Why Votes Have a Value*

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Abstract

We perform an experiment where subjects pay for the right to vote in a firm when they can also buy non-voting shares with the same dividend rights. Voting on the replacement of the manager changes the expected value of future dividends. We observe a significant premium for the voting shares. We formulate three versions of the instrumental voting hypothesis and find that none can explain our experimental results. We also formulate three versions of the expressive voting hypothesis and find that voters only value the right to vote if it gives them effective control or power.

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1 Introduction

In this paper we investigate experimentally why people value the right to vote. The observation that people generally do value the right to vote is common to the literature in political science as well as in financial economics. However, no generally accepted explanation of this phenomenon has emerged, and the two disciplines just mentioned differ substantially in their approach to this problem. We contrast two explanations. The instrumental voting hypothesis holds that voters value the right to vote only as a mean to an end, as voting allows each voter to affect decisions he or she cares about, whereas voters do not attach a value to the opportunity to vote in itself. The expressive voting hypothesis holds that voters value the right to vote beyond purely instrumental reasons. Our experimental evidence is inconsistent with all versions of the instrumental voting hypothesis we consider and we interpret our results as supportive of expressive voting. In particular, we conclude that experimental subjects value the opportunity to join a group that exercises power beyond the consequences the votes have on their own wealth.

In political science the instrumental view of voting is a key element of the rational choice literature (Downs, 1957; Riker and Ordeshook, 1968) but has usually been criticized because with a larger number of voters the ability of any individual voter to affect the outcome and be pivotal for the final result is miniscule. Hence, if voting is associated with costs – however small – then it is not rational for voters to participate in elections. Several authors have therefore argued that voting is also *expressive*, i.e., voters do not just benefit from the votes indirectly through their ability to affect decisions in their favor, but they receive also a direct benefit from voting.[1] We use the term "expressive voting" in this broad sense and describe voters in our experiment as voting expressively if their motivation is anything other than wanting to affect the outcome of the vote.

[1] To the best of our knowledge the earliest reference to this argument, which explicitly introduces the concept of "expressive voting" is Fiorina (1976). However, Fiorina credits Butler and Stokes (1969) with this distinction and refers to the "older tradition" in political science (i.e., the tradition preceding Downs, 1957) as supporting a non-instrumental view of voting. Clearly, even the canonical model of Riker and Ordeshook (1968) bases the choice among candidates on rational choice, whereas the motivation to participate in the election is also motivated by the notion of a "civic duty," which already introduces a non-instrumental aspect into rational choice theory.

In financial economics the right to vote has a monetary value that can be observed for those companies that issue two classes of stock that have the same dividend rights, but one class (henceforth referred to as A-shares) has the right to vote, whereas another class of otherwise identical B-shares do not carry any voting rights. The difference between the price of two classes of otherwise identical shares represents the monetary value of a vote and is referred to as the "voting premium," and it is typically substantial (see Appendix A for a discussion of this literature).

Financial economists have addressed the problem of pivotality with a different argument. If bidders in a takeover want to take control of the company, then they need control of the votes and are therefore willing to pay a premium for the voting shares, whereas no such premium would be paid to non-voting shareholders. At any point in time there is a certain probability that a company is taken over and that such a premium would be paid, so we should always expect non-voting shares to trade at a discount to voting shares, which is exactly what we observe. Many papers have analyzed the theoretical and empirical aspects of dual class shares. We discuss the empirical research on dual class shares in Appendix A and draw the following conclusions from this discussion: (A) we observe large voting premia also in countries with no or hardly any takeovers; (B) *ex ante* expected voting premia are consistently larger than the voting premia that are paid *ex post* when takeovers actually occur; (C) we also observe large voting premia for companies where the bylaws force bidders to pay the same price for A-shares as for B-shares. Hence, the takeover theory and its variants cannot explain the voting premia actually paid in financial markets.

We address the question why votes have a value in the context of an experiment where we can price the value of the right to vote in a setup that is similar to the shareholder voting setup just described.[2] There are two classes of shares, which are auctioned off at the beginning. One class of shares has the right to vote and the other class has not. In the first period the company pays a dividend that depends on the quality of the manager. The second period's dividend is influenced by an intermediate vote where those experimental subjects who bought the voting shares decide on the replacement of the manager by a majority vote. However, the non-voting

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2 To the best of our knowledge only one study attempts to value the right to vote in an experiment. Güth and Weck-Hannemann (1997) attempt to elicit the value of the right to vote in a field experiment in the context of

shares receive exactly the same dividends as the voting shares, and there are no conflicts of interest between the holders of the two classes of shares – in fact, each subject can buy shares of both classes. In our experiment we find that individuals attach a significant value to the right to vote, which equals about 13% of the value of the shares in Nash equilibrium, a magnitude that is similar to those found in the empirical literature on dual class shares.

Within our setup we can separate the instrumental and the expressive aspects of voting. We develop three different versions of the instrumental voting hypothesis:

A. Individuals are either fully rational (Nash equilibrium) or they make errors, but the errors are symmetric and common knowledge (Quantal response equilibrium).

B. Individuals make random errors and they are overconfident, i.e. they believe that they can avoid errors better than other voters.

C. Individuals make random errors and are overconfident as in version B. In addition, they are affected by the illusion of control, i.e. they overestimate the probability of being pivotal.

We show that both cases considered in version A of the instrumental voting hypothesis predict that there should be no voting premium. The more restrictive setup assumes that all subjects are rational and that rationality is common knowledge. We derive the symmetric responsive Nash equilibrium of this game and show that there should be no voting premium.[3] A somewhat milder implementation of the rational choice paradigm invokes the notion of quantal response equilibrium (QRE) as proposed by McKelvey and Palfrey (1995, 1998), where voters are assumed to make random mistakes and then formulate strategies that are best responses in such a context. We show that this setup is a good model of the voting behavior in our experiment. However, we assume that errors are symmetric and common knowledge, and then the QRE does not predict a voting premium.

a political election. See Schram (1997) for a comment that highlights the severe difficulties with this methodology.

3 Voting games are notorious for multiple equilibria. Many of these equilibria are asymmetric where otherwise identical voters choose different strategies. Also, there are symmetric equilibria that are not responsive to environmental information (in our game: all voters vote to replace the manager). We focus on symmetric equilibria that are responsive to environmental information.

In version B of the instrumental voting hypothesis we drop the assumption that rationality is common knowledge and assume instead that voters are overconfident and trust that they make fewer mistakes when they vote than other participants in the same game. We show how this leads to a voting premium, but it is orders of magnitude smaller than the voting premium actually observed. If we in addition assume that individuals are affected by the illusion of control so that they overestimate the probability of being pivotal, the model predicts a higher voting premium. But even under extreme assumptions, the predicted premium is much smaller than the observed premium. We therefore reject all versions of the instrumental voting hypothesis as it contributes little to understanding our experimental results.

We then investigate three different versions of the expressive voting hypothesis:

A. Individuals value the right to vote because they enjoy the status of being a voter and being in control of a decision, or being part of a group that makes decisions. This is true even if the decisions have no material consequences.

B. Individuals enjoy being part of a group that exercises power, but only in so far as the decisions they can influence have material consequences.

C. Individuals enjoy being part of the majority and joining a "bandwagon" and they are willing to pay for this opportunity.

We find that our results are consistent only with version B of the expressive voting hypothesis. If the decision voters take has no material consequences then experimental subjects adjust their voting behavior accordingly, but they are not willing to pay more for the voting shares compared to the non-voting shares. We also do not observe bandwagon behavior (version C of the expressive voting hypothesis), and our experimental subjects are not willing to pay a premium for the opportunity to "join the bandwagon."

The remaining part of the paper is structured as follows. Section 2 develops the model and the main hypotheses. Section 3 describes the experimental setup. Section 4 discusses our experimental results, and Section 5 concludes. Appendix A summarizes our reading of the literature on dual class shares and Appendix B contains more details on the experiments.

