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Abstract

We study shareholder voting on management proposals. We build on a simple model of strategic voting, provide structural estimates of its parameters, and derive testable implications. The evidence suggests that voting is strategic in the sense that shareholders take into account the information of other shareholders when making their voting decisions. We conclude that strategic voting prevents incorrect rejections of management proposals.

Keywords: Shareholder meeting, proposal screening, strategic voting, sincere voting, supermajority rule.

JEL Classifications: D72, G34

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1 Introduction

We study shareholder voting on management proposals. We address two related questions. Firstly, why are shareholders asked to ratify management proposals? In principle, it would be sufficient to build corporate charters on a model of a representative democracy where shareholders only elect directors. Direct democracy is costly and many academic observers have expressed scepticism on the usefulness of this institution, not least because shareholders rarely reject management proposals which pass with wide margin. Nonetheless, shareholder voting has proved resilient and several interested parties have taken an active role in the proxy voting process (Easterbrock and Fischel (1983)). For example, regulators in the U.S. require shareholder approval of certain management proposals, investment managers are required to vote, management often put forward non-mandatory proposals, and a consulting industry has emerged around the demand for vote recommendations. More than 80% of the shares are typically voted in widely-held US corporations.[1] These facts suggest that shareholder voting serves a useful purpose. We investigate the hypothesis that shareholders screen proposals. Our empirical results suggest that they do, and that screening is particularly valuable when managers' ability to objectively evaluate the proposal is compromised, e.g., because of conflicts of interest.

Secondly, we ask whether shareholders vote strategically. More specifically, we want to understand if shareholders properly take into account the implications of the fact that their vote matters only when it is pivotal. The answer to the second question is critical for answering the first. We use a simple model, which has become standard in the political science literature, and which offers a remarkable implication: If shareholders do not vote strategically, but simply respond to their private information when casting their votes, then proposal screening may result in significant errors and shareholder voting will actually destroy value. The data suggest that strategic voting is particularly important when a proposal is subject to a supermajority rule.

We construct a simple model of strategic voting. In one state of the world, the proposal increases the value of the firm, whereas in the other state the proposal destroys value. Nobody knows the

[1] Basic facts about shareholder voting on management proposals can be found in Brickley, Lease, and Smith (1988), Young, Millar, and Glezen (1993), Morgan and Poulsen (2001), Bethel and Gillan (2002), and Burch, Morgan, and Wolf (2004).

true state of nature, but each shareholder receives some private information in addition to the publicly available information. Shareholders are only interested in a higher value of their shares (no conflicts of interest). If shareholders could communicate through a central mechanism, they would pool their information and make a decision based on a simple cutoff rule: If the amount of positive information exceeds the cutoff, the proposal is accepted, otherwise it is rejected. The central mechanism is referred to as the representative shareholder. However, such a central mechanism does not exist and shareholders must vote on the proposal without learning each others' information.

The model generates three testable implications. Firstly, the number of votes cast in favor of the proposal increases with the statutory majority rule. The statutory rule may coincide with the optimal cutoff rule of the hypothetical representative shareholder, but statutory rules are often too high. Then, shareholders tend to strategically vote in favor of the proposal to compensate for the conservatism of the statutory rule, even if they observe unfavorable information. The reason is that a shareholder's vote only matters when it is pivotal. As the statutory rule increases, the pivotal shareholder infers that many of the other shareholders have positive information and therefore is more inclined to also believe that passing the proposal increases value. Secondly, the relation is stronger for proposals for which public information is negative. When public information is negative and the statutory rule is too conservative, then good proposals induce a stronger compensating behavior of shareholders. Thirdly, the pass rate is independent of the statutory rule: Higher rules are not associated with higher rejection rates as shareholders' compensating behavior neutralizes the higher hurdle the proposal has to take. We collect data on 14,548 proposals, which were voted on at 9,158 shareholder meetings between 1994 and 2003, and find evidence consistent with the three implications. Hence, we conclude that shareholders vote strategically, and that proposal screening increases value.

The model is a version of the political voting model developed by Austen-Smith and Banks (1996) and Feddersen and Pesendorfer (1998).[2] We analyze pure strategy equilibria and provide a reparameterization for empirical testing. We use the model to show that, for many proposals in our

[2]Subsequent papers include Feddersen and Pesendorfer (1996), Dekel and Piccione (2000), and Persico (2004). Voting models with heterogeneous preferences, which can be used to model conflicts of interest, include Feddersen and Pesendorfer (1997) and Maug and Yilmaz (2002). We allow for conflicts of interest in the empirical analysis by controlling for insider ownership.

sample, strategic voting significantly reduces the probability of decision-making errors.

Empirical work on voting has been devoted mostly to the turnout question (why people vote or not vote; see Feddersen (2004) for a survey), and only a few experimental studies investigate how people vote. Guarnaschelli, McKelvey, and Palfrey (2000) and Battaglini, Morton, and Palfrey (2005) show that agents in the laboratory behave approximately in accordance with the theory of strategic voting. To the best of our knowledge, our paper is the first to investigate strategic voting in field data. Using data similar to ours, Brickley, Lease, and Smith (1988) and (1994) also show a positive empirical relation between the proportion in favor and the statutory majority rule. At the time of their two studies, the theory of strategic voting was not developed and they offer a different interpretation, which we discuss at the end of the paper.

Models of informational voting have been formulated with a focus on political applications and have played only a minor role in the literature on shareholder voting. In fact, a recent survey on corporate governance by Becht, Bolton, and Röell (2003) does not mention voting models at all. The literature on shareholder voting has taken a different direction. The point of departure is the separation of ownership and control and the conflict between shareholders and management (Berle and Means (1932)).[3] The question is whether shareholders ratify value-decreasing management proposals. The primary suspects are proposals which remove shareholder rights and therefore entrench management. Numerous papers, starting with DeAngelo and Rice (1983) and Linn and McConnell (1983), have examined the stock price reaction to the announcement of entrenchment proposals. The overall impression from these studies is that stock price changes are small and often statistically insignificant, which implies that, on average, shareholder voting may not matter. However, the empirical results in our paper suggest that the average conceals interesting variation across proposals where shareholder voting matters.

The rest of the paper is organized as follows: Section 2 develops the basic model with an emphasis on the empirical implications. The testing methodology is developed in Section 3, the data are described in Section 4, and the results of the structural estimation are reported in Section 5. Section 6 discusses alternative interpretations and Section 7 concludes.

[3] See also the special issues of the *Journal of Financial Economics,* Volume 11 (1983) and Volume 20 (1988).

2 The Theory of Strategic Voting

2.1 Assumptions

A proposal can be either accepted or rejected. The payoff v to the firm from accepting the proposal depends on the state of nature. Acceptance of the proposal increases the value of the firm by $v = 1$ with probability p and decreases it by $v = -1$ with probability $1 - p$. There are N shareholders with one vote each. Shareholders can vote either for or against the proposal. All votes are cast simultaneously and the voting rule requires that a votes are in favor of the proposal. The voting rule a is exogenous. Each shareholder i privately observes a signal $\sigma_i \in \{0, 1\}$, which indicates the state of the world correctly with a probability strictly less than 1:

$$\Pr(\sigma = 1|v = 1) = \Pr(\sigma = 0|v = -1) = 1 - \varepsilon, \quad 0 < \varepsilon < \frac{1}{2}. \tag{1}$$

The signal is incorrect with probability ε and therefore correct with probability $1 - \varepsilon$. The private signals are statistically independent conditional on the state of nature. The probability of receiving a good signal is:

$$\pi = p(1 - \varepsilon) + (1 - p)\varepsilon. \tag{2}$$

The prior p represents common information available to all shareholders. It includes proxy material, vote recommendations, and the stock price. We assume that markets are incomplete so that shareholders cannot take bets on the stock with and without the proposal. The signal σ represents information, which is specific to individual shareholders, and includes genuinely private information as well as differences in analyzing publicly available information. If these interpretations are correlated across shareholders and therefore have a common component, then this common component would also be reflected in the prior p. The ex-ante expected payoff from accepting the proposal is $E(v) = 2p - 1$. Therefore, if no private information is available, the proposal should be accepted whenever $p > 1/2$.

We follow the political voting literature and assume symmetry of voters (one man, one vote). This is an approximation as shareholders have votes proportional to the number of shares they own, an aspect we ignore to preserve analytic tractability. For the same reason, we do not allow for abstentions or non-participation, which would require a more complex model with more parameters.[4] We also assume that payoffs and error probabilities are symmetric across states. This assumption simply preserves identifiability. If we allow asymmetry across states, we cannot identify the additional parameter and the probability p at the same time, so the symmetry assumption does not restrict the empirical analysis. Finally, we ignore the process whereby managers select proposals and potentially also time the date when a proposal is put on the agenda. We argue that all these aspects are eventually reflected in the common prior p.

2.2 Representative Shareholder

Since there are no conflicts of interest, we can analyze any decision by looking at a representative shareholder, who collects N signals from all shareholders to arrive at an optimal decision. The information consists of g good signals and $N - g$ bad signals. The objective is to develop a benchmark for the efficiency of voting rules.

First, we derive the objective function. Invariably, the representative shareholder will commit two types of errors. With probability e_I, she will reject a value-increasing proposal (type I-error), and with probability e_{II}, she will accept a value-reducing proposal (type II-error). Given that all signals have the same precision, we can restrict ourselves to decisions by a simple cutoff rule: If $g \geq a$ signals are good, the proposal is accepted, otherwise it is rejected. The representative shareholder chooses a cutoff rule a that minimizes the expected loss:

$$\begin{aligned} L &= p \sum_{g<a} \Pr\left(g \,|v = +1\right) + (1-p) \sum_{g \geq a} \Pr\left(g \,|v = -1\right) \\ &= pe_I + (1-p)\, e_{II}. \end{aligned} \tag{3}$$

Note that L can also be interpreted as the probability of error.

Next, we derive the optimal cutoff rule. Let $\beta(g, N)$ be the probability of being in the good state after observing g good signals ($\sigma_i = 1$) and $N - g$ bad signals ($\sigma_i = -1$). In Appendix A.1,

[4] See Feddersen and Pesendorfer (1996) for a model, which explicitly allows for abstentions.

we derive the functional form of $\beta(g, N)$ by applying Bayes' Rule. Intuitively, $\beta(g, N)$ increases with g and decreases with N. Then, we can rewrite L as:[5]

$$L = \sum_{g<a} \beta(g, N) \Pr(g) + \sum_{g \geq a} (1 - \beta(g, N)) \Pr(g) \quad . \tag{4}$$

The representative shareholder accepts the proposal whenever $\beta(g, N) \geq 1 - \beta(g, N)$, or $\beta(g, N) \geq 1/2$. We ignore that g is an integer and define the optimal cutoff rule a^* from $\beta(a^*, N) = 1/2$. In Appendix A.2, we derive the following expression for the optimal cutoff rule:

$$\frac{a^*}{N} = \frac{1}{2} - \frac{1}{2N \ln\left(\frac{1-\varepsilon}{\varepsilon}\right)} \ln\left(\frac{p}{1-p}\right) \quad , \tag{5}$$

which is subject to $a^* \in [0, N]$.[6] Anticipating the discussion of voting rules, we shall refer to a^*/N as the optimal majority rule. From (5) we can observe two interesting properties. Firstly, a^*/N decreases with the prior p. Submajority ($a^*/N < 1/2$) is optimal for $p > 1/2$ and supermajority ($a^*/N > 1/2$) for $p < 1/2$. Secondly, the simple majority rule ($a^*/N = 1/2$) is optimal when the amount of information is large, which occurs whenever the signals are precise ($\varepsilon \to 0$) or the number of shareholders is large ($N \to \infty$). The optimality of the simple majority rule in the limit is a consequence of the symmetry assumption. Error symmetry means that one good signal always cancels out one bad signal, and payoff symmetry means that good and bad signals are valued equally.

The set of possible solutions to (3) is constrained by the two extreme cases with no information and perfect information, respectively. Firstly, if there is no information ($\varepsilon = 1/2$), the representative shareholder bases her decision on the prior alone. Then, $L = \min(p, 1-p) \leq 1/2$. Secondly, if information is perfect ($\varepsilon = 0$), all decisions are correct and $L = 0$. Hence, in the intermediate case with imperfect information, we must have $0 \leq L \leq 1/2$.

