of votes exogenously assigned to the other voters. Therefore, the kind of "confidence" we are interested in is the one that an agent shows when being asked to evaluate the probability of a random policy outcome, that can get her a gain, a loss, or the status quo. Empirical studies in behavioral finance do not find clear-cut evidence that overconfident investors actually do take more risks (see e.g. Dorn and Huberman (2005) and Menkhoff *et al.* (2006)). Interestingly, experimental literature has shown that individuals seem to be both overly optimistic about future outcomes and prone to overconfidence (see e.g. Lichtenstein *et al.* (1982)) and that these biases can lead to distortions in risk taking behavior. In our experiment, we elicit a subject's confidence (unconfidence) in two different situations. In one treatment, subjects are asked to state their beliefs about the exogenous distribution of votes over two alternatives. In this treatment they only know that the probability for each subject's vote to be assigned to either one or the other of the two alternatives is the same. In another treatment, we ask the subjects the same question, after having let them observe a private signal about the votes distribution. Thus, we can estimate the effects of exit polls and pre-voting information on both subjects' beliefs and their preferred threshold. Existing literature has shown that exit polls and pre-voting information affect voting behavior (see e.g. Blais and Bodet (2006), McAllister and Studlar (1991), Sudman (1986)). We check whether and, if so, in which way, pre-voting information affects the preferred threshold.

3 The Experimental Design

The experiment consisted of two treatments, the *NO-INFO* and the *INFO* treatment. In the *NO-INFO* treatment, subjects participated to two consecutive phases.[1] Only one of the two phases was used to determine subjects' final payoff. In particular, at the end of the session, we randomly selected the phase to pay by flipping a coin. Instructions were distributed and read aloud at the beginning of each phase. In the first phase, subjects participated to a variant of the Holt and Laury's mechanism to elicit agents' risk aversion (Holt and Laury, 2002). Subjects were presented with a battery of 19 pairs of lotteries numbered from (line) $L1$ to (line) $L19$ and a last

[1] An English version of the instructions is provided in the Appendix.

(empty) line $L20$. Each pair described two lotteries called A and B. Each lottery presented two possible monetary outcomes, a favorable and an unfavorable outcome, as well as their attached probabilities. Probabilities were framed by means of an urn that contained twenty tickets, numbered from 1 to 20. The structure of the battery had two main characteristics. First, within each pair, lottery A and lottery B had the same probability structure but different monetary outcomes. In particular, the favorable and the unfavorable outcome of lottery A were 12.00 and 10.00 euros respectively, while they were set to 22.00 and 0.50 euros for lottery B. Second, across pairs, while we kept constant the monetary outcomes of the corresponding lotteries, we varied the probabilities of the favorable and unfavorable outcomes. In particular, while in $L1$ the probabilities of the favorable and unfavorable outcome where $1/20$ and $19/20$ respectively, they were gradually and monotonically changed across pairs in such a way that in $L19$ they ended up with $19/20$ and $1/20$ respectively. Given the battery, each subject was asked to choose the line (pair of lotteries) starting from which she preferred lottery B to lottery A. Thus, for all the pairs of lotteries above her choice, a subject preferred lottery A to lottery B, while starting from the pair on the chosen line and for all the pairs below, she preferred lottery B to lottery A. A subject preferring lottery A to lottery B for all the 19 pairs selected the last (empty) line $L20$. Participants knew that, if the first phase of the experiment was selected to determine their final earnings, the computer would randomly select a pair of lotteries for each participant. Given her choice and according to the pair selected by the computer, each subject participated to the preferred lottery. Then, an experimenter randomly drew one of the twenty tickets contained in the urn. The ticket drawn by the experimenter was used to determine the outcome of the preferred lottery and the corresponding payoff.

We will use subject's choice in the first phase of the experiment as a proxy of her degree of risk aversion. Given the structure of the battery, the higher the number of the line chosen by the subject, the higher her degree of risk aversion. Note that, differently from the original setting proposed by Holt and Laury (2002), in our experiment we imposed consistency. Indeed, rather than offering further evidence on (in-)consistency of risk preferences, in this paper we are interested in measuring the correlation between risk aversion and the preferred majority threshold.[2]

The second phase of the experiment consisted of two consecutive parts. Again, the instructions of each decisional task were distributed and read aloud at the beginning of each part. In the first part of the second phase, each subject was asked to choose a majority threshold included between the simple majority and the unanimity, that

[2]Andersen *et al.* (2006) use a similar mechanism. See Dohmen *et al.* (2010) for an alternative design that imposes consistency.

she wanted to apply in a voting procedure between two alternatives, X and Y. At the beginning of the phase, the computer randomly assigned to each subject and with equal probability one of two types, x or y. Given her type, the vote of each subject was automatically assigned by the computer to the corresponding alternative, such that $x-$type voters supported alternative X while $y-$type voters supported alternative Y. Subjects were informed that, in case at the end of the experiment the second phase was selected to be paid, the payoff of each subject from the first part was determined by comparing her preferred majority threshold with the distribution of $x-$type voters and $y-$type voters in that session. In particular, if the majority threshold stated by a subject was equal to or smaller than the number of subjects of her own type, then she earned 22.00 euros; while, if it was equal to or smaller than the number of subjects of the other type, she earned nothing. Finally, if neither the number of subjects of her own type nor that of the other type were greater than or equal to her stated majority threshold, then the subject earned 11.00 euros. In the second part of the second phase, each subject was asked to guess the distribution of $x-$type and $y-$type voters in that session. If the second phase was selected to be paid and her guess was correct, then 3.00 euros were added to the subject's earnings from the first part of this phase.

The only difference between the *NO-INFO* and the *INFO* treatment was that in the latter, at the beginning of the second phase, each subject privately observed a signal about the distribution of $x-$type and $y-$type voters in that session. In particular, for each subject the computer randomly selected a subset of seven participants. Then, each subject was presented with the distribution of $x-$type and $y-$type voters in the correspondent subset. After that, each subject was asked to choose a majority threshold (part 1) and to guess the distribution of $x-$type and $y-$type voters in that session (part 2), as in the *NO-INFO* treatment.