2 The model

2.1 Model setup

General setup. The game has N potential risk-neutral investors with an initial endowment of cash who can bid for shares in a company. There are two classes of shares: A-shares, which give shareholders voting rights in the company, and B-shares, which have no voting rights. A-shares and B-shares are both entitled to the same dividends per share and the number of A-shares and the number of B-shares is $M < N$ for each class. At the beginning investors bid for shares in the company. Then there are two periods in which the firms pays, respectively, the dividends D_1 and D_2. The dividends depend on the quality of the manager employed and a state of nature. The basic setup is the same for both periods. After observing the dividend paid in the first period shareholders vote on the replacement of the manager who runs the firm in the second period.

Technology and dividends. Managers are drawn from a pool and the number of good managers and bad managers in the pool is the same. If the manager is good, then the dividend in period t is high ($D_t = H$) with probability $p \geq 0.5$. In the complementary state the dividend is low ($D_t = L < H$) with probability $1 - p$. If the manager is bad, then $D_t = L$ with probability p and $D = H$ with probability $1 - p$. Investors know the probability p, but not the quality of the manager. Since firms draw a good manager or a bad manager from the pool with equal likelihood, the posterior probability of having a good manager is therefore p if $D_t = H$ and $1 - p$ if $D_t = L$.

Voting. Shareholders observe the dividend in the first period and then vote on the replacement of the manager by majority vote. Only owners of A-shares are allowed to vote and they have one vote per share. We assume M is odd for simplicity, so the manager will be replaced whenever more than $(M+1)/2$ votes are cast for the replacement of the manager. Then a new manager is drawn from the same pool for the second period, so the new manager is good or bad with the same probability p. If less than $(M+1)/2$ votes are cast for the replacement of the manager, the old manager stays in charge.

Initial allocation of shares. At the beginning, each investor can submit a bid for one A-share and another bid for one B-share. No investor is allowed to bid for multiple shares of the same class, but each investor bids simultaneously for one A-share and one B-share.[4] It is not possible not to bid, but it is possible to bid zero. The auctioneer collects the N bids for each class of shares. The shares for each class are allocated to the investors who submitted the M highest bids. Investors pay a price equal to the M+1-st bid submitted for this class of shares. If several investors submit identical bids so that the M-th bid is not unique, then the auctioneer allocates the shares by lot among these investors.

We therefore obtain the following extensive form of the game:

1. Nature draws the quality of the manager who runs the firm. Investors bid for shares in the firm.
2. The auctioneer allocates the shares of the firm to investors and determines the prices. Investors pay the price for the shares they are allocated.
3. The dividend for the first period is realized and paid to all shareholders.
4. A-shareholders vote on the replacement of the manager.
5. The dividend for the second period is realized and paid to all shareholders.

The setup is the simplest setup that allows us to separate the different versions of the instrumental voting hypothesis and the expressive voting hypothesis, respectively. We need a minimum of two periods, so that individuals can learn and make inferences from the first dividend, and then make appropriate decisions contingent on the first dividend.

We use two classes of otherwise identical shares in order to control for unobservable factors that might affect individuals' valuations. In particular, our setup is robust to risk-aversion, because risk-aversion only affects the prices of the two types of shares, but not the price difference, which is the quantity we are most interested in. The reason is that the vote does not

4 We impose this restriction for several reasons. In the bidding stage, this assumption greatly simplifies the potential bids of the investors, and (together with a sufficiently high budget) makes sure that investors always have enough resources to bid for all shares they want. In the voting stage, this restriction makes sure that there are always M voters, so that it is not possible to buy a majority of votes. Barclay and Holderness (1989) and Dyck and Zingales (2004) show that the prices of blocks of voting shares that confer effective control of a firm are traded at substantially higher prices than individual shares in the market. This effect is precluded by our assumptions.

affect the payouts but only the probabilities of the different payouts. Expected utility is linear in the probabilities, so risk aversion will not affect the price difference.

2.2 Instrumental voting

In this section we make theoretical predictions for the voting premium that are implied by different versions of the instrumental voting hypothesis. We first calculate the Nash equilibrium under the assumption that investors are fully rational. Then we allow for symmetric errors that are common knowledge (Quantal Response Equilibrium), and finally introduce two behavioral biases: overconfidence and the illusion of control.

2.2.1 Nash equilibrium

Voting. Shareholders observe the dividend of the first period and infer that the manager is good with probability p and bad with probability $1 - p$. Denote by $\delta \in \{R, K\}$ the decision to replace (R) or to keep (K) the manager. In the first period and, if the manager is replaced, also in the second period, we have:

$$E\left(D_2 \middle| D_1 = H, \delta = R\right) = E\left(D_2 \middle| D_1 = L, \delta = R\right) = E\left(D_1\right) = \frac{H+L}{2} \tag{1}$$

After observing a high dividend, the posterio probability of the manager being good is p. Hence, if the manager is kept, we obtain:

$$\begin{aligned} E\left(D_2 \middle| D_1 = H, \delta = K\right) &= p\left(pH + (1-p)L\right) + (1-p)\left(pL + (1-p)H\right) \\ &= H - 2p(1-p)(H-L) \end{aligned} \tag{2}$$

Similarly, after observing a low dividend:

$$\begin{aligned} E\left(D_2 \middle| D_1 = L, \delta = K\right) &= p\left(pL + (1-p)H\right) + (1-p)\left(pH + (1-p)L\right) \\ &= L + 2p(1-p)(H-L) \end{aligned} \tag{3}$$

It follows that if $p > 0.5$ then A-shareholders wish to replace the manager if $D_1 = L$ and they wish to keep the manager if $D_1 = H$. If $p = 0.5$ they are indifferent between replacing and keeping the manager. In principle there are many asymmetric equilibria of this game where a majority of shareholders either votes to replace or to keep and no shareholder is pivotal for the decision. For example, in one equilibrium $(M + 1)/2 + 1$ A-shareholders always vote to replace the manager and $(M + 1)/2 - 1$ shareholders always vote to keep her. However, there is no central coordinating mechanism in this game to allocate different roles to shareholders. In the unique symmetric trembling hand-perfect equilibrium all A-shareholders vote to replace if $D_1 = L$ and to keep if $D_1 = H$ as long as $p > 0.5$.[5] We focus on this equilibrium here and ignore the asymmetric equilibria. We also ignore non-responsive symmetric equilibria where all shareholders vote for the same alternative all of the time. Note that these would not be trembling-hand perfect.

Bidding and valuation. Since $D_1 = L$ and $D_1 = H$ are equiprobable we obtain from the equilibrium replacement decision:

$$\begin{aligned} V_{Nash} &= E\left(D_1\right) + \frac{1}{2}E\left(D_2 \middle| D_1 = H, \delta = K\right) + \frac{1}{2}E\left(D_2 \middle| D_1 = L, \delta = R\right) \\ &= H + L + \left(\frac{1}{4} - p\left(1-p\right)\right)\left(H-L\right). \end{aligned} \tag{4}$$

Since $p\left(1-p\right) < 1/4$ whenever $p > 0.5$ we have $V_{Nash} > H + L$, otherwise $V_{Nash} = H + L$. Hence, the second term in equation (4) reflects the benefits from voting to shareholders. The intrinsic value V_{Nash} is the same for A-shares and for B-shares. The auction is a standard multi-unit Vickrey auction, so it is a weakly dominant strategy for each investor to bid the intrinsic value V_{Nash} for one A-share and also for one B-share. If all investors do this, the unique price for the A-shares is $P_A = V_{Nash}$, and, similarly for the B-shares $P_B = V_{Nash}$, so there is no price difference between the two classes of shares. Since all investors bid the same the auctioneer then allocates the shares by lot.