[5] We use the fact that $p \Pr(g \,|v = +1) = \Pr(g, v = +1) = \beta(g, N) \Pr(g)$.

[6] If $a^* < 0$, then $\beta(0, N) > 1/2$ (the proposal is always good), and if $a^* > N$, then $\beta(N, N) < 1/2$ (the proposal is always bad). In both cases, the decision depends only on the prior p and the signals of shareholders cannot make a difference to the optimal decision.

2.3 Shareholder Voting

We now consider the more realistic case, when no representative shareholder exists and information is revealed and aggregated through voting. Decisions are based on the statutory rule a. Statutory rules are chosen a long time before the vote and apply to broad classes of proposals, so they cannot be assumed to be tailored to individual proposals. Therefore, we may have that $a \neq a^*$. This veil-of-ignorance argument is common in the discussion of majority rules in the the political science literature, e.g., Aghion and Bolton (2003) and Holden (2004). The model has two classes of equilibria. The first class are symmetric equilibria in mixed strategies. The second class are asymmetric equilibria in pure strategies, so shareholders with the same information may choose different strategies.

The symmetric equilibria of the voting game are analyzed by Feddersen and Pesendorfer (1998), who have shown that all symmetric equilibria are in mixed strategies whenever $a \neq a^*$. Denote by ω_σ the probability to vote in favor of the proposal of a shareholder who has observed the signal $\sigma \in \{0, 1\}$. Any symmetric mixed strategy equilibrium can be fully described by a tuple (ω_0, ω_1). Based on the analysis of Feddersen and Pesendorfer (1998) and using (5) we prove the following proposition in Appendix B.1:

Proposition 1 ***(Mixed Strategy Equilibria)***. *There exists a responsive mixed strategy equilibrium whenever* $2a^* - N < a < 2a^* + 1$ *where the mixing probabilities* ω_σ *are given as follows:*
(i) If $2a^* - N < a < a^*$*, then* $\omega_0 = 0$ *and*

$$0 < \omega_1 = \frac{h - 1}{h(1-\varepsilon) - \varepsilon} < 1 \; , \quad \textit{where} \quad h = \left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{N+a-2a^*}{N-a}} \; . \tag{6}$$

(ii) If $a^* + 1 < a < 2a^* + 1$*, then* $\omega_1 = 1$ *and*

$$0 < \omega_0 = \frac{f(1-\varepsilon) - \varepsilon}{1 - \varepsilon(1+f)} < 1 \; , \quad \textit{where} \quad f = \left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{a-1-2a^*}{a-1}} \; . \tag{7}$$

(iii) If $a^* \leq a \leq a^* + 1$*, then* $\omega_0 = 0$ *and* $\omega_1 = 1$*, and the equilibrium is in pure strategies.*

The proposition shows that shareholders either vote according to their information after observing a bad signal and mix after observing a good signal (case (i)), or the opposite (case (ii)). If the statutory rule is optimal (case (iii)), then the equilibrium is in pure strategies. Only in this special case do shareholders vote in favor whenever they observe a positive signal and against otherwise. Following Austen-Smith and Banks (1996), we refer to this strategy as sincere voting.

In all pure strategy equilibria, some shareholders ignore their information and vote passively for or against the proposal independently of their information. The remaining shareholders vote sincerely and we denote their number by k. We prove the following theorem in Appendix B.2:[7]

Proposition 2 ***(Pure Strategy Equilibria)***. *For any set of parameters such that*

$$\beta(0, N) \leq 1/2 \leq \beta(N, N),$$

a number k of the N shareholders vote sincerely:

$$k = \max\left\{N - 2\left|a^{*} - a\right|, 0\right\}, \tag{8}$$

where a^{*} is defined from condition (5). The remaining $N - k$ shareholders vote passively for if $a \geq a^{*}$ and against if $a < a^{*}$. The number of passive voters is strictly positive if $a \neq a^{*}$.

The number of sincere voters is a linear, decreasing function of the absolute difference between the statutory rule and the optimal rule, $|a^{*} - a|$: If the statutory rule a exceeds the optimal rule a^{*}, then some shareholders passively vote for, in the opposite case some shareholders passively vote against. The number of shareholders voting sincerely can be zero, in which case the equilibrium is non-responsive. Sincere voting by all shareholders only obtains when the statutory rule equals the optimal rule.

2.4 Comparative Statics

In both mixed and pure strategy equilibria, voting behavior depends on the relation between the statutory rule a and the optimal rule a^{*}. This dependence is the distinguishing property of strategic voting.

[7] Maug (1999) and Persico (2004) also discuss asymmetric equilibria.

2.4.1 Expected Proportion in Favor

The proportion in favor increases with the statutory rule. If the statutory rule exceeds the optimal rule, $a > a^*$, then shareholders vote in favor more often. In mixed strategy equilibria, all shareholders with a good signal *and* some of the shareholders with a bad signal vote in favor. In pure strategy equilibria, all passively voting shareholders *and* sincerely voting shareholders with a good signal vote in favor. If the statutory rule is less than the optimal rule, $a < a^*$, the behavior is reversed. Hence, shareholders compensate for the conservatism of the statutory rule by voting in favor more often.

The relation between the proportion in favor and the statutory rule is illustrated numerically in Figure 1. Define $\alpha = a/N$, $\alpha^* = a^*/N$, and $\kappa = k/N$ and let $E(y/N)$ denote the expected proportion in favor of a proposal. From Proposition 1, the expected proportion of votes in favor in mixed strategy equilibria equals:

$$E\left(y/N\right) = \begin{cases} \pi\omega_1 & \text{, if } \alpha < \alpha^* \quad , \\ \pi + \left(1-\pi\right)\omega_0, & \text{, if } \alpha \geq \alpha^* \quad . \end{cases} \tag{9}$$

>From Proposition 2, the expected proportion of votes in favor in pure strategy equilibria equals:

$$E(y/N) = \begin{cases} \pi\kappa & = \pi - 2\pi\alpha^* + 2\pi\alpha & \text{, if } \alpha < \alpha^* \quad , \\ \pi\kappa + 1 - \kappa & = \pi - 2(1-\pi)\alpha^* + 2(1-\pi)\alpha & \text{, if } \alpha \geq \alpha^* \quad . \end{cases} \tag{10}$$

In Figure 1, the pure strategy equilibria are represented by the piecewise linear (dash-dotted) function with a kink at $\alpha = \alpha^*$, the mixed strategy equilibria by the non-linear (solid) function with an inflection point at $\alpha = \alpha^*$, and sincere voting by the horizontal (dashed) line. The figure emphasizes the difference between strategic and sincere voting. Strategic voting implies that $E(y/N)$ increases with α, whereas sincere voting implies no relation. The figure also illustrates the difference between mixed and pure strategy equilibria, which is marked only for small values of ε. The difference vanishes as $\varepsilon \to 1/2$.

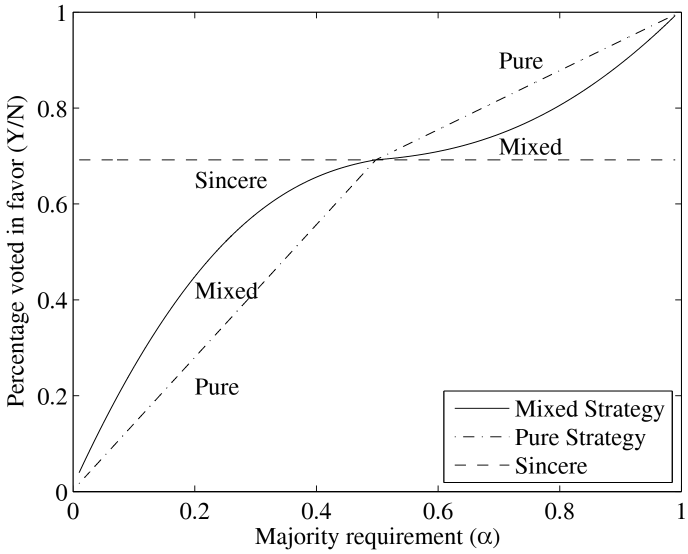

Figure 1: **Expected Proportion in Favor and Statutory Rule**: The non-linear function (solid) represents the expected proportion in favor for mixed strategy equilibria, the piecewise linear function (dash-dotted) pure strategy equilibria, and the horizontal line (dashed) sincere voting. Parameters: $p = 0.7$, $\varepsilon = 0.02$, and $N = 50$.

2.4.2 Pass Rate

The pass rate for a proposal is almost independent of the statutory rule. In the bad state, the probability of incorrectly passing the proposal equals e_{II}. Similarly, the probability of passing the proposal in the good state is 1 minus the probability of incorrectly rejecting it, hence $1 - e_I$ (see equation (3)). Across states the pass rate equals

$$Pass = p\,(1 - e_I) + (1 - p)\,e_{II}. \tag{11}$$

For all strategic voting equilibria, the pass rate converges relatively fast to the prior probability as N gets large or ε gets small, except near the extreme submajority and supermajority rules:[8]

$$\lim_{N\to\infty} Pass = \lim_{\varepsilon\to 0} Pass = p. \tag{12}$$

[8] >From arguments which parallel Proposition 2 of Feddersen and Pesendorfer (1998), the error probabilities converge to zero: $\lim_{N\to\infty} e_I = \lim_{N\to\infty} e_{II} = 0$. Then, (12) follows immediately.

When shareholders vote strategically, they effectively mimic the representative shareholder so that,

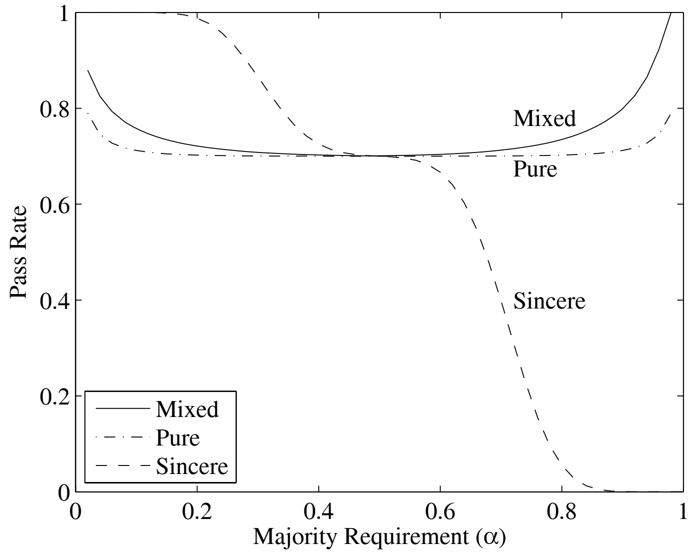

Figure 2: **Pass Rate and Statutory Rule**: Probability that a proposal passes for mixed strategy equilibria (solid), pure strategy equilibria (dash-dotted), and sincere voting (dashed). Parameters: $p = 0.7$, $\varepsilon = 0.3$, and $N = 50$.

on average, a proposal passes with probability p.

Figure 2 plots the pass rate as a function of the statutory rule α for pure strategy equilibria (dash-dotted), mixed strategy equilibria (solid), and sincere voting (dashed). For both mixed and pure strategy equilibria, the pass rate is close to the prior p except near the extreme submajority and supermajority. Sincere voting, on the other hand, distorts the voting outcome unless the statutory rule is close to the optimal rule. Sincerely voting shareholders tend to accept too many proposals subject to a submajority rule and reject too many proposals subject to a supermajority rule. Strategic voting mitigates these biases and eliminates them completely if the amount of information is large (12).[9]

[9] This result relies crucially on the assumption of homogeneous preferences. A strategic voting model with heterogeneous shareholders and conflicts of interest like Maug and Yilmaz (2002) behaves differently.