4 Theory

In this section, we present a simple theoretical model in which the majority threshold preferred by an agent depends on her degree of risk aversion and her priors about how others will vote.

In political choices, the agent faces a certain amount of risk if she does not know how others will vote. Consider agent j. Her voting prospect can be represented as a non degenerated lottery in the following way. Let $N = \{1, ..., n, j\}$ be the set of $n + 1$ agents who play a majority voting game where q is the majority threshold and agents have one vote each. Thus the sum of votes is $n + 1$. Assume that the threshold must be at least the simple majority.

Let $u_j(.)$ be j's utility function. The argument of u_j is a policy outcome. Assume that two alternative policy reforms, W and L, are opposed one to another within a legislature. Either reform passes only if it reaches the required majority threshold.[3] From j's perspective, W is better than the status quo, and L is worse: $u_j(W) > u_j(S) > u_j(L)$. We say that j "wins" if her most preferred policy alternative, W, reaches the required majority in voting. Agent j "loses" when this happens for the least preferred alternative, L. The status quo S remains if no alternative reaches the required majority threshold. In other words, agent j wins only if, in addition to her, a coalition T_W that commands at least $q-1$ votes forms. She loses if an adverse coalition T_L of voters that favor L collects at least q votes. We are interested in the probability that either T_W, or T_L or no winning coalition form, and in how these chances depend on the majority threshold.

Let us assume that agent j thinks that any other agent i (where $i = 1, .., n$) will cast her vote in favor of W with subjective probability p, and will vote for L with probability $(1-p)$.[4] One may say that p captures j's degree of confidence regarding how the other n agents will vote. Thus, the others' votes behave as n independent random variables, Z, where $Z = 1$ with probability p, and $Z = 0$ with probability $(1-p)$. As a consequence, the probability of forming T_W is given by the probability that the sum of those variables is at least $q-1$. If we assume that the number of agents is sufficiently large so that the Central Limit Theorem applies, the sum of votes gotten by T_W is distributed like a normal with parameters $\mu_W = n \cdot p$ and $\sigma_W^2 = np(1-p)$.[5] Let $f^W(.)$ be its density function, and call $\Pr\{W\}$ the probability of winning (i.e. the probability of T_W forming); thus,

$$\Pr\{W\} = \int_{q-1}^{n} f^W(x)dx. \tag{1}$$

Conversely, j's subjective probability of falling into the minority (the probability that T_L forms) is

[3] The reader may also think that W and L are two platforms proposed by two opposing candidates. The candidate who wins the electoral competition will be able to implement her platform only if she gets a sufficiently high majority, that will ensure her the support of the Parliament.

[4] To save notation, we do not index j's subjective probability p by j. The reader should keep in mind that p and all other variables that depend on p are conditional to j.

[5] We apply here the Central Limit Theorem in order to profit from the simplicity of a continuous distribution. For smaller numbers, a similar model can be easily built with a discrete binomial distribution. The main findings remain valid.

$$\Pr\{L\} = \int_q^n f^L(x)dx \tag{2}$$

where $f^L(.)$ is a normal density function with parameters: $\mu_L = n \cdot (1-p)$, and $\sigma_L^2 = \sigma_W^2 = \sigma^2$. An illustration of possible $f^W(.)$ and $f^L(.)$ is given in figure 1 below.

Finally, j's subjective probability that the status quo prevails (the probability that neither T_W nor T_L reach the required majority) is

$$\Pr\{S\} = 1 - \Pr\{W\} - \Pr\{L\} \tag{3}$$

Thus, from agent j's viewpoint, voting can be described as a lottery with three possible outcomes and attached subjective probabilities, as defined in (1-3); i.e. as $\Lambda = (W, \Pr\{W\}; L, \Pr\{L\}; S, \Pr\{S\})$.

Observe that all probabilities in Λ depend, among other things, on the majority threshold, q. For example, with the simple majority, $\Pr\{S\}$ is close to zero, whereas with unanimity, the status quo is "almost" certain. Thus, agent j's expected utility from the voting lottery

$$EU_j(\Lambda) = \Pr\{W\} \cdot u_j(W) + \Pr\{L\} \cdot u_j(L) + \Pr\{S\} \cdot u_j(S) \tag{4}$$

depends on the majority threshold q. Call q^* the threshold that maximizes EU_j. Below, we show that q^* is positively related to j's degree of risk aversion, and negatively related to her degree of confidence.

The first-order condition (FOC) on (4) for a stationary point q^0 is

$$\left.\frac{\partial EU_j(\Lambda)}{\partial q}\right|_{q^0} = 0 \Longleftrightarrow f^W(q^0-1) \cdot [u_j(W) - u_j(S)] = f^W(q^0) \cdot [u_j(S) - u_j(L)] \tag{5}$$

From (5) it is clear that the agent balances the marginal impact of q on the expected benefit of belonging to the majority with the marginal impact of q on the expected loss of falling into the minority. Solving (5) yields the unique stationary point:

$$q^0 = \frac{n+1}{2} + \frac{\sigma^2 \ln R_j}{1 + \mu_W - \mu_L} \tag{6}$$

where

$$R_j = \frac{u_j(S) - u_j(L)}{u_j(W) - u_j(S)} \tag{7}$$

Call R_j in (7) the ratio between agent j's benefits of not being tyrannized by an undesired majority, $u_j(S)-u_j(L)$, and her benefits of being part of a favorable winning majority, $u_j(W)-u_j(S)$. Basically, R_j is positively related to j's risk aversion. The idea is that, for given policy outcomes, W, L and S, a more risk averse agent "weights" the advantage of avoiding the tyranny of an adverse majority (the numerator) more than the advantage of being part of a favorable majority (the denominator). We will come back to this point below.

From the second-order condition (SOC) of EU_j maximization, it follows that q^0 is a maximum if:

$$1+\mu_W-\mu_L>0 \tag{8}$$

Observe that (8) implies that, for any q, a favorable majority is always more likely than an unfavorable one; i.e. $\Pr\{W\}>\Pr\{L\}$. In this situation, therefore, if the majority threshold is too high, lowering it may be advantageous because the expected utility of winning increases more than the expected disutility of losing. If the threshold is too low, raising it may be advantageous for the opposite reason.