2.2.2 Errors, Overconfidence, and the Illusion of Control

It is well-known that participants in experiments deviate from pure Nash strategies and that they also take into account the possibility that other players make mistakes in the formulation of their own optimal strategy. For this reason McKelvey and Palfrey (1995, 1998) develop the concept of a Quantal Response Equilibrium (QRE), which has been successfully applied to the

[5] In order to see this note that in any completely mixed strategy profile there is a positive probability for each A-shareholder to be pivotal. But then the expected second period dividend is strictly higher when the manager is replaced compared to when she is kept (given that $D_1 = L$ and $p > 0.5$) and voting to replace her is then a strictly dominant strategy for each shareholder.

analysis of experimental results.[6] The notion of a QRE is based on the assumption that players make mistakes and that their strategies are best responses given the mistakes they anticipate other players to make. We first develop the symmetric, standard notion of QRE and show that as long as it is common knowledge that errors are symmetric, the valuation of the two classes of shares is the same (although lower than in the Nash equilibrium). We then go one step further and analyze the case where investors are overconfident and believe that they make fewer errors than the other bidders.

Rationality with errors. We denote the probability that an A-shareholder makes an error when voting on the dismissal of the manager by τ_{D_1}. So τ_L is the probability that an A-shareholder votes against a dismissal after observing a low dividend, and τ_H is the probability that a shareholder votes for a dismissal after observing a high dividend. As individual errors are independent from one another, the voting equilibrium now involves a certain probability of a mistake, namely:

$$e_L = \Pr\left(\text{manager is kept} \mid D_1 = L\right) = \sum_{i=(M+1)/2}^{M} \binom{M}{i} \tau_L^i \left(1-\tau_L\right)^{(M-i)} \tag{5}$$

$$e_H = \Pr\left(\text{manager is replaced} \mid D_1 = H\right) = \sum_{i=(M+1)/2}^{M} \binom{M}{i} \tau_H^i \left(1-\tau_H\right)^{(M-i)} \tag{6}$$

Therefore, the expected dividend in the second period is $E\left(D_2 \middle| D_1 = H, \delta = K\right)$ as given in equation (2). with probability (1 – e_H)/2, With probability (1 – e_L)/2 the manager is replaced after a low dividend, and with probability e_H/2 the manager is replaced after a high dividend and the expected dividend equals (H + L)/2 from (1) in both cases. With probability e_L/2 the manager is kept after a low dividend and then $E\left(D_2 \middle| D_1 = L, \delta = K\right)$ as given in equation (3). Then the value of one share is:

$$V_{QRE} = H + L + \left(\frac{1}{4} - p\left(1-p\right)\right)\left(H - L\right)\left(1 - e_L - e_H\right). \tag{7}$$

Note that for the case without errors we have e_L = e_H = 0 and then the value in the QRE becomes again equal to V_{Nash} from (4). Under our assumptions that the probability of making a

6 See Guarnaschelli, McKelvey, and Palfrey (2000) for an application of the QRE to a voting game.

mistake is symmetric across players and common knowledge, $P_A = P_B = V_{QRE}$, so there is no price difference between voting A-shares and non-voting B-shares.

Overconfidence. We now go one step further and assume that investors are overconfident in the following sense. At the voting stage they make errors as described above and the probabilities of making mistakes are the same for all investors. However, the symmetry of errors is no longer common knowledge and each investor *believes* that only other shareholders will make mistakes, whereas each investor himself can make the correct judgement without fail at the voting stage. With this belief, investors value the right to be pivotal at the voting stage because according to their beliefs it helps them to avoid the errors other investors would make. With this assumption the voting stage remains unchanged and the actual error probabilities are still given by (5) and (6). The probability of any A-shareholder to be pivotal is:

$$\pi_{D_1} = \binom{M-1}{(M-1)/2} \tau_{D_1}^{\,(M-1)/2} \left(1-\tau_{D_1}\right)^{(M-1)/2} \tag{8}$$

With overconfident investors the valuation formulae for the expected dividends and therefore the intrinsic valuation in (7) have not changed. However, overconfident investors anticipate that they can improve on this valuation if they own a voting share and become pivotal in the voting game. The investor therefore believes that whenever he is pivotal he can change the probability of replacing the manager if $D_1 = L$ from $1-\tau_L$ to 1 and, if $D_1 = H$ from τ_H to 0. Hence, the overconfident investor overvalues the shares conditional on himself being able to vote by a premium ω:

$$\omega = \left(\pi_L \tau_L + \pi_H \tau_H\right)\left(1-4p(1-p)\right)\frac{(H-L)}{4} \tag{9}$$

The premium ω is the increase in intrinsic value of a share from the point of view of an overconfident investor who removes the errors he attributes to all other shareholders. This may not be the voting premium because the voting behavior of the investor creates an interdependence between the value of the B-shares and his ability to obtain an A-share in the auction. As a consequence, an overconfidend investor will also be inclined to bid more for a B-share. However, he will always bid more for a A-share and (9) therefore describes an upper bound on the voting premium.

Illusion of control. A well-known behavioral bias is the so-called "illusion of control" that goes back to at least Langer (1975). It refers to the phenomenon that individuals often overestimate the success probabilities when they are physically involved in the process that generates the outcome, e.g. when they roll the dice themselves. In our framework, illusion of control is equivalent to an overestimation of the probability of being pivotal. If subjects are not overconfident, the illusion of control has no effect on the voting premium which should still be zero. However, if subjects are overconfident *and* affected by the illusion of control, the voting premium they are willing to pay might be higher than shown in equation (9). The extreme case is that they believe to be always pivotal when they own an A-share, i.e. that $\pi_H = 1 = \pi_L$. So an upper bound for the voting premium is:

$$\omega' = \left(\tau_L + \tau_H\right)\left(1 - 4p(1-p)\right)\frac{\left(H - L\right)}{4} \tag{10}$$

2.3 Expressive voting

The discussion in the previous section relies on the notion of instrumental voting, where an individual's right to vote has a positive effect on the same individual's payouts. However, whenever the probabilities π_L and π_H of being pivotal are small, then the voting premium from (9) is small. This is the paradox of voting discussed in political science, which has led to the formulation of the alternative hypothesis of expressive voting (see the discussion of the literature in the introduction). We distinguish three different notions of expressive voting, all of which are supported by arguments in the literature on this subject:

A: Expressing one's opinion. At the most basic level, voters enjoy voting because it gives them the opportunity to "make their voice heard." The ability to vote is then associated with social status as it separates those who have the opportunity to vote and to collectively determine a decision from those who cannot. The content of the choice as well as its ultimate importance is secondary in this case. In the context of our model, we should then observe that investors value votes for this purpose, and that they value the vote independently of how much influence it has on anybody's payoff. Note that this notion of "expressing one's opinion" is not congruent with the notion of "civic duty" formulated by Riker and Ordeshook (1968). If exercising this duty is perceived to be costly, then investors should discount the A-shares, which are associated with participation in the vote relative to the B-shares, which imply no such duty.

B: Being part of a powerful group. In this interpretation voters enjoy voting because this is associated with the status of being part of a group that is in control and exercises power. The key difference to definition A of expressive voting is that the group is *powerful*, i.e. the group's decisions affect the payoffs of all citizens or – in case of a firm – of all shareholders. In our model, the A-shareholders *collectively* exercise power over the manager and therefore over the future dividends of the firm. If this is the primary motivation, then the voting behavior should be similar to the Nash/QRE-behavior described in the previous section. However, the value attached to voting shares will be larger. Note that this version of the expressive voting hypothesis is different from instrumental voting in that it does not rely on the ability of any individual to change the outcome, which is only possible if the individual is pivotal. The key aspect is that the individual benefits from being associated with a group that exercises influence collectively.