2.5 Efficiency Properties of Voting Rules

In Figure 3, we evaluate the loss function (3) numerically for mixed and for pure strategy equilibria, sincere voting, the representative shareholder, and the two special cases with no private information and perfect information, respectively. The figure emphasizes the following properties:

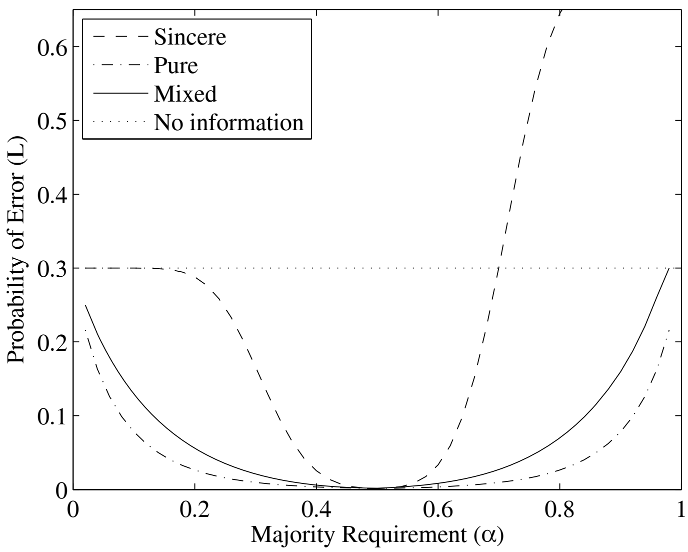

Figure 3: **Probability of Error and Statutory Rule**: Loss function (3) for mixed strategy equilibria (solid), pure strategy equilibria (dash-dotted), and sincere voting (dashed). The horizontal line (dotted) is the loss with no private information. Parameters: $p = 0.7$, $\varepsilon = 0.3$, and $N = 50$.

- Sincere voting results in larger errors than strategic voting except when the statutory rule equals the optimal rule. In other words, sincere voting is an equilibrium if and only if $\alpha = \alpha^*$ (Austen-Smith and Banks (1996)).

- Strategic voting is always better than decision making without private information, because each shareholder uses the available information in the same way as the representative shareholder would, so more information is used without introducing a bias. When the statutory rule approaches unanimity, the probability of error is almost as high with strategic voting as with no private information. The inefficiency of the unanimity rule is the main insight emphasized in Feddersen and Pesendorfer (1998).

- Sincere voting may result in larger errors than decision making without private information because it introduces a bias. For the parameters in Figure 3, sincere voting destroys value when the statutory rule exceeds approximately $\alpha = 2/3$. >From the law of large numbers, sincere voting inevitably leads to always reject when always accept is a better decision rule (for $p > 1/2$). The loss for sincere voting is similar to that of no private information when the statutory rule is less than approximately $\alpha = 1/3$.[10]

- Pure strategy equilibria perform slightly better than mixed strategy equilibria, because mixing equilibria involve some noise from uncoordinated voting decisions of shareholders, whereas pure strategy equilibria rely on some exogenous coordination mechanism that assigns shareholders the roles of sincere and passive voters.

3 Testing Methodology

In the empirical analysis, we emphasize the pure strategy equilibria, which can be estimated with ordinary least squares, but we shall also estimate the mixed strategy equilibria with non-linear least squares.

3.1 Pure Strategy Equilibria

Assume the following relation between the observed and the expected proportion in favor:

$$y/N = E(y/N) + \xi \quad , \tag{13}$$

where $E(\xi) = Cov(\pi, \xi) = Cov(\alpha^*, \xi) = 0$ and $Var(\xi) = \sigma^2$. We shall estimate (13) in a cross-section of proposals. Small amounts of noise arise within the theory from the realizations of shareholders' private information. Larger amounts of noise arise from omitted variables, which are always present in field data, and from variation across proposals in the model parameters, π and

[10] Formally, the limit of the pass-rate is a step-function: 1, if $\alpha < \varepsilon$, p, if $\varepsilon < \alpha < 1 - \varepsilon$, and 0, if $\alpha > 1 - \varepsilon$.

α^*. The assumptions imply a simple regression model from $E(y/N) = \gamma_0 + \gamma_1\alpha$ such that

$$y/N = \gamma_0 + \gamma_1\alpha + \xi \quad . \tag{14}$$

Combining (10) and (14), by equating corresponding coefficients, we obtain:

$$\begin{aligned} &\gamma_0 = \pi - 2\pi\alpha^* &&, \ \gamma_1 = 2\pi &&, \text{ if } \alpha < \alpha^* \quad , \\ &\gamma_0 = \pi - 2(1-\pi)\alpha^* &&, \ \gamma_1 = 2(1-\pi) &&, \text{ if } \alpha \geq \alpha^* \quad . \end{aligned} \tag{15}$$

Equations (14) and (15) define a piecewise linear regression with the kink at α^*. For the parameter values in Figure 1, the top expressions of (15) defines the steeper line to the left, where $\alpha < \alpha^*$, and the bottom expressions defines the flatter line to the right, where $\alpha \geq \alpha^*$. Each line in (15) represents a system of two linear equations in two unknowns with unique solutions given by:

$$\begin{aligned} &\pi = \tfrac{\gamma_1}{2} &&, \ \alpha^* = \tfrac{1}{2} - \tfrac{\gamma_0}{\gamma_1} &&, \text{ if } \alpha < \alpha^* \quad , \\ &\pi = 1 - \tfrac{\gamma_1}{2} &&, \ \alpha^* = \tfrac{1-\gamma_0}{\gamma_1} - \tfrac{1}{2} &&, \text{ if } \alpha \geq \alpha^* \quad . \end{aligned} \tag{16}$$

Our strategy is to estimate γ_0 and γ_1 from (14), compute estimates of π and α^* from (16), and perform tests based on these estimates.

Test 1. Strategic voting implies that $\gamma_1 > 0$, whereas sincere voting implies $\gamma_1 = 0$. This represents a direct test on the regression parameters.

Test 2. Consider two groups of proposals such that $p_H > p_L$ and accordingly $\pi_H > \pi_L$, and let their respective slope parameters be $\gamma_1(\pi_H)$ and $\gamma_1(\pi_L)$. Strategic voting implies that the slope parameters are different:

$$\begin{aligned} &\gamma_1(\pi_H) > \gamma_1(\pi_L) &&, \text{ if } \alpha < \alpha^* \quad , \\ &\gamma_1(\pi_H) < \gamma_1(\pi_L) &&, \text{ if } \alpha \geq \alpha^* \quad . \end{aligned} \tag{17}$$

Test 3. Strategic voting implies that the pass rate converges to p and becomes independent of α as N increases. Let ν be a noise term. Using probit analysis, we shall estimate the model:

$$Pass = \theta_0 + \theta_1 \alpha + \nu, \tag{18}$$

and test whether $\theta_1 = 0$. While this test requires the additional assumption that N is large, this seems defensible in the context of shareholder voting.

Tests 1 to 3 do not depend on the assumption that error probabilities and payoffs are symmetric across states, but the next two tests do. They are therefore not a test of the theory, but a test of the specific parameterization.

Test S (symmetry). The model parameters are confined to the unit interval, $\pi, \alpha^* \in [0,1]$, which constrains the regression parameters to $\gamma_0 \in [-1,1]$ and $\gamma_1 \in [0,2]$. A wide range of values for the regression parameters is consistent with the theory, but once we fix the value for one regression parameter, the permissible range for the other parameter is considerably tighter:[11]

$$\begin{array}{ll} \gamma_0 - \frac{\gamma_1}{2} \leq 0 \leq \gamma_0 + \frac{\gamma_1}{2} & , \text{if } \alpha < \alpha^* \quad , \\ \gamma_0 + \frac{\gamma_1}{2} \leq 1 \leq \gamma_0 + \frac{3\gamma_1}{2} & , \text{if } \alpha \geq \alpha^* \quad . \end{array} \tag{19}$$

Test M (majority rule). We are interested in testing whether the simple majority is optimal, $\alpha^* = 1/2$. The implied restrictions on the regression parameters equal (from (16)):

$$\begin{array}{ll} \gamma_0 = 0 & , \text{if } \alpha < \alpha^* = 1/2 \quad . \\ \gamma_0 + \gamma_1 = 1 & , \text{if } \alpha \geq \alpha^* = 1/2 \quad . \end{array} \tag{20}$$

This test is also an implication of symmetry and requires that N is large or ε small.

[11] If error probabilities or payoffs are asymmetric across states, γ_1 is multiplied by numbers different from 1/2 and 3/2, respectively, in (19).

3.2 Mixed Strategy Equilibria

Posit that $y/N = E(y/N) + \xi$, where ξ is defined as above. We derive an expression for $E(y/N)$ in Appendix C and apply non-linear least squares to estimate:

$$y/N = \begin{cases} \gamma_0 \left(\frac{(1-\gamma_1)^{\frac{\alpha+\gamma_2}{1-\alpha}} - \gamma_1^{\frac{\alpha+\gamma_2}{1-\alpha}}}{(1-\gamma_1)^{\frac{1+\gamma_2}{1-\alpha}} - \gamma_1^{\frac{1+\gamma_2}{1-\alpha}}} \right) + \xi & \text{if } \alpha < \alpha^*, \\ \gamma_0 + (1-\gamma_0) \left(\frac{(1-\gamma_1)\gamma_1^{\frac{\gamma_2}{\alpha}-1} - \gamma_1 (1-\gamma_1)^{\frac{\gamma_2}{\alpha}-1}}{(1-\gamma_1)^{\frac{\gamma_2}{\alpha}} - \gamma_1^{\frac{\gamma_2}{\alpha}}} \right) + \xi & \text{if } \alpha \geq \alpha^*, \end{cases} \tag{21}$$

where $\gamma_0 = \pi$, $\gamma_1 = \varepsilon$, and

$$\gamma_2 = \begin{cases} 1 - 2\alpha^* & \text{if } \alpha < \alpha^*, \\ 2\alpha^* & \text{if } \alpha \geq \alpha^*. \end{cases}$$

We can test whether the model parameters are plausible: $\pi, \alpha^* \in [0,1]$ and, from (2):[12]

$$\begin{aligned} &\varepsilon \in [0, \pi] \quad &, \text{ if } \pi < 1/2 \quad , \\ &\varepsilon \in [0, 1-\pi] \quad &, \text{ if } \pi \geq 1/2 \quad . \end{aligned} \tag{22}$$

These tests imply the analogues of Test 1 and 2. Test 3 is the same for pure and mixed strategy equilibria. We are also interested in testing whether the simple majority rule is optimal (Test M). The implied parameter restriction is:

$$\gamma_2 = \begin{cases} 0 & \text{if } \alpha < \alpha^* = 1/2 \quad , \\ 1 & \text{if } \alpha \geq \alpha^* = 1/2 \quad . \end{cases} \tag{23}$$

4 Institutional Background & Data

4.1 Legal Background

Shareholders can vote at annual general meetings, special meetings, and by written consent. The standard part of the annual general meeting includes the election of the board of directors and ratification of auditors. The non-standard part includes management and shareholder proposals.

[12] Solve (2) for p and observe that $\varepsilon < 1/2$ from (1). Then, the conditions (22) follow from $p \in (0,1)$.

We study non-standard management proposals. We do not study elections, which are decided by plurality voting. Shareholders can vote for a specific director or withhold, but cannot vote against. We also do not consider shareholder proposals, which are not legally binding, so the meaning of the majority rule is not clear.

Figure 4 displays a time line of events. An ownership register is established on the record date, which occurs approximately 35 days before the shareholder meeting (Young, Millar, and Glezen (1993)). The proxy material (Def 14a) is filed with the SEC and mailed to shareholders about 20 days before the meeting. After the proxy material has become public, Institutional Shareholder Services (ISS) and other private consulting firms analyze the proposals and issue vote recommendations to their clients. The New York Stock Exchange and the American Stock Exchange inform brokers whether a proposal is routine or non-routine according to NYSE rule 452 and Amex rule 577, respectively (see below). The voting results are announced at the shareholder meeting and filed with the SEC in the subsequent earnings report (10-K or 10-Q).