Let us consider now what happens in the case (8) is satisfied. Then we will look at the case in which it is not.

Case 1: (8) holds

Notice that (8) holds if and only if $p>0.5-\epsilon$, with $\epsilon\to 0^+$, given that we assume that the number of agents is sufficiently large. Therefore, agent j is "confident" that the probability of a favorable majority is always higher than an unfavorable one. It is easy to see that in this case the maximum q^0 is larger than $\frac{1}{2}$ if $R_j>1$. This means that the agent prefers either a super-majority or unanimity, i.e. $q^*\in\left(\frac{1}{2},1\right]$, if the gains of winning $(u_j(W)-u_j(S))$ are lower than the gains from not losing $(u_j(S)-u_j(L))$. The intuition is clear: if j has little advantages in winning, compared to the disadvantage of losing, she tends to protect herself with a super-majority. To some extent, the positive prospect that winning is more likely than losing is mitigated by the higher cost of falling into a minority. She somehow fears to be tyrannized, then she prefers a super-majority. If $R_j\le 1$, the agent has two good perspectives from voting: on the one hand, winning is always more likely; on the other hand, losing is (weakly) less costly than winning. In this case, she wants to increase the chance of winning by choosing a low threshold, even though this will also increase the chance of losing. Therefore, $q^0\le\frac{1}{2}$, and the preferred threshold q^* is constrained to be the bare majority.

Case 2: (8) does not hold

Notice that (8) does not hold if and only if $p<0.5-\epsilon$, with $\epsilon\to 0^+$, given that we assume that the number of agents is sufficiently large. Therefore, agent j is "unconfident", in the sense specified above. In this case, q^0 is the minimum of

EU_j. Thus, the preferred threshold q^* is either unanimity or the simple majority. It is however possible to say something else about the preferred threshold. Observe that if $R_j \geq 1$, q^0 in (6) is lower than $\frac{1}{2}$; in other words, EU_j reaches a minimum below the simple majority. In this case, the preferred threshold q^* is unanimity. The intuition is clear: since (8) does not hold, winning is always less likely than losing; moreover, $R_j \geq 1$ implies that losing is relatively more costly than winning. The voting lottery presents a double disadvantage: tyranny is highly likely and highly costly. This is the worst situation; thus, not surprisingly, the agent prefers the highest protection from the risk of being tyrannized. This kind of protection is provided by unanimity. If $R_j < 1$, winning is relatively more attractive than losing. In this case, the agent might prefer a simple majority to unanimity, despite winning is always less likely. Intuitively, the simple majority becomes the preferred threshold if the relative advantage of winning $(1/R_j)$ is higher than the relative probability of losing when the simple majority threshold is set up.[6] In other words, if $\Pr\{W\}$ is only slightly lower than $\Pr\{L\}$, and winning generates high benefits compared to the cost of losing, the agent prefers to give up the highest protection of unanimity in favor of the lowest protection given by the bare majority threshold.

So far we have seen that a corner solution (i.e. the bare majority or the unanimity) emerges when (8) is not satisfied, whereas an internal solution (a super-majority) may emerge if (8) holds. In both cases, however, the agent prefers a low threshold when R_j is sufficiently low. In other words, if the advantages from winning are sufficiently high compared to the cost of losing, the agent asks for low protection from the majority tyranny, because this also implies increasing the chance of winning. Observe that R_j is low not only when the favorable outcome is relatively high compared to the unfavorable one, but also when, given gains and losses, u_j is rather convex or not highly concave. Thus, for any W, S and L, R_j decreases if the agent's risk aversion decreases.[7]. This positive relation between risk aversion and the preferred threshold is one of the two theoretical predictions that we test with our experiment.

An additional prediction to be validated concerns the role of the subjective probability p, capturing the agent's degree of confidence about how the other agents will vote. In this case, the intuition provided by the theoretical model is straightforward. Higher p means that the agent considers winning relatively more likely; thus, other

[6] The relative probability of losing is $\frac{1-x_j}{x_j}$, where x_j is the probability of winning when the simple majority threshold is set up. Given that j is unconfident (i.e. she thinks that winning is less likely than loosing), it is $\frac{1-x_j}{x_j} > 1$.

[7] Note that all lotteries over three fixed prizes can be represented in the 2-dimensional Machina-Marschak triangle. The slope of indifference curves on this domain is exactly R_j and, indeed, the more risk averse agent j is, the steeper the indifference curves are (see Machina (1987) for details).

things being equal, she fears losing less and prefers lower protection. In this case, she wants to facilitate majority formation, because, for any q, a favorable majority has become more probable; thus, she wants a lower threshold.[8]

Notice that the effect of p on the preferred threshold is independent of the agent's risk aversion. In fact, our model predicts that if a confident agent ($p > 0.5-\epsilon$) and an unconfident agent ($p < 0.5-\epsilon$) have the same ratio R in (7), the preferred threshold of the former is never higher, i.e. "less risky".[9]

We test the negative effect of agents' confidence on the preferred majority thresholds in two different settings. In the first treatment, we measure confidence by simply asking uninformed agents to state their genuine priors about the distribution of others' votes over the two alternatives. In the second treatment, we study how the effects of confidence change when agents, before stating their preferred majority thresholds, privately observe a signal about the (exogenous) distribution of votes over policies.

5 Experimental Results

Overall, we run three sessions of the *NO-INFO* treatment and two sessions of the *INFO* treatment. Each session of the *NO-INFO* treatment involved 31 subjects, while each session of the *INFO* treatment involved 35 subjects. Each subject could only participate in one of these sessions. The sessions were run at the EELAB, University of Milan - Bicocca, in 2008 and at the Bocconi University, Milan, in 2009. Each session lasted around one hour and subjects earned on average 12.59 euros plus 3.00 euros of show-up fee. The experiment was computerized using the z-Tree software (Fischbacher, 2007).