C: Being part of a majority. This motivation is similar to that of joining a particular party or similar collective. Schuessler (2000) argues that citizens attach to collectives and associates this also with the notion that they prefer to join the majority. If this formulation of expressive voting is the primary motivation of the participants in our experiments, then we should see that (1) they try to vote with the majority, i.e., there is some kind of "bandwagon" where they try to infer how other participants vote and (2) that they value votes more if they have more opportunities to join a collective they can identify with. In particular, a stronger bandwagon effect should be associated with a higher voting premium. Note, however, that Schuessler (2000) also emphasizes that some voters may wish to deviate from the majority if the majority becomes very large. In this case the large collective may not offer a sufficiently clear identity to the voter.

3 Experimental setup

We implement the model described in Section 2.1 in an experiment and test if participants in our experiments value the right to vote, and if voting premia are better explained by expressive or by instrumental motivations.

All treatments have N = 8 investors who are given an initial budget of 150 points[7] each. There are 5 A-shares and 5 B-shares, and the dividends are $D_H = 20$ and $D_L = 0$. The participants play the same game (treatment) for 30 rounds, and no participant played more than one of the treatments. We have four treatments of this experiment:[8]

BT: The base treatment has p = 80%. With this the difference between the good manager with E(D) = 16 and the bad manager with E(D)=4 is substantial and it should pay to solve the inference problem correctly. The inference problem is non-trivial, so it is plausible that some players do not trust other players to vote correctly and overconfident players should therefore tend to overvalue the voting rights associated with the A-shares.

NU: In the no uncertainty-treatment p = 100%. Then E(D) = 20 with a high quality manager and E(D) = 0 with a low quality manager, so that the stakes have increased relative to the base treatment. In addition, the inference problem is now trivial, which should reduce the number of shareholders who vote against their interest and reduce the premium overconfident participants pay in order to prevent irrational voting by others.

NI: In the noninfluential manager treatment p = 50%. Then E(D) = 10 independently of the quality of the manager and the vote has no consequences for the value of the firm. The inference problem is trivial. While A-shareholders have an impact on decisions in the firm, they cannot influence the distribution of future dividends through the way they vote.

BH: In the blockholder treatment all parameters are as in the base treatment, so p = 80%. However, in addition to the 5 A-shares auctioned off in the beginning there is a blockholder who owns 6 A-shares and who always votes in favor of the incumbent manager. As a result, it will never be possible to replace the manager no matter how the 5 new A-shareholders vote. This treatment is similar to the noninfluential manager (NI) treatment with respect to the

[7] The currency in the experiment was "points" which were exchanged into real money at the end of the experiment at the exchange rate of 1 point = 3 euro cent. In order to prevent investors from running out of money after a series of low (i.e. zero) dividends, each individual also received an additional 16 points at the end of each round.

[8] For each treatment, we had two sub-treatments that only differed in the way the results of the vote were announced. In the limited information treatment, only the decision whether or not the manager had been dismissed was announced, whereas the computer program also announced the number of votes for and against dismissing the manager in the full information treatment. For each of the four treatment, we ran five experiments with limited information and five experiments with full information. The premium in offers and prices was higher for the full information sub-treatment, but the difference between the sub-treatments was never statistically significant.

instrumental value of the vote, which is zero. However, from an expressive point of view there is a difference between voting without having an impact (version B) and voting with a pre-specified majority (version C).

Insert Table 1 about here.

Table 1 shows an overview over the four different treatments. It contains the probability p with which a good manager generates a high dividend and the number of additional shares held by a blockholder who does not participate in the initial auction. In addition, the table shows the Nash value of the shares from equation (4). Shares are most valuable in treatment NU with V_{Nash} = 25 and least valuable in treatments NI or BH with V_{Nash} = 20. All experiments were carried out in Berlin between January 2006 and September 2007. Appendix B contains a translation of the instructions handed out to the participants of the experiment for the base treatment.

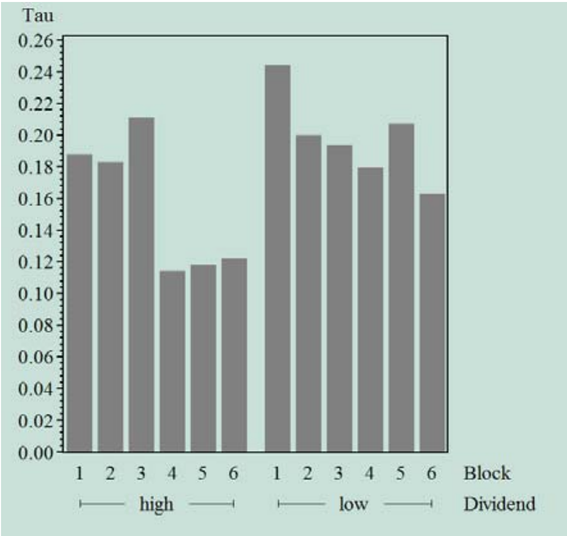
4 Results

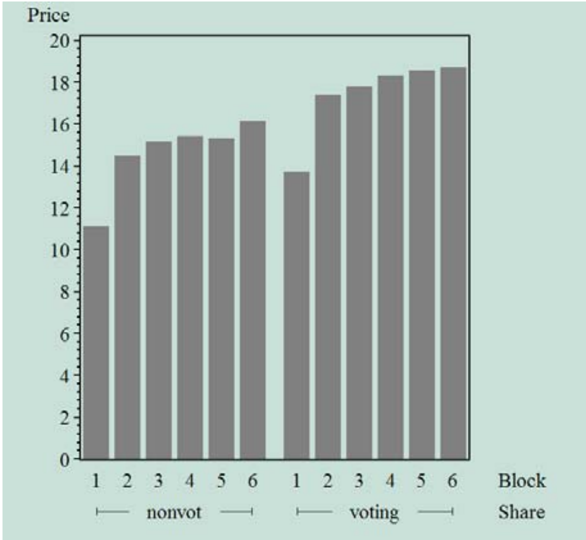
4.1 Learning in the base treatment

The left part of Figure 1 shows the frequency τ of wrong votes, i.e. the frequency that A-shareholders vote for either replacing the manager after $D_1 = H$ has been observed or for keeping the manager after $D_1 = L$ has been observed. The frequency is displayed for six blocks of five rounds each. Block 1 contains rounds 1 to 5, block 2 rounds 6 to 10, etc. Similarly, the right part of Figure 1 shows the prices of voting and non-voting shares over time. The figure demonstrates that subjects do learn over time: voting errors decrease over time and prices increase over time towards the risk-neutral Nash-value of 21.8.

Figure 1: Wrong votes and prices over time

The left figure shows the frequency τ of wrong votes conditional on the observed first dividend D_1. The right figure shows the average price of voting and non-voting shares. Both figures show averages for six blocks. Block 1 contains rounds 1 to 5, block 2 rounds 6 to 10, etc.





Based on Figure 1, we use averages across the last 15 periods (i.e. over the last 3 blocks) in our analysis. The difference of τ between blocks 1 to 3 and blocks 4 to 5 is highly significant after $D_1 = H$ (χ^2-test with p-value 0.8%). The other changes from blocks 1-3 to blocks 4-5 are not statistically significant.

4.2 Prices in the base treatment

We analyze pricing behavior first. Table 2 shows statistics for the prices of voting and non-voting shares (P_A and P_B) as well as for the voting premium $P_A - P_B$ and the scaled voting premium $(P_A - P_B)$ / 21.8. We need to scale because the intrinsic values of the shares change across treatments. As the prices P_A and P_B are very volatile and therefore unsuitable for scaling, we scale by the risk-neutral value of the shares in the Nash equilibrium described in Section 2.2.1. In Panel A, we treat every round as an independent observation, so that we have 300 observations here (10 groups with 30 rounds each). As prices might be correlated within each session, we also average the prices across the last 15 rounds for each session and present the results on these 10 observations separately in Panel B.

Insert Table 2 here.