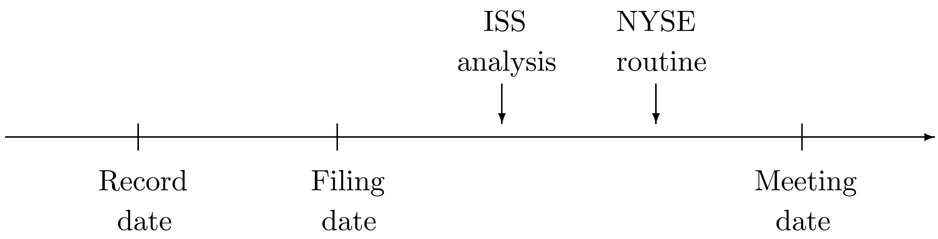

Figure 4: **Time Line**: A shareholder register is established on the record date and the proxy material is mailed to shareholders on the filing date. ISS issues vote recommendations and NYSE and Amex classify proposals as routine or non-routine.

Only shareholders on the record date are eligible to vote. Shareholders can vote in person at the meeting or by mailing back the proxy card or by internet. Votes can be cast either for or against a proposal, but shareholders can also abstain. The proxy statement contains a vote recommendation by management. If the proxy card is signed and dated, but returned blank, the votes are cast in accordance with management's recommendation.

Quorum requires that a majority of eligible votes are cast. When shares are registered in street name, shareholders can instruct the broker to vote the shares. The treatment of uninstructed shares depends on whether the proposal is routine or non-routine. When the proposal is routine, the broker must vote the uninstructed shares, resulting in a broker vote. When a proposal is non-routine, the broker cannot vote the uninstructed shares, but the broker non-votes count towards quorum and are reported as a separate item along with the number of votes cast for and against and abstentions in the 10-K/10-Q filing. Hence, all shares that are registered in street name count towards quorum.

Management proposals are decided by majority voting. The corporate charters specify one of three vote count methods. Let *For*, *Against*, and *Abstain* denote the number of votes cast according to each label, and let $Nonvoted$ denote the number of shares that are not voted.

Type I. A proposal passes if there is quorum and

$$\frac{For}{For + Against} > \alpha \quad . \tag{24}$$

Abstentions, broker non-votes, and non-voted shares do not count.

Type II. A proposal passes if there is quorum and

$$\frac{For}{For + Against + Abstain} > \alpha \quad . \tag{25}$$

Abstentions effectively count as votes against the proposal, but broker non-votes and non-voted shares do not count.

Type III. A proposal passes if there is quorum and

$$\frac{For}{For + Against + Abstain + Nonvoted} > \alpha \quad . \tag{26}$$

Abstentions, broker non-votes, and non-voted shares effectively count as votes against the proposal.

Exchange regulations require that there is an annual general meeting and that shareholders approve equity-based compensation plans and significant stock-for-stock mergers and acquisitions. Some investors are required to vote. Under the Employee Retirement Income Security Act (ERISA) pension funds must vote according to two letters issued in 1988 (Avon Letter) and 1990 (ISSI letter), and an amendment of the Investment Advisers Act (1940) as of 2003 requires that investment advisers vote. State laws require that shareholders vote on fundamental corporate changes such as mergers and charter amendments, but shareholders cannot vote on operating strategies, dividend policy, or fix employment contracts (Easterbrook and Fischel (1983)). Otherwise, there are few state law restrictions. Firms may choose any quorum and majority rules. Some states have default supermajority rules for mergers and charter amendments. A few states require that the vote to change a supermajority charter provision must be by an equal supermajority vote.

4.2 Data

The Investor Responsibility Research Center (IRRC) collects the voting results from 10-K/10-Q filings for significant management proposals of large U.S. corporations. We purchase their data for 1994-2003. Each record states the company name, the meeting date, a verbal description of the proposal, the voting results, and the statutory rule. For Type I proposals, the percent voted for and against are reported and, for Type II and Type III proposals, also the abstentions. Three pieces of information that are available from the proxy material and the 10-K/10-Q reports are missing: The quorum rule, the shareholder turnout, and the number of broker non-votes. The data consists of 15,447 management proposals of which data are complete for 14,548 management proposals put forward at 9,158 shareholder meetings by 2,822 firms.

Brickley, Lease, and Smith (1994) and Bethel and Gillan (2002) show that routine proposals receive more votes in their favor than non-routine proposals. We manually collect the routine classification variable from the NYSE Weekly Bulletin and the Amex Weekly Bulletin, respectively. Nasdaq does not classify proposals as routine or non-routine, but allows brokers to vote according to the NYSE and Amex regulations. We shall estimate the missing values (see below).

Morgan and Poulsen (2001) and Bethel and Gillan (2002) show that proposals with positive vote recommendations are associated with a five percentage points higher support than proposals with negative vote recommendations. ISS vote recommendations are not public and very expensive to purchase, but a subset is available on Investext. We collect available vote recommendations from Investext using a combination of computer and manual extraction techniques. A small number of vote recommendations are purchased from ISS. The final sample includes 7,748 management proposals with vote recommendations.

Brickley, Lease, and Smith (1988), Morgan and Poulsen (2001) and Bethel and Gillan (2002), show that the proportion in favor of a management proposal increases with insider ownership. For each firm with at least one management proposal and a vote recommendation, we collect manually the complete time-series of the ownership of officers and directors in 1994-2003 from the electronic proxy statements (Edgar). Sometimes, when there are gaps in the time-series, we replace the missing value with the observation closest in time (before or after). We define insider voting power as the proportion of the voting rights owned by officers and directors and affiliated blocks. The final sample includes 12,602 management proposals with data on insider ownership.

4.3 Descriptive Statistics

The distribution of statutory majority rules can be seen in Table 1. Most proposals are decided by simple majority and only a few by supermajority. Henceforth, we refer to the former as simple-majority proposals and the latter as supermajority proposals. Our inference on strategic voting will be based on the difference in voting behavior on the 14,021 simple-majority proposals versus the 527 supermajority proposals.

Table 1: **Statutory Rules**

	50%	**55%**	**60%**	**67%**	**70%**	**75%**	**80%**
#Observations	14,021	1	6	432	2	40	46

A proposal passes if there is quorum and the percent voted for exceeds the statutory rule.

The voting results are examined in Table 2 for management proposals by NYSE and Amex firms with known routine classification. The table reports the average proportion voted for and against, abstentions and non-voted. The averages are conditional on the vote count method and on routine classification. The proportions in the top four rows sum to one. The table also reports the pass rate, the number of failed proposals, the number of proposals subject to a supermajority rule, and the total number of proposals. Several observations can be made.

Table 2: **Voting Results**

	Routine			**Non-routine**		
	Type I	**Type II**	**Type III**	**Type I**	**Type II**	**Type III**
Proportion voted for	0.899	0.891	0.791	0.853	0.829	0.709
Proportion voted against	0.101	0.098	0.068	0.147	0.154	0.059
Proportion abstain	N/A	0.015	0.006	N/A	0.017	0.010
Proportion non-voted	N/A	N/A	0.135	N/A	N/A	0.222
Pass rate	1.000	1.000	0.996	0.998	0.991	0.934
#Failed proposals	0	1	5	2	15	77
#Supermajority	10	8	121	68	7	245
#Observations	1,725	2,985	1,200	984	1,608	1,167

Management proposals by NYSE and Amex firms. Broker votes are included in the vote counts for routine proposals. Type I: Proportions of shares voted for and against. Type II: Proportions of shares voted including abstentions. Type III: Proportions of shares outstanding.

Turnout is high. The turnout can be inferred from the average proportion of non-voted shares in the fourth row. Turnout is 86.6% for routine proposals (including broker votes) and 77.6% for non-routine proposals (excluding broker votes). Regulations that require certain shareholders to vote may contribute to the high shareholder turnout. Feddersen (2004) surveys the theories of election turnout.

Voting outcomes are predictable. The average proportion in favor of a management proposal is above 70% and the pass rate is near 100%. The high average pass rate is consistent with the hypothesis that shareholders hire management as experts on running the firm and, therefore, that the average management proposal is good. Pre-meeting behaviors may contribute to the low uncertainty. Firstly, management may use their control over the agenda to bias the selection towards high-p proposals, and management may settle with dissident shareholders before the meeting to ensure a high probability of passage.[13] Secondly, anticipating that a proposal will pass, a shareholder with negative information may sell her shares before the meeting instead of voting against the proposal (Burch, Morgan, and Wolf (2004)). As a result, the proportion in favor of Type I and II proposals for which non-voted shares do not count may increase, because the old shareholder with negative information may not want to vote the shares after they have been sold and the new shareholder is not allowed to vote the shares. In any case, these behaviors do *not* bias our analysis, they only shift the distribution towards high$-p$ proposals.

Shareholders have private information. Some shareholders vote for and others vote against. This observation suggests that shareholders have private information. Furthermore, when there are multiple proposals at the same shareholder meeting, the proportion in favor is rarely equal across the proposals. Controlling for routine classification and vote count method, the average intra-meeting standard deviation is 0.059, and it is zero in less than 2% of shareholder meetings.

Non-voted shares matter. The proportion in favor and the pass rate are similar for proposals of Type I and Type II, because abstentions are generally negligible, but the proportion in favor and the pass rate are significantly less for proposals of Type III. Counting non-voted shares as votes against the proposal, lowers the proportion in favor by 10 to 15 percentage points and swings the outcome from pass to fail for 62 proposals. The number is substantial relative to the 100 failed proposals in the table. Furthermore, 20 Type III proposals fail, because shareholder turnout is less than the statutory rule, i.e., these proposals would have failed even if all the participating shareholders had voted in favor.

Broker votes matter. Routine proposals obtain more votes in their favor than non-routine proposals. On average, the broker raise the proportion in favor by 4.6% for Type I proposals, 6.2%

[13] See Carleton, Nelsen, and Weisbach (1998) for an example.

for Type II proposals, and 8.2% for Type III proposals. We use the conditional averages to estimate the number of proposals which are swung by the broker votes. If we subtract the conditional average from the observed proportion in favor, we find that the outcome of 60 proposals are swung from pass to fail of which four are Type I proposals, 14 Type II proposals, and 42 Type III proposals. Hence, we concur with Bethel and Gillan (2002) that broker votes may swing the outcome from fail to pass for a significant number of management proposals.

Summary statistics for subcategories of management proposals are reported in Table 3. We have classified the proposals into four categories: Compensation (Panel A), recapitalization (Panel B), restructuring (Panel C), and charter amendments (Panel D). Corporate governance proposals to restore shareholder rights (Panel D1) and corporate governance proposals to remove shareholder rights (Panel D2) are separated from other charter amendments. A few proposals do not fit into any of these categories and are eliminated. Some proposals are complex packages of subproposals. We assume that proposals are packaged to avoid inconsistent outcomes. For example, proposals to restructure are often packaged with proposals to issue stock. This combination is classified as a restructuring proposal. We want to bring out the following patterns:

Compensation proposals dominate. Exchange regulations require shareholder approval of equity-based compensation plans (see above). In addition, shareholder approval determines the corporate tax status of both cash and equity-based compensation plans. Under Section 162(m) of the Internal Revenue Code, a corporation may not deduct for federal income tax purposes annual compensation in excess of $1 million paid to its officers and directors, unless the compensation is approved by shareholders. Bebchuk and Fried (2004) argue that shareholders approve ineffective, large-dilution compensation packages in order to secure this favorable tax treatment. If their hypothesis is correct, then it may explain the high pass rate for compensation proposals and implies that results on compensation proposals must be interpreted with caution.