5.1 The *NO-INFO* treatment

Table 1 reports the distribution of subjects' choices in the first phase of the experiment. More than 78% of subjects choose a pair of lotteries included between the 11th and the 20th line, with the median choice being the 16th. Thus, as in other experiments,[10] we observe the majority of subjects exhibiting risk aversion.

[8]Let us sketch the proof of this intuition: if p increses, q^0 in (6) decreases if it is a maximum, and it increases if it is a minimum; in both cases, the agents prefers a (weakly) lower threshold.

[9]For example, if $R \to 0^+$, both agents choose the simple majority. If $R \to 1^-$, the confident agent chooses the simple majority, while the unconfident chooses unanimity. The same happens if $R = 1$. Finally, if $R \in (1, +\infty)$, then the confident agent chooses either a qualified majority or unanimity, while the unconfident chooses unanimity.

[10]See Carlsson *et al.* (2002) and Harrison and Rutström (2008).

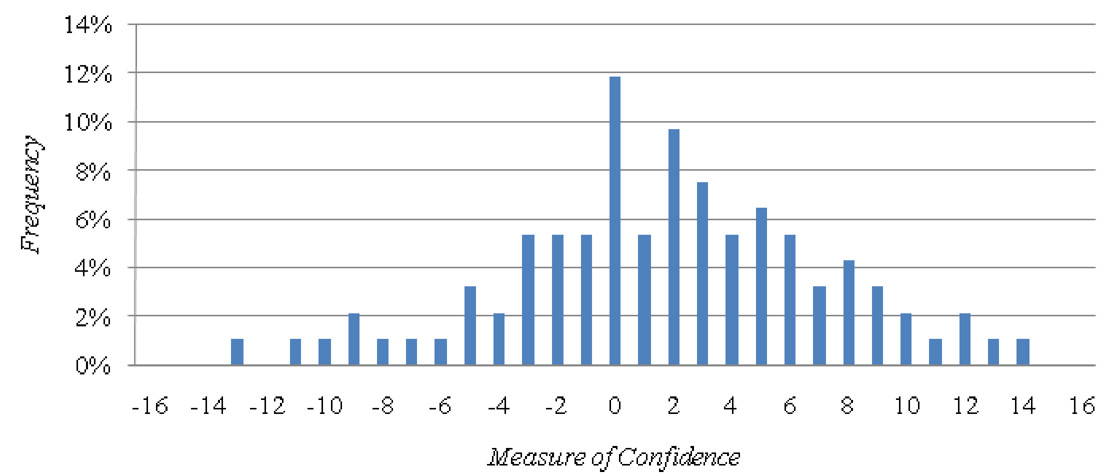
Table 1. Distribution of Risk Preferences in *NO-INFO*

	Category	N	$F(x)$
$rho \leq -2.863$	1	1	0.011
	2	0	0.011
	3	0	0.011
	4	1	0.022
	5	0	0.022
	6	3	0.054
	7	0	0.054
	8	2	0.075
	9	5	0.129
$-0.112 \leq rho \leq 0.038$	10	8	0.215
	11	2	0.237
	12	1	0.247
	13	5	0.301
	14	4	0.344
	15	10	0.452
	16	19	0.656
	17	13	0.796
	18	6	0.860
	19	8	0.946
$rho \geq 1.613$	20	5	1.000

Note. This table reports the distribution of subjects' risk preferences in *NO-INFO* and the correspondent cumulative distribution function. For a given answer, *rho* refers to the estimated interval of the risk aversion parameter as obtained by using a *CRRA* utility function.

Moving to the second phase of the experiment, we start from analyzing subjects' guesses about the distribution between $x-$type and $y-$type voters. Given that, for each subject, both types have the same probability and the random draws are independent for all subjects, a "rational" subject should always show "moderate" confidence, i.e. $1+\mu_W-\mu_L=1$. In other words, a "rational" subject should always expect the rest of the population being equally splitted over the two alternatives. Thus, knowing her type, she should always expect probability of winning being moderately higher than probability of loosing. We define "over"-confident a subject who states a distribution of the other subjects' votes that is biased in favour of her type, i.e. $1+\mu_W-\mu_L>1$. Therefore, according to their guess in the second phase of the experiment, we split the subjects into two subsets: confident and unconfident ones. The subset of confident subjects is composed by those being moderately confident (and so "rational") and those being over-confident, according to the definitions above. A "rational" subject expects that $n/2+1$ subjects in her session (including herself) will be of her type. Therefore, we built for each subject a measure of confidence defined as the difference between the number of voters she expects to have her own type and $n/2+1$. The distribution of this measure of confidence is shown in figure 1.

Figure 1. Measure of Confidence in *NO-INFO*



Observe that the modal guess is "rational" ($n/2+1$), whereas around 58% of subjects exhibit over-confidence. A binomial test strongly rejects the null hypothesis of equal distribution between confident and unconfident subjects either by considering or excluding the "rational" ones (*p-value* < 0.01). According to a Spearman correlation test, we find no significant correlation between risk aversion (as proxied by the subject's choice in the first phase) and her confidence. This holds both by considering the measure of confidence introduced above ($rho = 0.082$, *p-value* $= 0.432$) and by using a dummy variable that assumes value one if the subject is confident ($rho = -0.027$, *p-value* $= 0.792$; considering only the over-confident ones, $rho = 0.090$, *p-value* $= 0.389$).

Result 1. *The majority of subjects exhibit risk aversion and report over-confident guesses. There is not significant correlation between the degree of risk aversion and confidence.*

Let us now look at the preferred majority thresholds. Table 2 reports the distribution of subjects' choices about thresholds in the second phase of the experiment.

Table 2. Distribution of Majority Thresholds in *NO-INFO*

Majority Threshold	N	$F(x)$
16	8	0.086
17	2	0.108
18	5	0.161
19	4	0.204
20	3	0.237
21	2	0.258
22	10	0.366
23	8	0.452
24	7	0.527
25	7	0.602
26	4	0.645
27	9	0.742
28	3	0.774
29	1	0.785
30	3	0.817
31	17	1.000

Note. This table reports the distribution majority thresholds chosen by subjects in the first part of the second phase of the *NO-INFO* treatment and the correspondent cumulative distribution function.