Individuals value the right to vote. From Table 2 we can clearly reject the hypothesis that the voting premium is zero. The voting premium is 2.82 on average (median 2.00) across all 300 rounds for which we repeated the base treatment. If we recognize the fact that observations from the same session may not be independent, then it may be preferable to look at averages across the last 15 rounds for each session, where the voting premium is only slightly different with a mean of 2.91 and a median of 2.63. These numbers are different from zero at all conventional significance levels and at about 13% of the intrinsic value of the shares they are also economically significant.

Other predictions of Nash equilibrium. The individual prices are also interesting. The average (median) price for an A-share is 17.41 (18.00), the average (median) price of a B-share is 14.60 (15.76). Hence, average prices are substantially (and highly significantly) below the risk-neutral Nash-equilibrium value of 21.80 in the base treatment (20% for A-shares, 33% for B-shares). One interpretation is that individuals are risk-averse and therefore value the shares at less than their risk-neutral values.

4.3 Offers in the base treatment

Our analysis of offers arrives at the same qualitative conclusions as the analysis of prices. Table 3 shows descriptive statistics for the 2400 individual offers (10 sessions with 8 subjects and 30 rounds) in Panel A. Panel B displays the results for the 80 average offers across the last 15 rounds for each subject. Offers are much more volatile than prices: their standard deviation is six to eight times higher than the standard deviation of prices. Offers vary between 0 to 300 and there are no systematic changes over the rounds (not shown in the tables) as we observe them for prices or the voting behavior in Figure 1. Given that the maximum payout per share is 40 (if both dividends turn out to be high), any offer above 40 appears irrational at first glance. Note, however, that the five winners in the auction do not pay their own offers but the lower offer of the sixth highest bid. Given that the equilibrium price is consistently lower than the expected value of the shares, subjects who issue extremely high offers typically receive high payouts. So there is little incentive to refrain from "irrationally high" offers as long as there are at least three subjects who offer less than the expected value of the shares. For this reason, we only interpret the median of the offers, as we consider the mean as meaningless.

Insert Table 3 here.

Median offers are by construction higher than (average or median) prices, because prices equal the sixth highest bid, i.e. the 25th percentile of all offers. Table 3, Panel A reveals that 53.8% of all 2400 pairs of bids feature a positive voting premium and only 10.8% bid less for the A-share than for the B-share. The remaining bids (35.4%) had the same price for both shares. Again, voting premia are positive and statistically significant at all conventional significance level and we conclude that our experimental subjects value the right to vote. Overall, this shows that the Nash equilibrium described in Section 2.2.1 is a poor prediction for the outcome of this experiment.

4.4 Voting behavior in the base treatment

The results may deviate from the standard Nash equilibrium simply because subjects make errors at the voting stage of the game. If enough subjects are overconficent and believe that they are better at voting than their fellow group members, they might be willing to pay more for a voting share than for a non-voting share and drive up the voting premium. We explore this explanation by analysing the subjects' voting behavior.

Insert Table 4 here.

Table 4 displays the results of the voting stage. To conserve space, the table contains the results for all treatments, but we only interpret the results for the base treatment in this section. The table shows that the frequency that an A-shareholder votes for keeping the manager after observing a low dividend $\tau(0)$ is 19.5% across all rounds. The frequency $e(0)$ that after a low dividend more than two A-shareholders vote against replacing the manager is 6.8%. After a high dividend, 15.7% of A-shareholders vote wrongly (i.e. for replacing the manager) resulting in an actual dismissal in 5.0% of all cases. If these errors are taken into account, the value of shares V_{QRE} from equations (5) to (7) is 21.65, i.e. 0.15 lower than the Nash value of 21.8.

If the subjects in our experiment are overly optimistic in the sense that they believe that only the other subjects but not they themselves make errors, then we can calculate the maximum premium ω they are willing to pay for a voting share from equation (9). This maximum premium turns out to be 0.08, which is just 3% of the median observed premium of 2.63. We conclude that errors and overconfidence cannot explain the observed voting premium.

If overconfidence alone cannot explain the voting premium, maybe overconfidence combined with the illusion of control can exlain it? The last column of Table 4 shows the upper bound for the predicted premium ω' from (10), which is 0.63, i.e. 24% of the observed voting premium. Only if we assume (a) overconfidence, (b) extreme illusion of control (i.e. the belief to be always pivotal), and (c) the belief that all other subjects always make errors, then we obtain a predicted voting premium of 1.8 which comes reasonably close to the observed 2.6. However, these believes are grossly counter-factual, and we therefore reject the overconfidence hypothesis and the “illusion of control” hypothesis.

4.5 No uncertainty

As a robustness check, we repeat the same experiment with $p = 1$, i.e. a good manager will generate a high dividend with certainty and a bad manager will generate a low dividend with certainty. Therefore, the inference problem at the voting stage is greatly reduced, and we expect less errors in the voting stage. Table 4, Panel B shows that there are indeed less errors under NU than under BT. After a low dividend, 18.3% of the subjects vote for keeping the manager in the base treatment while only 11.0% do so in the no-uncertainty treatment. The difference is highly significant (χ^2 p-value: 0.3%). Moreover, under BT we observe inefficient voting outcomes after a low dividend in 7.1% of all cases while we never observe any inefficient voting outcomes under NU. Again this difference is significant (p-value: 1.6%). After a high dividend, error rates are also lower under NU than under BT, but here the differences are not statistically significant.

While the error rates go down, the damage caused by a wrong decision increases. This is the reason, why the predicted premium with overconfidence ω stays constant at 0.06 in Table 4, Panel B. The maximum premium with overconfidence and the illusion of control ω’, even doubles from 0.54 to 1.08, because the probability of being pivotal decreases as errors drop, so that the illusion of control has a bigger effect now.

Insert Table 5 here.

Table 5 shows descriptive statistics for the prices (Panel A) and offers (Panel B) averaged across the last 15 rounds for the no-uncertainty treatment. Given that the Nash-value of the shares is higher under the no-uncertainty treatment, it is not surprising that prices and offers are generally higher in Table 5 than in Tables 2 and 3. The differences are never significant however. The mean (median) relative price premium is 16.0% (12.5%) in Table 5, Panel A which is higher than in the base treatment, where it is 13.4% (12.1%, see Table 2, Panel B), although the difference is not significant. Mean and median offers are slightly lower under NU than under BT (compare Table 5, Panel B with Table 3, Panel B), but the difference is again not significant. We conclude that the results for the no uncertainty treatment are overall similar to those in the base treatment and that all the conclusions we inferred from the base treatment are still valid.

Our evidence from the base treatment and the no uncertainty treatment is inconsistent with the hypothesis that voters are willing to pay a premium because they are overconfident. Altogether this rejects all variants of the instrumental voting hypothesis exposed in Section 2. Whereas voting behavior can be explained reasonably well by applying the QRE-concept, actual bidding behavior violates not only the predictions of Nash equilibrium, but also the boundedly rational QRE and the interpretation of voting premia as prices overconfident voters are willing to pay. Only if voters are overconfident *and* subject to the illusion of control, a relevant part of the voting premium can be explained. However, even extreme overconfidence combined with extreme illusion of control cannot generate the voting premia we observe in the experiment. We therefore conclude that the voting premium must have a significant expressive component.

4.6 Expressive voting

The remaining task is to distinguish the three different versions of the expressive voting hypothesis from each other and we perform two further treatments, the noninfluential manager (NI) treatment and the blockholder (BH) treatment (see Section 3 for the details of these treatments).