Supermajority rules are used for all proposals. Supermajority rules are most common for corporate governance proposals to restore shareholder rights (Panel D1), because charter rules that entrench management are often supported by supermajority rules. Supermajority rules are least

Table 3: **Proposals**

	Routine			Non-routine		
	Type I	**Type II**	**Type III**	**Type I**	**Type II**	**Type III**
A. Compensation[a]						
Proportion voted for	0.899	0.889	0.763	0.837	0.818	0.693
Pass rate	1.000	1.000	1.000	0.998	0.992	0.989
ISS recommends for	0.826	0.820	0.875	0.688	0.626	0.743
#Supermajority	5	2	2	0	1	0
#Observations	1,567	2,842	206	807	1,414	87
B. Recapitalization[b]						
Proportion voted for	0.887	0.909	0.785	0.891	0.911	0.691
Pass rate	1.000	1.000	0.995	1.000	1.000	0.926
ISS recommends for	0.709	0.833	0.808	0.938	0.960	0.790
#Supermajority	3	3	64	0	1	22
#Observations	107	91	746	36	48	242
C. Restructuring[c]						
Proportion voted for	N/A	N/A	N/A	0.969	0.970	0.741
Pass rate	N/A	N/A	N/A	1.000	1.000	0.994
ISS recommends for	N/A	N/A	N/A	0.967	1.000	0.964
#Supermajority	0	0	0	4	0	99
#Observations	0	0	0	95	97	471
D. Charter amendments[d]						
Proportion voted for	0.953	0.957	0.834	0.949	0.927	0.711
Pass rate	1.000	1.000	0.996	1.000	1.000	0.976
ISS recommends for	0.962	0.962	0.953	1.000	0.750	0.893
#Supermajority	2	3	55	1	1	28
#Observations	47	48	247	17	14	125

Table 3: **Continued**

	Routine			Non-routine		
	Type I	**Type II**	**Type III**	**Type I**	**Type II**	**Type III**
D1. Restore rights[e]						
Proportion voted for	N/A	N/A	N/A	0.954	0.918	0.738
Pass rate	N/A	N/A	N/A	1.000	1.000	0.852
ISS recommends for	N/A	N/A	N/A	0.800	0.875	0.982
#Supermajority	0	0	0	2	3	76
#Observations	0	0	0	9	10	128
D2. Remove rights[f]						
Proportion voted for	N/A	N/A	N/A	0.777	0.694	0.591
Pass rate	N/A	N/A	N/A	1.000	0.810	0.711
ISS recommends for	N/A	N/A	N/A	0.125	0.100	0.129
#Supermajority	0	0	0	1	1	20
#Observations	0	0	0	15	21	114

Management proposals by NYSE and Amex firms. The average proportion voted for, the pass rate, the average of a dummy variable, which is one when ISS recommends to vote for the proposal and zero otherwise, the number of supermajority proposals, and the number of observations. The average of the ISS variable is estimated for the subset of proposals with known ISS vote recommendation. Broker votes are included in the vote counts for routine proposals. Type I: Proportions of shares voted for and against. Type II: Proportions of shares voted including abstentions. Type III: Proportions of shares outstanding. The table omits 24 proposals, which do not belong to any of the main categories.

[a] Approve stock option plan, stock award plan, cash bonus plan, employee stock purchase plan, director deferred compensation plan, and director loan plan.

[b] Authorize management to issue stock, preferred stock, debt, and stock split.

[c] Approve merger, acquisition, spinoff, divestiture, restructure to holding company, leveraged buyout, and liquidation.

[d] Approve technical charter amendments, approve board size, change company name, and change state of incorporation.

[e] Declassify the board, remove supermajority lock-in provision, opt out of anti-takeover state law, recapitalize into single-class firm, restore shareholders' advance notice and special meeting rights, adopt cumulative voting, and set director tenure limit.

[f] Classify the board, approve supermajority lock-in provision, poison pill, provision to remove directors for cause only, director liability provision, recapitalize into dual-class firm, remove shareholders' advance notice, special meeting, and preemptive rights, opt into anti-takeover state law, remove cumulative voting, remove director tenure limit, and remove shareholder approval of golden parachute.

common for compensation proposals (Panel A).

Voting outcomes for corporate governance proposals are uncertain. Voting outcomes are predictable except for the proposals in the bottom right corner of Table 3: Non-routine, Type III, corporate governance proposals to restore (Panel D1) or remove shareholder rights (Panel D2). Since these proposals are often subject to supermajority approval, strategic voting may make the biggest difference here.

Table 4: **Insider Ownership**

	0-10%	**10-20%**	**20-50%**	**50-100%**	**Sum**
Observations	8,278	1,712	1,826	786	12,602
Proportion	0.657	0.136	0.145	0.062	1.000

Proportion of the voting rights owned by officers and directors and affiliated blocks. Ownership data are missing for 1,946 proposals.

Table 4 reports the distribution of insider ownership. For about two-thirds of the firms less than 10% of their shares are held by insiders, whereas for about 6% of the firms in our sample more than 50% of the shares are held by insiders. The firms with high ownership concentration are recently listed firms, dual-class firms, and subsidiaries of other listed corporations. The empirical results below do not depend on the inclusion of proposals by these firms.

5 Results

5.1 Pure Strategy Equilibria

We shall estimate the following regression model:

$$y/N = \gamma_0 + \gamma_1\alpha + \beta' X + \xi, \tag{27}$$

where the vector of control variables X includes a dummy variable for Type III proposals, a dummy variable for routine proposals, and insider voting power. Since we want to make inference from the regression intercept, the sample mean is subtracted from each control variable. The list does not include the ISS vote recommendation. We interpret ISS vote recommendation as public information, which is reflected in p, so that a positive recommendation is associated with a higher p and therefore a higher value of π. Technically, ISS vote recommendations are not public, but we suspect that many institutional shareholders and other blockholders buy ISS reports and have access to their information, so that from the perspective of our model, ISS vote recommendations are closer to common information reflected in p than to private signals. The interpretation of ISS vote recommendation as a proxy for p is supported by the evidence in Section 5.3 below. According to (15), a proxy for π must enter the regression model interactively. Therefore, we shall estimate the regression separately for proposals with positive and negative vote recommendations and compare the coefficients across the two subsets.

The model in Section 2 assumes that shares are voted for or against a proposal and is silent about abstentions and non-voted shares. Therefore, in testing the model, we shall transform the data and define the proportion in favor as:

$$y/N = \frac{For}{For + Against} \quad . \tag{28}$$

The transformation makes no difference for Type I proposals, it makes only a small difference for Type II proposals, but it makes a bigger difference for Type III proposals.

We employ all 14,548 proposals with complete voting results. The routine dummy variable is missing for proposals at Nasdaq firms and must be estimated. We classify restructuring proposals and governance proposals as non-routine according to the NYSE and Amex rules. Furthermore, we classify Type III proposals depending on observed shareholder turnout: The proposal is routine if turnout exceeds 85% and it is non-routine if turnout is less than 75%. Missing values on the remaining Type III proposals, and Type I and Type II proposals by Nasdaq firms, are replaced by the conditional sample mean for each of the proposal subcategories in Table 3. Missing insider ownership data are replaced by the unconditional mean.

Table 5 reports the coefficients of ordinary least squares (15) and model parameters (16) assuming that $\alpha \geq \alpha^*$. Imputed model parameters for $\alpha < \alpha^*$ are rejected (Test S) and not reported. Robust standard errors are reported below the coefficients. We ignore possible firm- or meeting-fixed effects, because the panel is unbalanced with mostly short time-series. There is a single observation for 16% of the sample firms and 61% of all shareholder meetings. These observations would be lost using panel regressions with fixed effects. The results (not reported) are similar in regressions where we include only one proposal at each level of the statutory rule from each shareholder meeting, so intra-meeting correlation does not affect our results. We also notice that the 527 supermajority proposals are spread out among 442 shareholder meetings. Since management proposals typically pass, they rarely reappear on the agenda next year. We discuss the regression results with respect to the tests in Section 3.

Test 1. The proportion in favor increases significantly with the statutory majority rule. This result is consistent with strategic voting and inconsistent with sincere voting. The slope coefficient implies that a proposal at $\alpha = 2/3$ obtains 3.5% more votes in favor than a simple-majority proposal. When the supermajority rule is $\alpha = 4/5$, the additional support is 6.3%. These additional votes swing 74 of 527 supermajority proposals from fail to pass. The effect on the pass rate is similar to that of the vote count method and broker votes (see Section 4.3 above), so the economic effect of strategic voting is comparable in magnitude to other effects that have been documented on shareholder voting before.

Test 2. The slope coefficient γ_1 is steeper in the subsample with negative vote recommendations. We interpret a negative vote recommendation as a proxy for π_L and a positive vote recommendation as a proxy for π_H. Then, the difference between the slope coefficients is consistent with strategic voting. The imputed model parameter π in Panel B and the statistical test in the top row of Panel C support this interpretation of the data.

Test S. The model parameters, π and α^*, lie within the unit interval and a test of the quantitative restrictions on the regression parameters are consistent with the model assumption that the payoffs

Table 5: **Proportion in Favor and Statutory Rule**

	All proposals	**ISS For**	**ISS Against**
A. Regressions			
Constant	0.773 (0.011)	0.888 (0.008)	0.591 (0.052)
Majority (α)	0.211 (0.022)	0.075 (0.015)	0.281 (0.104)
Type III	0.049 (0.002)	0.036 (0.002)	0.037 (0.007)
Routine	0.036 (0.002)	0.006 (0.002)	0.044 (0.006)
Insider	0.089 (0.004)	0.072 (0.004)	0.257 (0.011)
R^2	0.065	0.089	0.186
#Super	527	449	62
#Obs	14,548	5,745	2,003
B. Parameters			
π	0.894 (0.011)	0.962 (0.007)	0.859 (0.052)
α^*	0.575 (0.059)	0.996 (0.195)	0.953 (0.349)
C. Tests			
Test 2: $\gamma_1(\pi_L) \geq \gamma_1(\pi_H)$		0.206 (0.105)	
Test S: $\gamma_0 + \frac{1}{2}\gamma_1 \leq 1$	0.879 (0.001)	0.925 (0.001)	0.732 (0.003)
Test S: $\gamma_0 + \frac{3}{2}\gamma_1 \geq 1$	1.090 (0.022)	1.000 (0.015)	1.013 (0.103)
Test M: $\gamma_0 + \gamma_1 = 1$	0.984 (0.011)	0.963 (0.007)	0.873 (0.051)

Panel A. Ordinary least squares regression of the proportion in favor on the statutory rule, a dummy variable for Type III proposals, a dummy variable for routine proposals, and insider voting power. The sample means have been subtracted from the control variables. Robust standard errors are reported below the estimated parameters.
Panel B. Imputed model parameters assuming $\alpha \geq \alpha^*$. The standard error of α^* has been computed with the delta method.
Panel C. Test 2 is a test of the difference between the slope coefficients when ISS recommends against (π_L) versus for (π_H). Test S is derived from the quantitative parameter restrictions. Test M is test of the optimality of the simple majority rule.

and errors are symmetric. The point estimates of π are similar to the unconditional average proportion in favor of the proposal (Table 2).

Test M. Using all proposals, we cannot reject the hypothesis that the simple majority rule is optimal. In this case, the model parameters are consistent with the identifying condition $\alpha \geq \alpha^*$. For the two subsets with ISS vote recommendations, the optimality of the simple majority rule is rejected, and the identifying condition $\alpha \geq \alpha^*$ is violated for some proposals, but we do not have enough variation in the statutory rule to estimate the break point in the data.

Control variables. After scaling, Type III proposals attract about four to five percentage points more votes in their favor than Type I and Type II proposals. The additional votes can be the result of strategic voting behavior. Knowing that non-voted shares count against the proposal, some shareholders may passively vote in favor to offset the bias. Routine proposals receive higher support than non-routine proposals, and the effect is stronger when ISS recommends against the proposal. We do not know if the additional support is due to broker-votes or other shareholders' votes. Finally, we can see that the proportion in favor increases with insider ownership. The effect is stronger when the ISS recommendation is against, because negative recommendations are associated with more concentrated insider ownership.

5.2 Mixed Strategy Equilibria

Table 6 summarizes our non-linear least squares estimations for the mixed strategy equilibria. The estimation must be carried out without the control variables. The table reports the results of estimating (21) and those of a corresponding regression subject to the restriction that $p = 0.99$. We report only the results for the parameter region $\alpha \geq \alpha^*$, because the identifying condition $\alpha < \alpha^*$ is violated in the other region. In the unrestricted regression, the parameter estimates for π and α^* are close to those of the pure strategy equilibria, while the estimate for ε falls outside the allowed range in (22), but the standard error is large. In the restricted regression, where we force ε to be inside the permissible range from 0 to $1 - \pi$, the point estimates are the maximum allowed. The parameter estimates suggest that the mixed strategy equilibria are similar to the pure strategy

Table 6: **Non-Linear Least Squares Estimation of Mixed Strategy Equilibria**

	All proposals	**ISS For**	**ISS Against**
A. Unrestricted			
π	0.853 (0.007)	0.916 (0.005)	0.764 (0.024)
ε	0.500 (0.255)	0.500 (0.123)	0.500 (0.395)
α^*	0.429 (0.014)	0.486 (0.019)	0.563 (0.070)
B. Restricted			
π	0.856 (N/A)	0.917 (N/A)	0.749 (N/A)
ε	0.137 (0.005)	0.074 (0.003)	0.246 (0.016)
α^*	0.414 (0.010)	0.421 (0.011)	0.528 (0.093)
χ^2-test	2.0 (0.157)	11.8 (0.000)	0.5 (0.493)

Estimates for the parameter region $\alpha \geq \alpha^*$. The Wald χ^2-statistic tests the restriction $p = 0.99$. Standard errors are below the parameter estimates and p-values below the χ^2-statistics.

equilibria of this game.