The median preferred threshold is 24 (in percentage, around 77%), while the modal threshold is unanimity. The first column of table 3 reports results from a Tobit model in which the chosen majority thresholds are regressed on individual degrees of risk aversion and two dummies, one for rationality and the other for over-confidence. The majority thresholds are positively and highly correlated with subjects' degree of risk aversion (the estimated coefficient of *Risk Aversion* is 0.499 and it is significant at the 1% level). This result is confirmed by non-parametric tests. Indeed, according to a Wilcoxon-Mann-Whitney test, the majority thresholds chosen by subjects exhibiting risk aversion are significantly higher than those chosen by risk lovers (*p-value* = 0.012). As for the confidence, the coefficients of both dummies are negative and only the one reflecting over-confidence is highly significant.

Table 3. Tobit Models in *NO-INFO and INFO*

Dependent Variable:	(1)	(2)
Majority Threshold		
Explanatory Variables:		
Risk Aversion	0.499^{***}	1.027^{***}
	(0.164)	(0.218)
Rationality	-2.409	-1.522
	(3.014)	(1.971)
Over-Confidence	-2.742^{**}	-1.183
	(1.313)	(1.894)
Net Favorable Signal		-0.803^{**}
		(0.356)
Constant	19.185^{***}	13.132^{***}
	(2.555)	(3.416)
N. Obs.	93	70
Log-pseudolikelihood	-242.946	-182.396
F-test	4.38	6.96
Prob>F	0.006	0.000

Notes. This table reports coefficient estimates (robust standard errors in parentheses) from Tobit models for both the *NO-INFO* and *INFO* treatment. The dependent variable is given by the majority thresholds chosen by subjects in the first part of the second phase of the experiment. *Risk Aversion* is given by subjects' choices in the first part of the experiment. *Rationality* and *Over-Confidence* are dummies assuming value one if, in the second part of the second phase of the experiment, a subject reported "rational" or over-optimistic guesses respectively. For a given signal received by a subject in the second phase of the *INFO* treatment, *Net Favorable Signal* is the difference between the number of voters of her own type and the number of voters of the other type in her observed subset of seven subjects. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01 level, respectively.

Thus, after controlling for the degree of risk aversion, over-confident subjects choose majority thresholds that are significantly lower than the thresholds chosen by the unconfident ones. This evidence and the non significant correlation between confidence and risk aversion discussed above support the theoretical insights of our model. In fact, the theoretical model predicts that a confident subject with a given degree of risk aversion will never choose a higher threshold than an unconfident one with same degree of risk aversion. This is due to the assumption that risk aversion and confidence are independent idiosyncratic features in our model.

Result 2. *Subjects prefer super-majority thresholds. Subjects' preferences strongly depend on behavioral characteristics. In particular, majority thresholds are positively correlated with risk aversion and negatively correlated with confidence.*

5.2 The *INFO* treatment

Table 4 shows the distribution of subjects' choices in the first phase of the experiment.

Table 4. Distribution of Risk Preferences in *INFO*

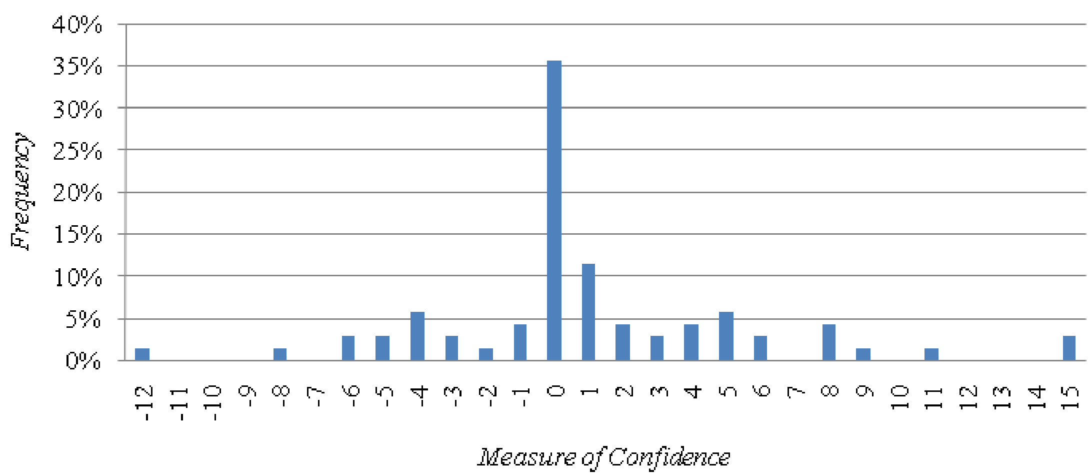
	Category	*N*	$F(x)$
$rho \leq -2.863$	1	1	0.014
	2	0	0.014
	3	0	0.014
	4	1	0.028
	5	0	0.028
	6	0	0.028
	7	1	0.043
	8	2	0.071
	9	1	0.085
$-0.112 \leq rho \leq 0.038$	10	5	0.157
	11	9	0.285
	12	1	0.300
	13	4	0.357
	14	2	0.385
	15	9	0.514
	16	14	0.714
	17	8	0.828
	18	2	0.857
	19	5	0.928
$rho \geq 1.613$	20	5	1.000

Note. This table reports the distribution of subjects' risk preferences in *INFO* and the correspondent cumulative distribution function.

Similarly to the *NO-INFO* treatment, the median choice in the first phase of the experiment is line 16. More than 84% of subjects exhibit risk aversion. We do not find any significant difference between treatments in the risk parameter (Wilcoxon-Mann-Whitney test, *p-value* = 0.607).

Consider now the second phase of the experiment. Recall that, in the *INFO* treatment, before choosing the majority threshold and stating her guess, each subject observed the distribution of $x-$type and $y-$type voters in a subset of seven subjects. In order to classify subjects as confident or unconfident, we must combine subjects' stated guesses with the informative content of their private signal. First, for each subject, we built a theoretical distribution by rescaling the number of xs and ys in the private signal to the size of the subject pool. Then, we built for each subject a new measure of confidence defined as the difference between the number of voters she expects to have her own type and the predicted number obtained by rescaling the private signal she received. Figure 2 reports the distribution of this new measure of confidence.