These treatments are similar in that the vote of the A-shareholders does not affect the expected second period dividend. In the NI-treatment this is the case because the quality of the manager does not change with replacement, and in the BH-treatment the vote has no influence because the manager never gets replaced. However, the BH-treatment differs in two important respects from the NI-treatment. Firstly, in the blockholder treatment it is clear what the dividend-maximizing decision is, even though this decision cannot be taken here because of the veto power of the blockholder. By contrast, in the noninfluential manager treatment there is no dividend-maximizing decision and this difference between the two treatments may still affect the way individuals vote for non-instrumental reasons. Secondly, in the blockholder treatment the outcome of the vote is given *ex ante* and known to the experimental subjects, because they know the voting behavior of the blockholder, so it is clear what the majority is. In the noninfluential manager treatment the outcome of the vote is uncertain and there is no clear majority *ex ante*.

Insert Tables 6 and 7 here.

Tables 6 and 7 report the results for the noninfluential manager treatment and the blockholder treatment, respectively. Both tables are structured like Table 5, with average prices in Panel A and average offers in Panel B. From Panel A in both treatments we can see that the voting premium becomes very small and statistically indistinguishable from zero in both treatments. Moreover, the voting premium is significantly smaller under the NI or the BH treatments than under the BT or the NU treatments. This clearly rejects version A ("Expressing one's opinion") of the expressive voting hypothesis. This version of expressive voting builds on the notion that the right to vote confers a status that investors would be willing to pay for, so that we should observe voting premia in all of our treatments.

The voting behavior (Table 4) reveals remarkable differences between the two treatments. While the probability of dismissing a manager after a high dividend does not differ significantly between the NI- and the BH-treatment, the number of votes for keeping the manager after a low dividend is significantly lower in the BH-treatment. This is the opposite of what the bandwaggon effect would predict, so this is direct evidence against version C ("Being part of a majority") of the expressive voting hypothesis. The only theoretical approach that is consistent with our data is therefore the notion that voters enjoy belonging to a powerful group (version B).

5 Conclusion

We perform an experiment where experimental subjects pay for the right to vote. The most important conclusion from our analysis is that experimental subjects are willing to pay a significant premium for the right to vote. However, this voting premium cannot be explained by any version of the instrumental voting hypothesis. Our results therefore strongly suggest that people value the right to vote, and that they do so for expressive reasons rather than instrumental reasons.

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Appendix A: Empirical evidence on voting premia from dual class shares

Paste in details on voting premia. Main conclusion: (1) the conventional wisdom on voting premia is lacking, premia cannot be explained by expected takeover gains or gains from block acquisitions; (2) some numbers on typical voting premia we should expect.

Appendix B: Instructions for the base treatment

Welcome! This is an experiment in behavioral economics. You and the other experiment participants will take part in a decision situation. In this situation, you can earn money that will be paid to you in cash at the end of the experiment. How much you will earn depends on the decisions that you and the other participants in the experiment make.

These instructions describe the decision situation and are identical for all experiment participants. It is important that you read the instructions carefully so that you understand the decision situation well. If something seems unclear to you while reading, or if you have other questions, please let us know by raising your hand. We will then answer your questions individually.

Please do not, under any circumstances, ask your question(s) aloud. You are not permitted to give information of any kind to other participants.
You are also not permitted to speak to other participants at any time throughout the experiment. Whenever you have a question, raise your hand and we will come to you and answer it. If you break these rules, we may be compelled to terminate the experiment.

Once everyone has read the instructions and there are no further questions, we will conduct a short quiz with you. In it, each of you will complete two short tasks on your own. We will walk around, look over your answers, and solve comprehension problems. The quiz serves solely to ensure that you thoroughly understand the crucial details of the decision situation.

Of course, your anonymity and the anonymity of the other participants will be guaranteed throughout the entire experiment. You will not find out the true identity of the other participants, nor will they find out your identity.

<u>1. General</u>

The experiment consists of several rounds in which decisions must be made and information must be processed. Through your decisions, you can earn points. These points represent your income and will be converted into euros at the end of the experiment and paid out in cash.
The exact sequence of the experiment, the different decisions, and the payment modalities will be explained in detail in the following.

2. The distribution of roles

You will find yourself in a decision situation that will be repeated for 30 rounds. This situation can be compared to a simple stock market. On this stock market, there is one single company issuing shares. You can buy shares of this company and thus take on the role of shareholder. The amount of dividends paid out on the shares depends on how good or bad the manager of the company is.
Random chance plays an important role here: it decides whether the manager of the company is good or bad. The computer takes on the roles of company, manager, and chance.

3. Two possible stock market conditions

At the beginning of *each round*, the computer generates the quality of the manager randomly. You can imagine it as if the computer were to pick a ball blind out of a hat that contains five balls inscribed with the words "good manager" and another five inscribed with the words "bad manager". Neither you nor any of the other participants know the quality of the manager. You only know the following: there is a 50% probability of a good manager, and a 50% probability of a bad manager.
The quality of the manager influences the probability that the company will make a profit. First, we will look at the situation that arises in the case of a good manager.

4. The stock market condition in the (unobservable) case of a good manager

If the manager is good (which neither you nor any of the others can know), there is an 80% probability that the company will make a profit. Thus, you can imagine the situation with a good manager as if the computer were to pick a ball blind out of a hat containing eight balls inscribed with the words "profit", and two balls inscribed with the words "no profit". For you, the question of whether the company makes a profit is only important in relation to the dividends on shares.

If the company makes a profit, the dividends on shares amount to 20 points per share. If, however, the company does not make a profit, the dividends amount to 0 points per share.

Now we will look at the situation in the (also unobservable) case of a bad manager.

5. The stock market condition in the (also unobservable) case of a bad manager

If the manager is bad, there is a 20% probability that the company will make a profit. The case of a bad manager can thus be conceived as if the computer were to pick a ball blind out of a hat, in which there are two balls inscribed with the word “profit” and eight inscribed with “no profit”. For you, the question of whether the company makes a profit or not is only important in relation to the dividends on shares.

If the company makes a profit, the dividends paid out amount to 20 points per share, as above. If the company does not make a profit, however, the dividends amount to 0 points per share, as above.

Obviously, a dividend of 20 points per share is more likely if the manager is good. Conversely, a dividend of 0 points per share is more likely if the manager is bad.

Please keep in mind that the quality of the manager is unknown to all participants and that there is an equal probability of both possible qualities at the beginning of each round.

6. The auctioning of shares

There are two kinds of shares: type A shares and type B shares. The next section will explain the difference between them. The dividends are the same for both types.

Per round there are five type A shares and five type B shares.

Apart from you, there are seven other people who can buy shares of the company: namely, the other experiment participants. Thus, there are a total of eight people on the market who can bid for shares. All of these people are subject to the same rules. These rules will be explained to you in the following.

You can buy a maximum of one share of each type per round. In total, therefore, you can buy a maximum of two shares per round: one type A share and one type B share.
You can attempt to buy the shares of your choice by taking part in two simultaneous auctions. In the one auction, type A shares are sold, and in the other, type B shares are sold.

You will be asked to make a bid for each share type. In each of the two auctions, the following rule applies: the five experiment participants who placed the five highest bids for the type of shares offered in that auction will each receive one share of that type. The price they will each pay for their share will be the amount of the sixth-highest bid in that auction. (If two or more bids in one auction are identical, the computer will randomly determine their order.) Those participants who made the sixth-to-eighth-highest bids will not receive any share of the type offered and also will not pay anything in this auction.

The most sensible thing you can do in both of these auctions is to submit a bid that corresponds to your true appraisal of the share in question, in other words, the maximum amount you would be willing to pay for it.

After everyone has placed their bids in the two simultaneous auctions, each of you will be informed of the price of the type A and type B shares, and of the dividends per share (which is the same for both share types). You will always be given this information, no matter whether you have purchased shares or not.
Furthermore, each of you will be told which share, if any, you have acquired. You will not receive any information on which shares, if any, others have acquired.
The auction winners will then receive the five type A shares and the five type B shares. If you have purchased at least one share, your interim earnings will amount to, in points:

The *dividends* on the shares you purchased, multiplied by the *number* of shares you purchased, minus the *price(s)* you had to pay.