The nature of the non-linear regressions can be seen in Figure 5. The dots represent the seven conditional sample means. Four sample means are supplemented with vertical lines, which represent plus/minus two standard errors away from the mean. We suppress the standard errors for the other three means with only a few observations. The upward-sloping line represents the pure strategy equilibria (dash-dotted), the curved line the mixed strategy equilibria (solid), and the horizontal line sincere voting (dashed). We assume that $\alpha^* = 1/2$, which forces the $E(y/N)-$functions to pass through $(1, 1)$. The mass of observations at $\alpha = 1/2$ forces all three functions to pass through the conditional sample mean of the simple majority. We can see that the conditional mean of the other mass point in the data, $\alpha = 2/3$ with 82% of the supermajority proposals, lies *above* the pure strategy equilibria line. Therefore, the non-linear least squares-estimator chooses ε such that the $E(y/N)-$function becomes as concave as possible, which occurs when ε approaches 1/2 and the function becomes linear. When we impose the constraint $\varepsilon \leq 1 - \pi$, then this constraint becomes binding.

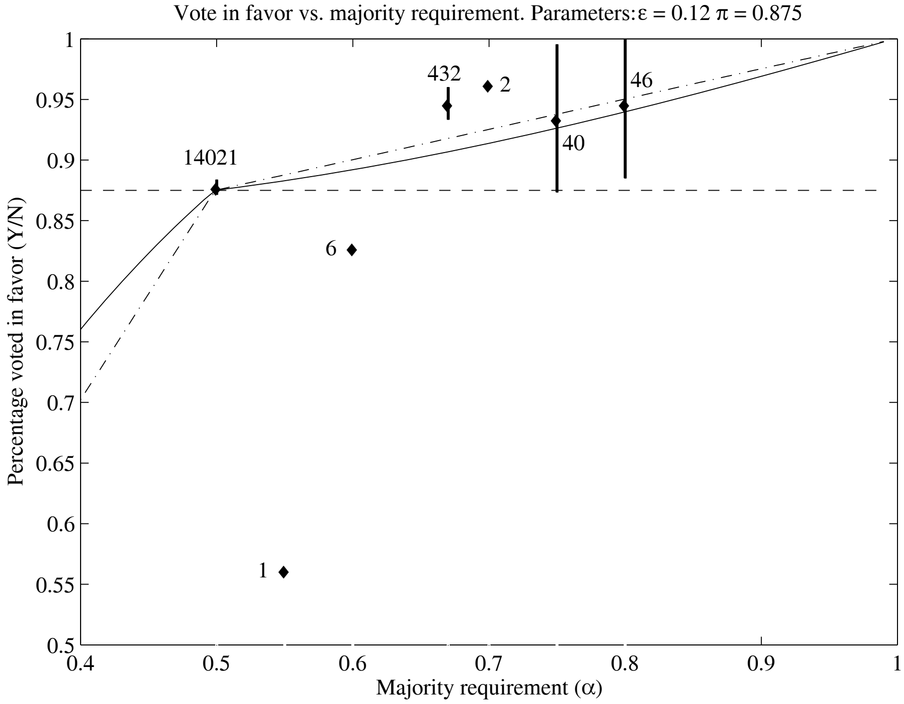

Figure 5: **Predicted and Observed Proportion in Favor**: Mixed strategy equilibria (solid), pure strategy equilibria (dash-dotted), sincere voting (dashed), and conditional sample means (marked with a diamond). The labels indicate the number of observations. The vertical lines represent the ± 2 standard error-bounds around the conditional sample means.

5.3 Test 3: Pass Rate and Statutory Rule

We estimate a probit model with the dependent variable equal to one if the proposal passes and zero if it fails. In addition to the independent variables used above, we add a variable which equals one when ISS recommends for and zero when ISS recommends against. Missing values are replaced by the unconditional sample mean. The ISS vote recommendation enters the probit regression additively, because, under the null hypothesis that shareholders vote strategically, a shift in the prior p affects only the intercept and not the sensitivity to the majority rule, which is zero.

The estimation results are reported in Panel A of Table 7. Specification (1) assigns equal weight to all observations. The pass rate decreases with the statutory rule and the dummy for Type III proposals, and it increases with the ISS variable, the routine dummy, and insider ownership. All

Table 7: **Pass Rate and Statutory Rule**

	Ordinary probit	**Weighted probit**	**Turnout restriction**
	(1)	(2)	(3)
A. Results			
Constant	3.51	2.97	2.28
	(0.25)	(0.65)	(0.81)
Majority (α)	-4.30	-3.19	-1.79
	(0.48)	(1.29)	(1.62)
ISS For	1.09	1.05	1.08
	(0.08)	(0.08)	(0.09)
Type III	-0.53	-0.55	-0.52
	(0.07)	(0.07)	(0.07)
Routine	0.71	0.66	0.63
	(0.08)	(0.08)	(0.08)
Insider	1.17	1.29	1.27
	(0.26)	(0.29)	(0.29)
#Fail	207	166	159
#Obs	14,548	14,548	14,519
B. Significance			
Elasticity at mean α	-0.0292	-0.0209	-0.0115
$Pass_{2/3} - Pass_{1/2}$	-0.0049	-0.0035	-0.0019

Ordinary probit: Pass/fail dummy variable, the statutory rule, a dummy variable for ISS vote recommendations, a dummy variable for Type III proposals, a dummy variable for routine proposals, and insider voting power. Missing values for the ISS dummy, the routine dummy, and insider voting power are replaced by sample means. Panel A reports estimated coefficients and standard errors (below). Panel B reports the elasticity at mean α and the implied change in the pass rate when the statutory rule increases from 1/2 to 2/3.
Weighted probit: The weight is the square root of the number of observations at each level of the statutory rule times the pass probability times the failure probability. The weighted failure count is less than the actual count when the weight is low.
Turnout restriction: Weighted probit without 29 Type III proposals, where shareholder turnout is less than the statutory rule.

coefficients are statistically different from zero. The statistically negative relation between the pass rate and the statutory rule verifies the findings by Brickley, Lease, and Smith (1988) and (1994), who use ordinary least squares instead of probit analysis. Specification (2) puts less weight on the supermajority proposals using as weight $w_\alpha = \sqrt{n_\alpha \times p \times (1-p)}$. The weighting procedure assumes that the pass rate is estimated less accurately when there are few observations. The estimated coefficients are similar to specification (1) and remain statistically different from zero. Specification (3) repeats the weighted regression without 29 Type III proposals for which shareholder turnout is less than the statutory rule. These proposals fail regardless of the number of votes in favor. Five observations occur at $\alpha = 1/2$ and 17 at $\alpha = 4/5$. In specification (3), the relation between the pass rate and the statutory rule is not statistically different from zero.

In Panel B of Table 7, we can see that the elasticity of the pass rate with respect to the statutory rule is small and implies that the pass rate decreases by less than one half percent as we move from simple majority to two-thirds supermajority. In Table 8, we report the predicted pass rate for $p = 0.9$, $N = 30$, and $\varepsilon = \{0.1, 0.2, 0.3\}$. Strategic voting (Panel A) implies that the relation between the pass rate and the statutory rule is close to zero, but positive. In contrast, sincere voting (Panel B) predicts a sharp decline in the pass rate except when the error term is small. While the prediction of the voting theory is not perfectly aligned with the evidence in Table 7, we conclude that the predictions of strategic voting does much better than sincere voting.

5.4 Economic Significance

Economic significance can be assessed by evaluating the loss function (3) for $\{p, \varepsilon, N\}$. Table 3 suggests that model parameters vary with the vote count method, routine classification, and proposal category. The economic value of voting is small when the prior p is high and the scope for improvement is small, so we focus on the proposals in the rightmost column in Table 3, where the pass rate is lower and the economic value of voting is potentially higher. We omit the compensation proposals, which are rarely subject to a supermajority rule. We shall assume that $N = 30$, p equals the observed pass rate, and that π equals the average proportion voted for. The error term ε is implied by (2). We set π equal to the average proportion in favor, because there are too

Table 8: **Predicted Pass Rate and Statutory Rule**

	$\varepsilon = 0.1$	$\varepsilon = 0.2$	$\varepsilon = 0.3$
A. Strategic voting			
$\alpha = 1/2$	0.9000	0.9001	0.9060
$\alpha = 2/3$	0.9000	0.9029	0.9258
$\alpha = 4/5$	0.9017	0.9191	0.9632
B. Sincere voting			
$\alpha = 1/2$	0.9000	0.9000	0.8960
$\alpha = 2/3$	0.8999	0.8769	0.6573
$\alpha = 4/5$	0.8768	0.5463	0.1436

Predicted pass rate for mixed strategy equilibria and sincere voting, respectively. We assume that $p = 0.9$ and $N = 30$.

few observations in each box in Table 3 to accurately impute π from regression coefficients. The estimation procedure for π is accurate if $\alpha^* = 1/2$ and all proposals in the sample are subject to a simple majority rule (see equation (10)). If some proposals are subject to a supermajority rule, we underestimate π and overstate economic significance. Given the relatively small number of such proposals, the bias is negligible.

Table 9 reports the loss L from decision-making. Note that $|v| = 1$ in our model, so economic significance would have to be assessed by scaling the results in the table appropriately. As it stands, the table reports the probabilities of decision-making errors. The model parameters are summarized in Panel A. We evaluate decision making without private information and decision making by the representative shareholder with access to all information in Panel B. Since $p > 1/2$, the best decision without private information is to always accept. This simple rule leads to small errors for restructuring proposals with a high p , but it leads to large errors for corporate governance proposals with relatively small p. The probability of error by the representative shareholder is always small with $N = 30$ independent signals.

In Panels C and D, we evaluate strategic voting. Strategic voting is always better than decision making without private information. With a simple majority rule strategic voting outcomes are similar to those of the representative shareholder because, by the law of large numbers, the simple

Table 9: **Probability of Error**

	Recapital-ization	**Restruct-uring**	**Charter amendments**	**Restore rights**	**Remove rights**
A. Parameters					
p	0.926	0.994	0.976	0.852	0.711
ε	0.276	0.256	0.278	0.162	0.284
π	0.691	0.741	0.711	0.738	0.591
B. Benchmarks					
No information	0.0717	0.0047	0.0210	0.1849	0.3459
Representative	0.0022	0.0002	0.0013	0.0000	0.0055
C. Strategic voting (PSE)					
$\alpha = 1/2$	0.0028	0.0000	0.0017	0.0000	0.0055
$\alpha = 2/3$	0.0097	0.0016	0.0055	0.0001	0.0178
$\alpha = 4/5$	0.0272	0.0043	0.0136	0.0019	0.0480
D. Strategic voting (MSE)					
$\alpha = 1/2$	0.0044	0.0008	0.0032	0.0000	0.0076
$\alpha = 2/3$	0.0228	0.0039	0.0130	0.0012	0.0414
$\alpha = 4/5$	0.0532	0.0060	0.0227	0.0147	0.1080
E. Sincere voting					
$\alpha = 1/2$	0.0029	0.0011	0.0029	0.0000	0.0055
$\alpha = 2/3$	0.1667	0.1204	0.1841	0.0046	0.1491
$\alpha = 4/5$	0.7045	0.6755	0.7517	0.1722	0.5627

Loss function (3) for non-routine, Type III proposals (rightmost column in Table 3). Compensation proposals are omitted. We assume that $N = 30$, p equals the pass rate, and π equals the average proportion in favor. Panel A reports the imputed model parameters, Panel B the probability of error when the decision is based on the prior p (no private information) and when the decision is based on all available information (representative). Panels C, D, and E report the probability of error when decisions incorporate the information of shareholders according to the three models of voting behavior.

majority rule approximates the optimal majority rule for $N = 30$. When the supermajority rule is high, $\alpha = 4/5$, and the prior is relatively low, strategic voting results in substantially larger errors than the representative shareholder. Hence, supermajority rules are potentially costly to shareholders. We can also see in Panels C and D that pure strategy equilibria dominate mixed strategy equilibria. This is a generic feature of the model, which we discuss above (see Section 2.5).