Figure 2. Measure of Confidence in *INFO*



As shown by the graph, 36% of subjects reported "rational" guesses, while 41% exhibited over-confidence. We built a dummy assuming value one if the subject is "rational", a dummy assuming value one if the subject exhibits over-confidence and a dummy assuming value one in case of unconfidence. Recall that in this treatment a "rational" subject should rescale the distribution of the signal she privately received to the size of the subject pool. Accordingly, over-confidence means that the subject's guess on the number of voters of her own type is strictly larger than the predicted number inferred by rescaling the signal. As shown in table 5, although the population is equally splitted between those observing a favorable signal and those receiving an unfavorable one, a binomial test rejects the null hypothesis of an equal distribution between confident and unconfident subjects. This is true both by including (*p-value* = 0.000) and by excluding (*p-value* = 0.072) the "rational" subjects amongst the confident ones.

Table 5. Over-Confident, Rational and Unconfident subjects in *INFO*

	Favorable Signal		
Measure of Confidence	> 0	< 0	N
> 0	9	20	29
$= 0$	13	12	25
< 0	13	3	16
N	35	35	70
p-value[a]	0.175	0.000	0.000
p-value[b]	0.523	0.000	0.072

Note. This table reports the distribution of Over-Confident, "Rational" and Unconfident subjects in *INFO* cross-tabulated with the information contained in their signals. The table also reports results from a binomial test for the null hypothesis of an equal distribution between Confident and Unconfident subjects either by including (a) or by excluding (b) from the first category those reporting "rational" guesses.

By considering only subjects observing an unfavorable signal, there is a clear tendency towards over-confidence (20 subjects out of 35 report over-confident guesses, while only 3 show unconfidence), confirming the tendency in the *NO-INFO* treatment. Interestingly, a different picture emerges when we focus on those observing a favorable signal. In this case, the proportion of over-confident subjects is slightly smaller than the unconfident ones (9 vs 13). However, the proportion of subjects being "rational" is almost the same that we find when the signal is unfavorable. We have an intuitive interpretation for this evidence. Suppose that, when asked to state her prior without observing any signal, a subject is genuinely over-confident (i.e. over-confident according to the measure defined for *NO-INFO*). If we let this subject observe a favorable private signal, then she "tempers" her over-confidence and shows herself as "rational" (according to the measure defined for *INFO*). If instead she observes an unfavorable signal, her genuine over-confidence prevails. Although the opposite happens for genuinely unconfident subjects, this effect is less evident, given the relative small number of these subjects.

Similarly to the *NO-INFO* treatment, risk aversion is not significantly correlated to confidence. This is true both if we consider the measure of confidence introduced for the *INFO* treatment (rho = 0.122, *p-value* = 0.315) and by using a dummy variable with value one when a subject exhibits confidence (rho = 0.093, *p-value* = 0.442; considering only the over-confident ones, it is rho = 0.164, *p-value* = 0.279).

Result 3. *More than one third of subjects react to the private signal by rationally updating their guesses about the others' types. A large proportion of subjects continue to exhibit over-confidence.*

Consider now the first part of the second phase of the experiment. Table 6 reports the distribution of subjects' choices about thresholds. The modal choice is unanimity; the second most preferred threshold is the simple majority.

Table 6. Distribution of Majority Thresholds in *INFO*

Majority Threshold	N	$F(x)$
18	9	0.129
19	0	0.129
20	3	0.171
21	4	0.229
22	5	0.300
23	4	0.357
24	2	0.386
25	5	0.457
26	4	0.514
27	5	0.586
28	1	0.600
29	2	0.629
30	6	0.714
31	2	0.743
32	3	0.786
33	3	0.829
34	0	0.829
35	12	1.000

Note. This table reports the distribution majority thresholds chosen by subjects in the first part of the second phase of the *INFO* treatment as well as the correspondent cumulative distribution function.

In the second column of table 3, we present results from a Tobit model that regresses the majority threshold chosen by a subject on the same set of explanatory variables used for the *NO-INFO* treatment and on *Net Favorable Signal*. This variable is defined, given the signal that a subject receives, as the difference between the number of voters of her own type and the number of voters of the other type in her observed subset of seven subjects. As before, the estimated coefficient of *Risk Aversion* is positive and highly significant. Interestingly, neither *Over-Confidence* nor *Rationality* are significant while *Net Favorable Signal* is highly significant. Thus, the private signal tends to replace (or at least has a stronger impact than) subject's over-confidence in determining the preferred majority threshold.

Result 4 *In the INFO treatment, there is a positive and highly significant correlation between subject's preferred majority threshold and her degree of risk aversion. Moreover, the private signal replaces the influence of her over-confidence in determining her preferred majority threshold.*

6 Conclusion

In this paper, we argue that the fear of being subject to a majority tyranny leads an individual to prefer more demanding majority thresholds. In accordance to the theoretical prediction, our experimental results show that the level of the preferred majority threshold depends on the voter's risk aversion and on subjective priors about how others will vote. Therefore, a more risk averse and a less confident agent may fear more being tyrannized by an unfavorable majority, thus asking for higher super-majorities.

These findings have important implications for the design of the optimal voting system, which have been neglected by the literature so far.[11] As a major expression of a system's democracy, the design of voting institutions should account, among other things, for citizens' preferences regarding the threshold required in order to determine the winning majority.

It is also worth observing that, while risk aversion is intrinsically related to an individual's perception of private gains and losses, lack of confidence reflects an individual's perception about how own preferences may differ from the others'. Lack of confidence may derive from the feeling of being different in ideology, needs, desires, vision of the world. This is particularly important in collective situations, such as

[11] With one notable exception by Procaccia and Segal (2003) analyzing how a constitution is drafted by people that behave according to Prospect Theory (Kahneman and Tversky (1979)).

voting. An unconfident individual may think that the majority is different from herself and consequently she does not want the majority to easily make decisions that will affect her. Thus, over-confidence is a behavioral distortion that possibly affects the calculus of the threshold. In fact, we find that naively over-confident individuals significantly prefer lower thresholds. As soon as agents receive a private signal according to which others are more likely to vote in a favorable way, naive over-confidence is replaced by the signal. Thus, the preferred thresholds are fully determined by the signal, rather than by voters' naive priors. Our findings are in line with the existing literature on the role of exit polls and pre-voting information on agents' choice. However, while previous experimental works focus on the role of exit polls on voting behavior, our paper sheds light on their relevance for agents' preferences on the voting rules.