You can also have negative earnings.

If you did not acquire a share, your interim earnings amount to zero.

You (and only you) will be told your interim earnings.

In the next section, the difference between A shares and B shares will be described.

<u>7. The share types</u>
When you purchase a type A share, you attain the right to participate in a vote. You do not attain such a right with type B shares, however.

All five people who have purchased a type A share take part in a vote whose outcome decides whether the company manager will be retained or not. This vote takes place after all share purchases have been made and after you have been told your interim earnings from that round. At this point in time, therefore, you know whether the shares had dividends of 0 or 20 points.

If the majority of the participants who have a type A share are in favor of keeping the same manager, he will be retained. Retaining the same manager means that the computer does not again randomly generate the quality of the manager. If retained, the manager remains of the same quality as before the vote.

If the majority of participants who have a type A share vote to fire the manager, he will be fired and a new manager will be hired. Firing means that the computer will again randomly generate the quality of the new manager. This will again entail a 50% probability that the new manager will be good and a 50% probability that the new manager will be bad.

8. The second dividend payout on shares

After the vote on the manager, the company will again become active on the market, either with the old or a new manager depending on the outcome of the vote.

Depending on the quality of the manager and the corresponding probability of the company's success, the computer again determines the dividends on the shares. The dividends again amount to 20 points in the case that the company is successful and 0 points in the case that the company is unsuccessful. As before, the probability of earning 20 points is higher when the manager is good (namely, 80% for a good manager in comparison to 20% for a bad manager).

You will then be told your final dividends from that round. In the next round, the situation will be repeated with a new manager. All rounds are thus of the same structure.

9. Your finances

At the beginning of the experiment, you receive an initial budget of 150 points. You will also be paid the fixed amount of 16 points with each round, in addition to your profits (or losses) in that round. Your final dividend payout comprises the sum of the dividend payouts from all previous rounds. Furthermore, you receive three euros if you arrived 10 minutes before the beginning of the experiment. The exchange rate used to convert points into cents is the following:

1 point = 3 cents

10. The entire procedure of one round in overview

1. The manager's ability is determined randomly but not disclosed. The auctions for type A shares and type B shares take place.
2. All participants are informed of the prices and dividends of the shares. Furthermore, each of you is informed individually which share(s) you have acquired.
3. The dividends of 0 or 20 points per share are announced. You are told your interim earnings from that round.
4. The vote on retaining or firing the manager takes place among all holders of type A shares. Depending on the results of the vote, either the same manager is retained or a new manager is hired.
5. The result of the vote is announced to all participants.

6. The second dividend payout of 0 or 20 points per share is announced. You receive the total payout in this round, which is comprised of the following: if you did not purchase any shares, you are only paid the fixed amount of 16 points in this round. If you purchased one or two shares, your profits from this round comprise the dividends on the shares that you own, minus the price(s) you had to pay for these share(s), plus the fixed payment of 16 points.

This procedure is repeated 30 times.

After the end of the thirtieth round, you fill out another questionnaire containing questions on your behavior during the experiment. After everyone has completed the questionnaire, each of you will be told the amount of your total profits. You will not be told anything about the total profits of the other participants.

Please remain seated and wait quietly until we come to you and pay out your total earnings in cash. Please do not talk to the other participants. After your total earnings have been paid out, please leave the room quietly.

If there was anything you did not understand, please let us know by raising your hand. We will answer your questions on an individual basis.

Thank you for participating!

Table 1: Overview over the different treatments

This table shows the two defining parameters for each treatment, i.e. the probability p that the dividend is high (low) when the manager is good (bad) and the number of shares held by a blockholder that are always voted in favor of the manager. In addition, the table shows the Nash value of the shares from equation (4), the number of sessions, the number of rounds per session, and the number of subjects per session.

Treatment	Link (p) between skill and dividend	Shares held by blockholder	Nash value of shares	Sessions	Rounds per session	Subjects per session
Base treatment (BT)	80%	0	21.8	10	30	8
No uncertainty (NU)	100%	0	25.0	10	30	8
Noninfluential manager (NI)	50%	0	20.0	10	30	8
Blockholder (BH)	80%	6	20.0	10	30	8

Table 2: Prices in the Base Treatment BT

This table contains statistics on four variables for the base treatment: the price of voting shares, the price of non-voting shares, the difference between these two prices (the premium), and the premium scaled by the Nash value (from Table 1) of the shares (the relative premium). The table shows mean, median, standard deviation, and the p-values of two tests, the t-test for zero mean and the Wilcoxon signed rank test for zero median. For the prices of voting and non-voting shares, the table also shows the mean difference between the price and the Nash value, and the p-value of the t-test for this difference being zero. Panel A shows the results for the pooled sample of all sessions and rounds. In Panel B, we first calculate one value of the respective variable for each session by averaging the variable across the last 15 rounds of the session. In the second step, we calculate the statistics across the 10 sessions.

Panel A: All rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	Difference to Nash	
							Mean	T-test p-value
Voting share	300	17.414	18.000	4.629	0.000	0.000	4.386	0.000
Non-voting share	300	14.598	15.760	5.299	0.000	0.000	7.202	0.000
Premium	300	2.816	2.000	3.315	0.000	0.000		
Relative premium	300	0.129	0.092	0.152	0.000	0.000		

Panel B: Average of last 15 rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	Difference to Nash	
							Mean	T-test p-value
Voting share	10	18.524	18.267	4.646	0.000	0.002	3.276	0.053
Non-voting share	10	15.612	17.367	5.408	0.000	0.002	6.188	0.006
Premium	10	2.911	2.633	2.504	0.005	0.004		
Relative premium	10	0.134	0.121	0.115	0.005	0.004		

Table 3: Offers in the Base treatment BA

This table contains statistics on four variables for the base treatment: the offer for voting shares, the offer for non-voting shares, the difference between these two offers (the premium), and the premium scaled by the Nash value (from Table 1) of the shares (the relative premium). The table shows mean, median, standard deviation, and the p-values of two tests, the t-test for zero mean and the Wilcoxon signed rank test for zero median. For the the premium, the table also shows the frequencies that the premium is negative or, respectively, positive. Panel A shows the results for the pooled sample of all subjects and rounds. In Panel B, we first calculate one value of the respective variable for each subject by averaging the variable across the last 15 rounds of the subject. In the second step, we calculate the statistics across the 80 subjects.

Panel A: All rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	Frequency negative	Frequency positive
Voting share	2400	27.758	20.000	36.434	0.000	0.000		
Non-voting share	2400	22.652	18.000	32.176	0.000	0.000		
Premium	2400	5.106	1.000	17.389	0.000	0.000	10.8%	53.8%
Relative premium	2400	0.234	0.046	0.798	0.000	0.000		

Panel B: Average of last 15 rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	Frequency negative	Frequency positive
Voting share	80	29.408	20.167	37.809	0.000	0.000		
Non-voting share	80	23.948	18.400	33.582	0.000	0.000		
Premium	80	5.461	1.667	13.911	0.001	0.000	16.3%	70.0%
Relative premium	80	0.250	0.076	0.638	0.001	0.000		

Table 4: Voting behavior

This table describes the voting outcomes for all four treatments. For each treatment it shows (1) the frequency tau(0) that A-shareholders vote for keeping the manager after a low dividend, (2) the frequency e(0) that a manager is actually kept after a low dividend, (3) the frequency tau(20) that A-shareholders vote for replacing the manager after a high dividend, and (4) the frequency e(20) that a manager is actually replaced after a high dividend. In addition, the table shows the p-value of the Chi-square test that tau(0) equals tau(20), the value of the shares V_QRE when the empirical error probabilities are taken into account (from equations (5) to (7)), and the upper bounds for the predicted premiums under overconfidence (Omega, from equation (9)) and under overconfidence combined with the illusion of control (Omega', from equation (10)). Panel A shows the results for the pooled sample of all sessions and rounds. In Panel B, we first calculate one value of the respective variable for each session by averaging the variable across the last 15 rounds of the session. In the second step, we calculate the statistics across the 10 sessions.