In Panel E, we evaluate sincere voting. Sincere voting is as good as strategic voting at the simple majority rule, but sincere voting makes things worse when the proposal is subject to a supermajority rule. The probability of error is much higher than decision making without private information, because sincere voting tends to result in rejection when always accept, on average, is a better decision rule.

6 Relation to the Shareholder Voting Literature

The analysis in this paper is centered around the positive relation between the proportion in favor and the statutory rule. The relation is not a new discovery and explanations other than strategic voting have been offered.

Agenda control hypothesis. Brickley, Lease, and Smith (1988) propose that management screen proposals more carefully when they are subject to a majority rule. Therefore, on average, supermajority proposals that appear on the agenda are associated with a higher π than simple-majority proposals. Two empirical arguments speak in favor of strategic voting. Firstly, the strategic voting theory offers a multitude of empirical implications (Tests 1-3, S, and M), which are consistent with the data, while the agenda control hypothesis offers an explanation for only one of these implications, namely Test 1. Secondly, if an ISS vote recommendation is a proxy for p, then the agenda control hypothesis predicts that ISS is more likely to support a supermajority proposal. We test this prediction by estimating a probit model, where the dependent variable equals one if ISS recommends to vote in favor, and zero if ISS recommends to vote against. We use the same independent variables plus a set of dummy variables for each of the main proposal categories in Table 3. The estimated coefficients and standard errors are reported in Table 10. The relation between the ISS dummy variable and the statutory rule is not statistically different from zero. This result is consistent with the observation that ISS typically does not provide information to its clients about the statutory rule.

Table 10: **Determinants of ISS Vote Recommendations**

Constant	Majority	Type III	Routine	Insider	Comp	Recap	Restruct	Restore	Remove
1.001 (0.282)	0.747 (0.504)	0.079 (0.064)	0.524 (0.042)	-0.662 (0.082)	-0.844 (0.101)	-0.669 (0.099)	0.840 (0.142)	0.571 (0.220)	-1.894 (0.139)

Probit model, where the dependent variable equals one if the ISS vote recommendation is for and zero if it is against. The explanatory variables are the statutory rule, a dummy variable for Type III proposals, a dummy variable for routine proposals, insider voting power, and dummy variables for each of the proposal categories in Table 3. Standard errors are reported below the coefficients. There are 5,745 observations at one and 2,003 observations at zero.

Proxy solicitation costs. Management spend corporate resources on soliciting proxies from shareholders (Pound (1988), Young, Millar, and Glezen (1993)). The costs cover the printing and mailing of proxy material as well as managerial time and effort. Management may contact large shareholders directly and explain why their support for a certain proposal is important. One possibility is that management increases its efforts when a proposal is subject to a supermajority rule. Our data provide a natural experiment to test the higher-effort hypothesis. There are 207 shareholder meetings with simultaneous simple-majority and supermajority proposals. Direct contact with the large shareholders should raise the support for all proposals put forward at the same meeting. Then, the proportion in favor should not differ between the simple-majority proposals and the supermajority proposals in the matched sample. Table 11 reports the regression results using one simple-majority proposal and one supermajority proposal from 207 meetings with at least one proposal of each type. When there are multiple proposals, we randomly choose one of each. We can see that the proportion in favor increases significantly with the statutory rule also in the matched sample. We conclude that explanations based on proxy solicitation costs are unlikely to account for our results.

Table 11: **Simultaneous Simple-Majority and Supermajority Proposals**

Constant	Majority	Type III	Routine	Insider	R^2	#Obs
0.827 (0.036)	0.155 (0.060)	0.023 (0.013)	0.021 (0.010)	0.036 (0.023)	0.067	414

Subset of 207 meetings with at least one simple-majority and one supermajority proposal. Ordinary least squares regression of the proportion in favor on the statutory rule, a dummy variable for Type III proposals, a dummy variable for routine proposals, and insider voting power. The sample means have been subtracted from the control variables. Robust standard errors are reported below the estimated parameters.

7 Conclusions

We have estimated a strategic voting model and found that shareholders vote strategically. Three empirical implications are consistent with the evidence: (1) Higher statutory rules are associated with a higher vote cast in favor of the proposal, (2) the relation is stronger for proposals with less favorable public information, and (3) the pass rate is independent of the statutory rule. We are not aware of any competing model or explanation that could account for these findings. The estimation results also suggest that strategic voting is economically important for some proposal classes. The probability of error (accepting a bad proposal or rejecting a good proposal) is reduced relative to decision making without private information and relative to sincere voting. Proposal screening through voting therefore adds value.

The main limitation of our model is its simplicity. We have imposed a binary signal structure with symmetric payoffs and errors, and we have assumed symmetric voters with homogenous preferences and one vote each. The symmetry assumptions narrow down the number of free model parameters to be identified in the data. As a result, we cannot account for different shareholder structures and degrees of ownership concentration. Furthermore, we cannot explain why supermajority rules exist. Supermajority rules make decision-making more conservative, but strategic voting largely neutralizes the desired conservatism. Instead, supermajority rules may serve the purpose of preference aggregation rather than information aggregation.[14] We regard the development of a more realistic model of shareholder voting, which accounts for ownership structure and combines heterogeneous preferences with an informational role for voting, as a fruitful avenue for

[14] Preference aggregation is emphasized by Messner and Polborn (2004), Holden (2004), and Levy (2005).

future research.

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8 Appendix

A General Results

A.1 Derivation of $\beta(g,N)$

Denote by $\Pr(g,N|v)$ the probability that g out of N signals are positive conditional on the state of the world v. Then:

$$
\begin{aligned}
\beta(g,N) &= \frac{\Pr(g,N\,|v=1)}{\Pr(g,N\,|v=1)+\Pr(g,N\,|v=-1)} \\
&= \frac{\binom{N}{a}\,p\,(1-\varepsilon)^{g}\,\varepsilon^{N-g}}{\binom{N}{a}\,p\,(1-\varepsilon)^{g}\,\varepsilon^{N-g}+\binom{N}{N-a}\,(1-p)\,\varepsilon^{g}\,(1-\varepsilon)^{N-g}}
\end{aligned}
\tag{29}
$$

Observe that $\binom{N}{a}=\binom{N}{N-a}$ and simplify to obtain:

$$
\beta(g,N)=\frac{p}{p+(1-p)\left(\frac{\varepsilon}{1-\epsilon}\right)^{2g-N}}. \tag{30}
$$

A.2 Derivation of (5)

Recall that a^* is defined from $\beta(a^*,N)\geq\frac{1}{2}\geq\beta(a^*-1,N)$. We simplify by using $\beta(a^*,N)=\frac{1}{2}$ and rewrite:

$$
\frac{p}{1-p}=\left(\frac{1-\varepsilon}{\varepsilon}\right)^{N-2a^*}. \tag{31}
$$

Taking logs on both sides and rewriting gives the desired result.

B Proofs

B.1 Proof of Proposition 1

Denote the probability of vote "yes" as a function of the state v by:

$$\pi(v=1) = \pi_1 = (1-\varepsilon)\,\omega_1 + \varepsilon\omega_0 \quad ,$$
$$\pi(v=-1) = \pi_0 = \varepsilon\omega_1 + (1-\varepsilon)\,\omega_0 \quad .$$

Then, denote the beliefs of any shareholder conditional on knowing that $a-1$ of the other $N-1$ shareholders have voted in favor of the proposal by $\beta(a-1, N-1)$. Beliefs $\beta(a-1, N-1)$ summarize all information the $i-th$ shareholder obtains from being pivotal, but not the signal received by the $i-th$ shareholder herself.

$$\begin{aligned}
\beta(a-1, N-1) &= \frac{p\pi_1^{a-1}(1-\pi_1)^{N-a}}{p\pi_1^{a-1}(1-\pi_1)^{N-a} + (1-p)\,\pi_0^{a-1}(1-\pi_0)^{N-a}} \\
&= \frac{p}{p + (1-p)\,X(a-1, N-1)}
\end{aligned}$$

where

$$X(a-1, N-1) = \left(\frac{\pi_0}{\pi_1}\right)^{a-1}\left(\frac{1-\pi_0}{1-\pi_1}\right)^{N-a} \quad .$$

Now denote beliefs of any shareholder conditional on being pivotal and on her signal σ by β_σ. Any shareholder who randomizes after observing a certain signal σ has to be indifferent between voting "yes" and voting "no," so that $\beta_\sigma = \frac{1}{2}$ after that signal. We have:

$$\begin{aligned}
\beta_1 &= \frac{\beta(a-1, N-1)(1-\varepsilon)}{\beta(a-1, N-1)(1-\varepsilon) + (1-\beta(a-1, N-1))\,\varepsilon} \\
&= \frac{p}{p + (1-p)\,X(a-1, N-1)\,\frac{\varepsilon}{1-\varepsilon}} \quad .
\end{aligned} \tag{32}$$

Similarly:

$$\begin{aligned}\beta_0 &= \frac{\beta\left(a-1,N-1\right)\varepsilon}{\beta\left(a-1,N-1\right)\varepsilon+\left(1-\beta\left(a-1,N-1\right)\right)\left(1-\varepsilon\right)} \\ &= \frac{p}{p+\left(1-p\right)X\left(a-1,N-1\right)\frac{1-\varepsilon}{\varepsilon}} \quad . \end{aligned} \tag{33}$$

We can see immediately by direct calculation that:

$$\beta_1-\beta_0=\frac{p\left(1-p\right)X\left(\frac{1-2\varepsilon}{\varepsilon(1-\varepsilon)}\right)}{\left(p+\left(1-p\right)X\frac{1-\varepsilon}{\varepsilon}\right)\left(p+\left(1-p\right)X\frac{\varepsilon}{1-\varepsilon}\right)}>0$$

since we assume that $\varepsilon<1/2$. Hence, we have either that $\beta_1=1/2$ or that $\beta_0=1/2$, but never both. For a pure strategy equilibrium we need $\beta_0\leq 1/2\leq\beta_1$ with at least one inequality being strict. We can therefore distinguish three cases.

Case 1: $\beta_1=1/2$. If $\beta_1=1/2$, then $\beta_0<1/2$ and the shareholder strictly prefers rejection of the proposal after observing a bad signal, so $\omega_0=0$. Solving the condition $\beta_1=1/2$ gives:

$$\frac{p\left(1-\varepsilon\right)}{\left(1-p\right)\varepsilon}=X\left(a-1,N-1\right)=\left(\frac{\varepsilon}{1-\varepsilon}\right)^{a-1}\left(\frac{1-\varepsilon\omega_1}{1-\omega_1\left(1-\varepsilon\right)}\right)^{N-a} \quad .$$

Rearranging:

$$\frac{1-\varepsilon\omega_1}{1-\omega_1\left(1-\varepsilon\right)}=\left(\frac{p}{1-p}\left(\frac{1-\varepsilon}{\varepsilon}\right)^{a}\right)^{\frac{1}{N-a}}=h \quad . \tag{34}$$

We substitute for $\frac{p}{1-p}$ from (31), which gives the expression for h in (6). Solving (34) for ω_1 as a function of h gives (6). The equilibrium is responsive whenever $\omega_1>0$, which requires $h>1$. The equilibrium is in mixed strategies if $\omega_1<1$, which is equivalent to $h<\frac{1-\varepsilon}{\varepsilon}$. From (6) this result obtains whenever the exponent of $\frac{1-\varepsilon}{\varepsilon}$ is positive, or $a>2a^{*}-N$. The equilibrium is in mixed strategies if $\omega_1<1\Longleftrightarrow h<\frac{1-\varepsilon}{\varepsilon}$. This requires the exponent of h to be less than 1, which is equivalent to $a<a^{*}$. Hence, for $a\geq a^{*}$ we always have $\omega_1=1$.