Of course, protection comes at the cost of lower chance to overcome the status quo in a favorable way. One might argue that this individual trade off between risk of tyranny and chance of being part of a favorable majority reflects the trade off at collective level between decisiveness of the voting rules and the need of protecting minorities. In this paper we have not answered the question of which threshold will be chosen at the constitutional level, and whether it is "socially" optimal or not. We think, however, that our findings contribute to answer important normative issues such as: how do voting rules reflect the risk attitudes of citizens where crucial policy issues are concerned? What kind of protection do agents demand when they belong to an ethnic minority or when they think that their policy preferences are different from the bulk of the population? What degree of conflict on decisional rules should we expect within a constituency whose members have diversified preferences? How many super-majority thresholds should a statute include, and for which issues?

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Appendix

Instructions

Welcome to the experimental laboratory of _____________ University of _____________ .
Thank you for participating in this experimental session. By carefully following the instructions described below, you can earn an amount of Euros that will be paid in cash at the end of the session.

The choices and the earnings of each participant will remain anonymous throughout the session. This means that no participant in this session will receive any information about the choices and the earnings of the other participants.

During the session, it is not allowed to speak or to communicate in any other way with the other participants. If you have any questions, please raise your hand and one of the lab assistants will come to answer your questions privately.

All the following rules are the same for all participants.

General rules

This experimental session consists of two consecutive phases.

Only one of the two phases will be used to determine your final earnings. In particular, the phase used to determine your earnings will be randomly chosen at the end of the experiment, by flipping a coin. Thus, each of the two phases has a probability of 50% to be chosen for payment.

In a few seconds, we will distribute the instructions for Phase 1.

The instructions for Phase 2 will be distributed at the end of Phase 1.

Phase 1

Your task in this phase.

Please take a look at Table 1. Table 1 describes 19 pairs of lotteries, with each pair corresponding to different Line. Each pair consists of two lotteries, called A (left column) and B (right column). For each lottery of a pair, the table indicates the monetary outcomes as well as the attached probabilities expressed in terms of tickets. Notice that, within each pair of lotteries, the number of the tickets assigned to the higher and to the lower monetary outcome is the same. Within each pair, the only difference between lottery A and lottery B is in the monetary earnings:

- in lottery A, the higher monetary outcome is 12.00 euros and the lower is 10.00 euros;
- in lottery B, the higher monetary outcome is 22.00 euros and the lower is 0.50 euros.

You have to indicate from which pair of lotteries you prefer taking part to lottery B rather than to lottery A. In other words, in your computer screen you have to select a Line number from L1 to L20, such that:

- for all the pairs above the line you have chosen, you prefer lottery A to lottery B;
- for the line you have chosen and for all the lines below, you prefer lottery B to lottery A.

Notice that selecting line L1 means that you prefer lottery B to lottery A for all the 19 pairs, while selecting the last (empty) line L20 means that you prefer lottery A to lottery B for all the 19 pairs.

At the end of the experiment, in case phase 1 will be randomly selected for payment, the earnings will be determined as follows.

First, for each participant, the computer will randomly select a pair of lotteries. Given the pair of lotteries the computer will select for you, your choice will be used to determine which lottery you will participate. At this point, an experimenter will randomly draw one of the 20 tickets. The selected ticket will be the winning ticket and it will be the same for all the participants.

Example

For all the pairs of lotteries from L1 to L6, John prefers lottery A to lottery B, while he prefers lottery B to lottery A for all the pairs from L7 to L19. For this reason, John chooses L7. At the end of the experiment, phase 1 is randomly selected for payment. Suppose that the computer selects the pair L10 for John. Given his choice, for L10 John prefers lottery B to lottery A. At this point, we randomly draw one of the 20 tickets. If the number of the selected ticket is between 1 and 10, John receives 22.00 euros; if the number of the selected ticket is between 11 and 20, John receives 0.50 euros.

Table 1

The following table shows 19 pairs of Lotteries, called A and B respectively.