Panel A: All rounds

Treatment	tau(0)	e(0)	tau(20)	e(20)	Chi-square p-value for tau(0)=tau(20)	V_QRE	Predicted premium	
							Omega	Omega'
Base treatment (BT)	19.50%	6.83%	15.68%	5.04%	5.34%	21.65	0.082	0.633
No uncertainty (NU)	12.03%	0.00%	11.02%	2.04%	54.21%	24.87	0.072	1.152
Noninfluential manager (NI)	55.80%	60.84%	22.93%	8.28%	0.00%	20.00	0.000	0.000
Blockholder (BH)	31.74%	13.77%	25.71%	9.77%	1.07%	20.00	0.000	0.000

Panel B: Last 15 rounds

Treatment	tau(0)	e(0)	tau(20)	e(20)	Chi-square p-value for tau(0)=tau(20)	V_QRE	Predicted premium	
							Omega	Omega'
Base treatment (BT)	18.33%	7.14%	11.82%	3.03%	1.43%	21.69	0.058	0.543
No uncertainty (NU)	11.03%	0.00%	10.56%	1.39%	83.58%	24.89	0.060	1.079
Noninfluential manager (NI)	56.32%	64.47%	21.89%	8.11%	0.00%	20.00	0.000	0.000
Blockholder (BH)	31.16%	15.12%	23.75%	7.81%	2.53%	20.00	0.000	0.000

Table 5: Prices and Offers in the No Uncertainty treatment NU

This table describes prices (Panel A) and offers (Panel B) for the No Uncertainty (NU) treatment. Panel A shows statistics on the price of voting shares, the price of non-voting shares, the difference between these two prices (the premium), and the premium scaled by the Nash value (from Table 1) of the shares (the relative premium). The table shows mean, median, standard deviation, and the p-values of two tests, the t-test for zero mean and the Wilcoxon signed rank test for zero median. In addition it shows the p-values of the two-sample t-test and the two-sample Wilcoxon signed rank test that the location of the distribution is identical under the NU and the BT treatment. We first calculate one value of the respective variable for each session by averaging the variable across the last 15 rounds of the session. In the second step, we calculate the statistics across the 10 sessions. Panel B displays the same statistics for individual offers.

Panel A: Average prices of the last 15 rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT	
							T-test	Wilcoxon
Voting share	10	20.900	20.767	4.374	0.000	0.002	0.2543	0.3030
Non-voting share	10	16.907	17.367	2.958	0.000	0.002	0.5175	0.7942
Premium	10	3.993	3.133	3.267	0.004	0.002	0.4174	0.3955
Relative premium	10	0.160	0.125	0.131	0.004	0.002	0.6398	0.6822

Panel B: Average offers of last 15 rounds

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT	
							T-test	Wilcoxon
Voting share	80	25.888	22.700	17.212	0.000	0.000	0.4501	0.2031
Non-voting share	80	22.164	19.767	13.227	0.000	0.000	0.6594	0.1270
Premium	80	3.724	1.533	17.422	0.060	0.000	0.4871	0.7664
Relative premium	80	0.149	0.061	0.697	0.060	0.000	0.3380	0.5675

Table 6: Prices and Offers in the Noninfluential manager treatment NI

This table describes prices (Panel A) and offers (Panel B) for the Noninfluential Manager (NI) treatment. Panel A shows statistics on the price of voting shares, the price of non-voting shares, the difference between these two prices (the premium), and the premium scaled by the Nash value (from Table 1) of the shares (the relative premium). The table shows mean, median, standard deviation, and the p-values of two tests, the t-test for zero mean and the Wilcoxon signed rank test for zero median. In addition it shows the p-values of the two-sample t-test and the two-sample Wilcoxon signed rank test for two hypotheses: (1) that the location of the distribution is identical under the NI and the BT treatment and (2) that the location of the distribution is identical under the NI and the NU treatment. We first calculate one value of the respective variable for each session by averaging the variable across the last 15 rounds of the session. In the second step, we calculate the statistics across the 10 sessions. Panel B displays the same statistics for individual offers.

Panel A: Average prices of the last 15 periods

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT		P-value 2-sample comparison with NU	
							T-test	Wilcoxon	T-test	Wilcoxon
Voting share	10	16.382	17.033	2.627	0.000	0.002	0.2249	0.1779	0.0136	0.0278
Non-voting share	10	15.980	16.467	2.718	0.000	0.002	0.8507	0.5772	0.4750	0.4370
Premium	10	0.403	0.280	0.668	0.089	0.158	0.0117	0.0277	0.0070	0.0054
Relative premium	10	0.020	0.014	0.033	0.089	0.158	0.0127	0.0323	0.0082	0.0064

Panel B: Average offers of last 15 periods

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT		P-value 2-sample comparison with NU	
							T-test	Wilcoxon	T-test	Wilcoxon
Voting share	80	19.454	18.103	9.087	0.000	0.000	0.0244	0.0100	0.0037	0.0001
Non-voting share	80	18.546	18.067	7.510	0.000	0.000	0.1639	0.5287	0.0353	0.0136
Premium	80	0.907	0.067	4.260	0.060	0.000	0.0062	0.0006	0.1636	0.0053
Relative premium	80	0.045	0.003	0.213	0.060	0.000	0.0076	0.0008	0.2067	0.0091

Table 7: Prices and Offers in the Blockholder treatment BH

This table describes prices (Panel A) and offers (Panel B) for the Blockholder (BH) treatment. Panel A shows statistics on the price of voting shares, the price of non-voting shares, the difference between these two prices (the premium), and the premium scaled by the Nash value (from Table 1) of the shares (the relative premium). The table shows mean, median, standard deviation, and the p-values of two tests, the t-test for zero mean and the Wilcoxon signed rank test for zero median. In addition it shows the p-values of the two-sample t-test and the two-sample Wilcoxon signed rank test for two hypotheses: (1) that the location of the distribution is identical under the BH and the BT treatment and (2) that the location of the distribution is identical under the BH and the NU treatment. We first calculate one value of the respective variable for each session by averaging the variable across the last 15 rounds of the session. In the second step, we calculate the statistics across the 10 sessions. Panel B displays the same statistics for individual offers.

Panel A: Average prices of the last 15 periods

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT		P-value 2-sample comparison with NU	
							T-test	Wilcoxon	T-test	Wilcoxon
Voting share	10	13.140	12.967	4.081	0.000	0.002	0.0132	0.0410	0.0007	0.0046
Non-voting share	10	12.847	12.733	4.018	0.000	0.002	0.2120	0.1377	0.0200	0.0476
Premium	10	0.293	0.333	0.933	0.346	0.219	0.0097	0.0513	0.0059	0.0054
Relative premium	10	0.015	0.017	0.047	0.346	0.219	0.0105	0.0595	0.0068	0.0064

Panel B: Average offers of last 15 periods

Variable	Obs.	Mean	Median	Standard deviation	T-test p-value	Wilcoxon p-value	P-value 2-sample comparison with BT		P-value 2-sample comparison with NU	
							T-test	Wilcoxon	T-test	Wilcoxon
Voting share	80	24.957	15.200	37.279	0.000	0.000	0.4544	0.0001	0.8395	0.0000
Non-voting share	80	22.558	15.000	29.452	0.000	0.000	0.7812	0.0135	0.9132	0.0001
Premium	80	2.398	0.000	16.696	0.203	0.185	0.2095	0.0005	0.6238	0.0035
Relative premium	80	0.120	0.000	0.835	0.203	0.185	0.2682	0.0007	0.8115	0.0062