Case 2: $\beta_0 = 1/2$. If $\beta_0 = 1/2$, then $\omega_1 = 1$ and the condition can be written as:

$$\frac{p}{1-p}\frac{\varepsilon}{1-\varepsilon} = X(a-1, N-1) = \left(\frac{\varepsilon + (1-\varepsilon)\,\omega_0}{1-\varepsilon(1-\omega_0)}\right)^{a-1}\left(\frac{1-\varepsilon}{\varepsilon}\right)^{N-a} \quad .$$

Rearranging:

$$\frac{\varepsilon + (1-\varepsilon)\,\omega_0}{1-\varepsilon(1-\omega_0)} = \left(\frac{p}{1-p}\left(\frac{\varepsilon}{1-\varepsilon}\right)^{N-a+1}\right)^{\frac{1}{a-1}} = f \quad . \tag{35}$$

Using (31) to substitute for $\frac{1-p}{p}$ gives the expression for f in 7. Solving (35) for ω_0 as a function of f gives (7). We have a mixing equilibrium if $\omega_0 > 0$, which requires $f > \frac{\varepsilon}{1-\varepsilon}$. Then, the exponent of $\frac{1-\varepsilon}{\varepsilon}$ in f has to exceed -1, which is equivalent to $a > a^* + 1$. Hence, for any $a \leq a^* + 1$ we have $\omega_0 = 0$. For the equilibrium to be responsive we need $\omega_0 < 1$, or $f < 1$, hence the exponent of $\frac{1-\varepsilon}{\varepsilon}$ in f has to be negative, or $a < 2a^* + 1$.

Case 3: Pure strategy equilibria. >From the discussion of Case 1 above we know that $\omega_1 = 1$ whenever $a \geq a^*$. Also, from the discussion of Case 2 we know that $\omega_0 = 0$ whenever $a \leq a^* + 1$. Hence, for $a^* \leq a \leq a^* + 1$ the equilibrium is in pure strategies.

B.2 Proof of Proposition 2

We demonstrate the result in four steps. We first analyze those parameter ranges, where some shareholders passively vote against. The second step analyzes those parameter ranges, where some shareholders passively vote for. Then, we show that these two cases and the case of sincere voting by all shareholders cover all possible cases. These three steps complete the description of equilibrium. Step 4 derives equation (8).

Step 1: $N - k > 1$ shareholders always vote against. We show that for any proposal and for any majority rule, where the parameters satisfy:

$$\beta(a, N) \leq \frac{1}{2} \leq \beta(a, a) \tag{36}$$

there always exists an equilibrium, where k shareholders vote sincerely, $k \geq a$, and the remaining $N - k > 1$ shareholders always vote against.

Consider the k^{th} sincere voter. She is marginal if $a - 1$ sincere voters observe good signals and the remaining $k - a$ observe bad signals. Then, sincere voting is a best response if and only if

$$\beta(a-1,k) \leq \frac{1}{2} \leq \beta(a,k) \quad . \tag{37}$$

Now consider one of the other $N - k$ passive voters. This voter is pivotal whenever $a - 1$ sincere voters observe good signals and the remaining $k + 1 - a$ observe bad signals. Then, voting against even after observing a good signal is a best response if $\beta(a, k+1) \leq \frac{1}{2}$. This together with condition (37) implies that the proposed equilibrium exists whenever

$$\beta(a,k+1) \leq \frac{1}{2} \leq \beta(a,k) \tag{38}$$

since $\beta(a, k+1) > \beta(a-1, k)$ from (30). Condition (38) implies that the proposed equilibrium exist for k satisfying the above parameters. Since $\beta(a,k)$ increases in a and decreases in k, condition (38) can only be satisfied for some $a < a^*$ if $k < N$, where k is increasing in a. Moreover, any k such that $a \leq k \leq N - 1$ defines an interval, where the proposed equilibrium exists. Since β is decreasing in k, the lowest value β can take is for $k = N - 1$, otherwise the number of shareholders voting against would be zero. Then, beliefs are $\beta(a, N-1)$. Conversely, the highest value beliefs can take is for the lowest value of k, a, then: $\beta = \beta(a,a)$. Hence, letting k run from a to $N - 1$ partitions the interval (36) into $N - a$ subintervals, and that value of k for which condition (38) is satisfied defines one of these subintervals uniquely.

Step 2: $N - k > 1$ shareholders always vote for. Next, we show that for any proposal and any majority rule, where the parameters satisfy:

$$\beta(0, N-a+1) \leq \frac{1}{2} \leq \beta(a-1, N) \tag{39}$$

there always exists an equilibrium, where k shareholders vote sincerely, where $N-a+1 \leq k \leq N-1$.

It is evident that $N-k \leq a-1$ otherwise the proposal would always be accepted, independently of the information available to all shareholders. Hence, $N-a+1 \leq k \leq N-1$. Consider again one of the k sincere voters. This shareholder is pivotal if and only if the other $k-1$ sincere voters have received exactly $a-1-(N-k)$ good signals and $N-a$ bad signals. Hence, the beliefs of the shareholder support her conjectured equilibrium voting strategy if and only if

$$\beta\left(a-(N-k)-1, k\right) \leq \frac{1}{2} \leq \beta\left(a-(N-k), k\right) \quad . \tag{40}$$

Now consider one of the passive for-voters. She follows her equilibrium strategy only if she rejects the proposal even if she receives adverse information. Whenever she is pivotal, and has observed bad information, she knows $k+1$ signals. Of these, $N-a+1$ are bad and $a-(N-k)$ are good. Hence, her passive voting strategy is optimal if and only if:

$$\beta\left(a-(N-k), k+1\right) \geq \frac{1}{2} \quad . \tag{41}$$

Since $\beta\left(a-(N-k), k\right) > \beta\left(a-(N-k), k+1\right) > \beta\left(a-(N-k)-1, k\right)$, conditions (40) and (41) together imply:

$$\beta\left(a-(N-k), k+1\right) \geq \frac{1}{2} \geq \beta\left(a-(N-k)-1, k\right) \quad . \tag{42}$$

Moreover, for any k such that $N-a+1 \leq k \leq N-1$ the proposed equilibrium exists. Since $\beta\left(a-(N-k), k\right)$ is increasing in a and k, condition (42) can only be satisfied for some $a > a^*$ if $k < N$, where k is decreasing in a. Also, the lowest value β can take is for $k = N-a+1$. Then, beliefs at the lower bound of (42) are $\beta\left(0, N-a+1\right)$. Conversely, for the upper limit of the interval (42), the highest value β can take is the highest of k and $N-1$. Then, $\beta = \beta\left(a-1, N\right)$. Hence, letting k run from $N-a+1$ to $N-1$ partitions the interval (39) into $a-1$ subintervals, and that value of k for which condition (42) is satisfied defines one of these subintervals uniquely. Hence, these conditions define a unique value for k, where the proposed equilibrium exists.

Step 3: Uniqueness. The interval $\beta(a-1,N) \leq \frac{1}{2} \leq \beta(a,N)$ together with (36) and (39) cover the interval:

$$\beta(0, N-a+1) \leq \frac{1}{2} \leq \beta(a,a) \quad . \tag{43}$$

We can see that for $a = 1$ the lower bound of (43) is $\beta(0,N)$, and for $a = N$ the upper bound is $\beta(N,N)$, hence for any $a \in [1,N]$ there exists an equilibrium with at least one sincere voter.

Finally, we have to show that the equilibria characterized so far are unique. We need to rule out equilibria with k sincere voters, where l shareholders always vote for and the remaining $N-k-l$ shareholders always vote against. We prove that this is not possible by contradiction. Every shareholder is pivotal whenever there are $a-1$ for-votes. Shareholders passively voting for are pivotal if sincere shareholders have observed $a-1-(l-1)$ good signals. Hence, a shareholder voting for who has observed a bad signal only votes for if:

$$\beta(a-l, k+1) \geq \frac{1}{2} \quad . \tag{44}$$

Conversely, a shareholder voting against is pivotal if the sincere voters have observed $a-1-l$ good signals, and votes against even though she has observed a favorable signal only if:

$$\beta(a-l, k+1) \leq \frac{1}{2} \quad . \tag{45}$$

Conditions (44) and (45) are consistent only if $\beta(a-l,k+1) = \frac{1}{2}$, which is generically not true.

Step 4: Derivation of (8). We proceed as in the derivation of (5) and require that $\beta(a,k) = \frac{1}{2}$. Then, after solving and taking logs we obtain:

$$a = \frac{k}{2} - \frac{1}{2\ln\frac{1-\varepsilon}{\varepsilon}} \ln\frac{p}{1-p} \quad . \tag{46}$$

Using $a^* = \alpha^* N$ yields:

$$|a^* - a| = \frac{N-k}{2} \quad .$$

Defining $\kappa = k/N$ gives (8) immediately.

C Testing Methodology for Mixed Strategy Equilibria

Case 1: $\alpha < \alpha^*$. Use $\alpha = a/N$ and $\alpha^* = a^*/N$ in (6) to obtain:

$$h = \left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{2(a-a^*)}{N-a}+1} = \left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{2(\alpha-\alpha^*)}{1-\alpha}+1}.$$

Rewrite the exponent as:

$$\frac{2(\alpha-\alpha^*)}{1-\alpha} + 1 = \frac{\alpha}{1-\alpha} + \underbrace{\frac{2\alpha^*-1}{1-\alpha}}_{=C}.$$

Write expected fraction of votes from (9) as:

$$\begin{aligned} E(y/N) = \pi\omega_1 &= \pi\left[\frac{\left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{\alpha}{1-\alpha}+C} - 1}{(1-\varepsilon)\left(\frac{1-\varepsilon}{\varepsilon}\right)^{\frac{\alpha}{1-\alpha}+C} - \varepsilon}\right] \\ &= \pi\left[\frac{(1-\varepsilon)^{\frac{\alpha}{1-\alpha}+C} - \varepsilon^{\frac{\alpha}{1-\alpha}+C}}{(1-\varepsilon)^{\frac{\alpha}{1-\alpha}+C+1} - \varepsilon^{\frac{\alpha}{1-\alpha}+C+1}}\right]. \end{aligned}$$

The last expression gives the first line of (21) from $\frac{\alpha}{1-\alpha} + 1 = \frac{1}{1-\alpha}$.

Case 2: $\alpha \geq \alpha^*$. We use (9), where ω_0 is given by (7). Then, with $\alpha = a/N$ and $\alpha^* = a^*/N$, we rewrite the exponent as:

$$-\frac{2a^*}{a-1} + 1 = -\frac{2\alpha^*}{\alpha - 1/N} + 1 \approx -\frac{2\alpha^*}{\alpha} + 1 = -E,$$

so that $E + 1 = \frac{2\alpha^*}{\alpha}$. Then:

$$\begin{aligned} \omega_0 &= \frac{f(1-\varepsilon)-\varepsilon}{1-\varepsilon(1+f)} = \frac{\left(\frac{1-\varepsilon}{\varepsilon}\right)^{-E}(1-\varepsilon)-\varepsilon}{1-\varepsilon-\varepsilon\left(\frac{1-\varepsilon}{\varepsilon}\right)^{-E}} \\ &= \frac{(1-\varepsilon)^{1-E}\varepsilon^{E}-\varepsilon}{1-\varepsilon-(1-\varepsilon)^{-E}\varepsilon^{E+1}} = \frac{(1-\varepsilon)\varepsilon^{E}-\varepsilon(1-\varepsilon)^{E}}{(1-\varepsilon)^{E+1}-\varepsilon^{E+1}} \\ &= \frac{(1-\varepsilon)\varepsilon^{\frac{2\alpha^*}{\alpha}-1}-\varepsilon(1-\varepsilon)^{\frac{2\alpha^*}{\alpha}-1}}{(1-\varepsilon)^{\frac{2\alpha^*}{\alpha}}-\varepsilon^{\frac{2\alpha^*}{\alpha}}}. \end{aligned}$$

The last expression gives the second line of (21).

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