	LOTTERY A	LOTTERY B
L1	If the selected ticket is no. 1, you win *12.00* euros; if the selected ticket is between 2 and 20, you win *10.00* euros.	If the selected ticket is no. 1, you win *22.00* euros; if the selected ticket is between 2 and 20, you win *0.50* euros.
L2	If the selected ticket is between 1 and 2, you win *12.00* euros; if the selected ticket is between 3 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 2, you win *22.00* euros; if the selected ticket is between 3 and 20, you win *0.50* euros.
L3	If the selected ticket is between 1 and 3, you win *12.00* euros; if the selected ticket is between 4 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 3, you win *22.00* euros; if the selected ticket is between 4 and 20, you win *0.50* euros.
L4	If the selected ticket is between 1 and 4, you win *12.00* euros; if the selected ticket is between 5 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 4, you win *22.00* euros; if the selected ticket is between 5 and 20, you win *0.50* euros.
L5	If the selected ticket is between 1 and 5, you win *12.00* euros; if the selected ticket is between 6 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 5, you win *22.00* euros; if the selected ticket is between 6 and 20, you win *0.50* euros.
L6	If the selected ticket is between 1 and 6, you win *12.00* euros; if the selected ticket is between 7 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 6, you win *22.00* euros; if the selected ticket is between 7 and 20, you win *0.50* euros.
L7	If the selected ticket is between 1 and 7, you win *12.00* euros; if the selected ticket is between 8 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 7, you win *22.00* euros; if the selected ticket is between 8 and 20, you win *0.50* euros.
L8	If the selected ticket is between 1 and 8, you win *12.00* euros; if the selected ticket is between 9 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 8, you win *22.00* euros; if the selected ticket is between 9 and 20, you win *0.50* euros.
L9	If the selected ticket is between 1 and 9, you win *12.00* euros; if the selected ticket is between 10 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 9, you win *22.00* euros; if the selected ticket is between 10 and 20, you win *0.50* euros.
L10	If the selected ticket is between 1 and 10, you win *12.00* euros; if the selected ticket is between 11 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 10, you win *22.00* euros; if the selected ticket is between 11 and 20, you win *0.50* euros.
L11	If the selected ticket is between 1 and 11, you win *12.00* euros; if the selected ticket is between 12 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 11, you win *22.00* euros; if the selected ticket is between 12 and 20, you win *0.50* euros.
L12	If the selected ticket is between 1 and 12, you win *12.00* euros; if the selected ticket is between 13 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 12, you win *22.00* euros; if the selected ticket is between 13 and 20, you win *0.50* euros.
L13	If the selected ticket is between 1 and 13, you win *12.00* euros; if the selected ticket is between 14 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 13, you win *22.00* euros; if the selected ticket is between 14 and 20, you win *0.50* euros.
L14	If the selected ticket is between 1 and 14, you win *12.00* euros; if the selected ticket is between 15 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 14, you win *22.00* euros; if the selected ticket is between 15 and 20, you win *0.50* euros.
L15	If the selected ticket is between 1 and 15, you win *12.00* euros; if the selected ticket is between 16 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 15, you win *22.00* euros; if the selected ticket is between 16 and 20, you win *0.50* euros.
L16	If the selected ticket is between 1 and 16, you win *12.00* euros; if the selected ticket is between 17 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 16, you win *22.00* euros; if the selected ticket is between 17 and 20, you win *0.50* euros.
L17	If the selected ticket is between 1 and 17, you win *12.00* euros; if the selected ticket is between 18 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 17, you win *22.00* euros; if the selected ticket is between 18 and 20, you win *0.50* euros.
L18	If the selected ticket is between 1 and 18, you win *12.00* euros; if the selected ticket is between 19 and 20, you win *10.00* euros.	If the selected ticket is between 1 and 18, you win *22.00* euros; if the selected ticket is between 19 and 20, you win *0.50* euros.
L19	If the selected ticket is between 1 and 19, you win *12.00* euros; if the selected ticket is no. 20, you win *10.00* euros	If the selected ticket is between 1 and 19, you win *22.00* euros; if the selected ticket is no. 20, you win *0.50* euros.

Phase 2

This phase consists of two parts. The instructions of the second part will be distributed at the end of the first part.

Part 1 of phase 2

Your task in part 1 of phase 2.

In this part of phase 2, you will be involved in the voting over two alternatives, X and Y.

You have to choose the majority threshold required to determine the winning alternative, knowing that:

[NO-INFO Treatment]

- there are 31 participants in this session. Each participant counts for one vote only. Thus, the majority threshold you have to choose must be included between 16 votes (the simple majority) and 31 votes (the unanimity).
- the vote of each participant is randomly (with equal probability) and anonymously assigned by the computer to one of the two alternatives. For each participant there is a separate random draw. Before choosing the majority threshold, you will be informed about which alternative you support. However, you will not observe the alternative voted by any of the other participants, which could be X or Y with equal probability.

[INFO Treatment]

- there are 35 participants in this session. Each participant counts for one vote only. Thus, the majority threshold you have to choose must be included between 18 votes (the simple majority) and 35 votes (the unanimity).
- the vote of each participant is randomly (with equal probability) and anonymously assigned by the computer to one of the two alternatives. For each participant there is a separate random draw. Before choosing the majority threshold, you will be informed about which alternative you support. However, you will not observe the alternative voted by any of the other participants, which could be X or Y with equal probability.
- before choosing the majority threshold, each participant will be shown the number of votes in favor of X and the number of votes in favor of Y in a subgroup of 7 participants randomly selected by the computer for her.

At the end of the experiment, in case phase 2 will be randomly selected for payment, the earnings of this part will be determined as follows.

If the number of votes in favor of the alternative you support is greater than or equal to the majority threshold you have chosen, then you get 22.00 euros.
If the number of votes in favor of the alternative you do not support is greater than or equal to the majority threshold you have chosen, then you get 0.00 euros.
If neither of the two alternatives receives a number of votes at least equal to the majority threshold you have chosen, then you get 11.00 euros.

Example

The computer randomly assigns John’s vote to alternative X.

[NO-INFO Treatment]

John chooses a majority threshold of 21 votes (out of 31) required to determine the winning alternative between X and Y. At the end of the experiment, phase 2 is randomly selected for payment. If the number of votes in favor of the alternative X is greater than or equal to 21, then John gets 22.00 euros. If the number of votes in favor of the alternative Y is greater than or equal to 21, then John gets 0.00 euros. If neither of the two alternatives receives at least 21 votes, John gets 11.00 euros.

[INFO Treatment]

Moreover, in the subgroup of 7 participants randomly selected by the computer for John, 5 votes are for alternative X and 2 votes are for alternative Y.
John chooses a majority threshold of 21 votes (out of 35) required to determine the winning alternative between X and Y. At the end of the experiment, phase 2 is randomly selected for payment. If the number of votes in favor of the alternative X is greater than or equal to 21, then John gets 22.00 euros. If the number of votes in favor of the alternative Y is greater than or equal to 21, then John gets 0.00 euros. If neither of the two alternatives receives at least 21 votes, John gets 11.00 euros.

Part 2 of phase 2

Your task in part 2 of phase 2.

[NO-INFO treatment]

In this part of phase 2, you have to guess the number of votes for alternative X and the number of votes for alternative Y, with the sum of these numbers being equal to 31, namely to the total number of participants in the session.

[INFO treatment]

In this part of phase 2, you have to guess the number of votes for alternative X and the number of votes for alternative Y, with the sum of these numbers being equal to 35, namely to the total number of participants in the session.

At the end of the experiment, in case phase 2 will be randomly selected for payment, the earnings of this part will be determined as follows.

If your guesses match the number of votes randomly assigned to alternative X and Y respectively, then 3.00 euros will be added to your earnings from part 1 of phase 2.